Module Description
Bachelor Health Informatics

Faculty Angewandte Gesundheitswissenschaften

Examination regulations 16.04.2018

Status: Dienstag 28.05.2019 09:04

- *G-01 Foundations of Medicine 4*
- *G-02 Foundations of Mathematics and Statistics 7*
- *G-03 Foundations of Informatics 11*
- *G-04 Foundations of Sciences 15*
- *G-05 General Business Administration and Accounting 18*
- *G-06 AWP (Foreign Language I) 23*
- *G-07 Foundations of Law 27*
- *G-08 Software Development 31*
- *G-09 Databases 35*
- *G-10 Foundations of Health Informatics 39*
- *G-11 Mathematics and Statistics 44*
- *G-12 Compliance and Risk Management 48*
- *G-13 AWP (Foreign Language II) 52*
- *G-14 AWP 56*
- *G-15 Medical Documentation 58*
- *G-16 Application Systems of Health Informatics 62*
- *G-17 Information Systems in Health Care 66*
  - **G3103 Medical- and Nursing Documentation System 68**
  - **G3104 Data Protection and Data Security in Health Economy 70**
- *G-18 Media Management 74*
- *G-19 Innovation and Complexity Management 80*
- *G-20 AWP (Foreign Laguage III) 84*
- *G-21 Medical Technology 88*
- *G-22 ERP-Systems 93*
- *G-23 Operations Research 98*
- *G-24 Practice of Programming 101*
- *G-25 Seminar: Current Aspects of Health Economy 105*
- *G-26 AWP (Foreign Language IV) 111*

- *G-27 AWP 114*
- *G-28 Internship (18 weeks) 116*
- *G-29 Social Processes and Communication 119*
- *G-30 Knowledge-based Systems 122*
- *G-31 IT-Projekt Management 127*
- *G-32 Logistics in Healthcare 130*
- *G-33 Collaborative Systems 133*
- *G-34 FWP-1* Evidence-based Medicine 137*
- *G-35 FWP-2* Telematics in Health Economy 140*
- *G-36 FWP-3* Data Analytics 143*
- *G-37 Managed Care 147*
- *G-38 IT-Organisation and Computer Center Management . 150*
- *G-39 Seminar: Management and IT-Consulting in health service 153*
- *G-40 Business Game: Medical Information Systems 157*
- *G-41 Bachelor Thesis 161*

G-01 FOUNDATIONS OF MEDICINE

Module code	G-01
Module coordination	Prof. Dr. Georgi Chaltikyan
Category	Health
Course number and name	G1101 Foundations of Medicine
Lecturer	Jessica Ortiz Huerta
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

After completing the module, students will be able:

- To recognize the basic morphological structures, organ and organ systems of the human body.
- To understand the structure and functions of the human body.
- To identify the essential functional dynamics in the healthy and sick human body as a basis for preventive and curative interventions.
- To outline the anatomical terms and descriptions in the medical nomenclature.
- To differentiate between individual patterns based on their clinical symptoms, treatment, and preventive options, and classify them according to their cultural and health-related significance.
- To drive their mindset into digital health using the acquired knowledge in Medical Basics, understanding the epidemiology and physiopathology challenges.
- To envision the association between Medical Basics and Digital Health and its application in the current innovative world.

Applicability in this and other Programs

This course content forms the basic knowledge for all other application-related modules in Health Informatics and Medical Informatics

Entrance Requirements

Basic knowledge of biology

Learning Content

1. Overview of Biomedical Terminology and Disciplines: Biological and medical language; Origin and structure of medical terms; Common roots and combining forms; Common suffixes and prefixes; Formation of plural; Special features: acronyms, eponyms; scope of biomedical or health sciences; Basic (fundamental) disciplines; Clinical medical specialties; Special and Interdisciplinary fields.
2. The Human Body: Structure of the living organisms; Functions of the living organisms; Basics of metabolism; Molecular composition; Cell structure and function; Genes and heredity; Basics of embryology; Tissues of the human body; Organs and organ systems; diseases and treatment; Health Information Technology approaches for the diseases and treatments.
3. The Framework of Medicine and Healthcare: Historic highlights and recent advances in medicine; Health: definitions, components, approaches, promotion; Disease: definitions, terminologies, categories, classification; Basics of healthcare delivery; Basics of clinical practice; History and physical examination; Diagnostic modalities; Treatment and rehabilitation; Prevention (prophylaxis); Medical professions and careers.
4. Basics of Privacy and Ethics in Medicine
5. Biomedical Innovation and Research, Current Trends and Future of Medicine (stem cells, genetics, and personalized medicine, HIT and AI, 3D-printed organs).

Teaching Methods

The respective course contents include blended learning; each lecture is enriched with case studies, practical demonstrations, the use of visual aids and different medical basic and electronic instruments. Complex interactions and knowledge integration are explored through project and group work using electronic media, literature search, group, and individual presentations.

Remarks

Visit to a doctor's surgery, ambulatory healthcare centre, hospital, health office; Digital health Congress or Conference.

Recommended Literature

- Martini, Frederic H., and Edwin F. Bartholomew. Essentials of Anatomy & Physiology, Global Edition, Pearson Education Limited, 2016. ProQuest Ebook Central
- Tittel, K., Seidel, E.: Beschreibende und funktionelle Anatomie, KIENER Verl.; 15. Auflage 2012
- Huch R., Jürgens K. (Hrsg.) Mensch Körper Krankheit, 4. Aufl., Biologie Anatomie Physiologie 5. Aufl., Elsevier GmbH, Urban & Fischer, München
- Schünke, M.: PROMETHEUS Allgemeine Anatomie Innere Organe: Lernatlas der Anatomie, Thieme Verl.; 4. überarbeitete und erweiterte Auflage 2014

G-02 FOUNDATIONS OF MATHEMATICS AND STATISTICS

Module code	G-02
Module coordination	Prof. Dr. Thomas Spittler
Category	Mathematics/ Sciences
Course number and name	G1102 Mathematics I G1103 Statistics I
Lecturers	Ibrahim Bader Prof. Dr. Agnes Nocon
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 67.5 hours virtual learning: 22.5 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Professional competence

- Students are familiar with mathematical reasoning and can construct and verify complex logical arguments by themselves.
- They understand the properties and interrelationships of fundamental mathematical objects such as sets, numbers and functions.
- They will be able to calculate the number of possible outcomes of elementary combinatorial processes and determine the probabilities and discrete distributions for simple combinatorial processes.
- Students are familiar with the scientific research process and have basic knowledge of the quantitative research approach (e.g. main study designs, sampling, data management).

- They conceive issues of descriptive statistics within the context of the quantitative research approach.
- They know and calculate descriptive parameters like measures of central tendency and dispersion, and have an understanding of the impact of probability theory on statistical parameters.
- They have basic knowledge of the statistical software R and present statistical results according to scientific standards.

Methodological competence

- Students acquire a comprehensive understanding of fundamental mathematical and statistical concepts.
- Students are able to apply mathematical and statistical methods to complex problems.

Personal competence

- Students train their ability for abstract thinking by working with abstract mathematical and statistical concepts.
- They increase their ability of self-organisation by going further into the topic and solving exercises in private study.

Social Competence

- The students' team-working and problem-solving skills are enhanced through solving exercises in small teams with their fellow students.

Applicability in this and other Programs

Mathematics and statistics is essential for most of the scientific courses, like Mathematics and Statistics, Practice of Programming, Knowledge-based Systems

Entrance Requirements

Knowledge of elementary high-school mathematics

Basic computer literacy

Learning Content

In Mathematics:

1. Basic knowledge of mathematics
1.1. Propositional Logic
1.2. Set Theory

1.3. Relations
1.4. Introduction to Functions

2. Linear algebra and matrix calculus
2.1. Vector space
2.2. Systems of linear equations
2.3. Matrices and Determinants
2.4. Solving systems of linear equations

3. Combinatorics and elements of discrete mathematics
3.1 Permutations
3.2 Combinatorics
3.3 Introduction to Probability Theory

In Statistics:

1. Quantitative research approach
1.1 research question
1.2 study desigs
1.3 data collection
1.4 data management

2. Summary statistics
2.1 scales of measurement
2.2 measures of center (mean, mode, median)
2.3 measures of spread (range, interquartile range, standard deviation)

3. Random variables
3.1 concept and probability distributions
3.2 sampling error and confidence interval

4. Presentation of results
4.1 pie charts, bar plots
4.2 histograms
4.3 box plots
4.4 tables

5. R software
5.1 installation
5.2 getting help
5.3 basic objects
5.4 data import
5.5 scripts
5.6 commands for parameter calculation

Teaching Methods

Lectures / exercises / tutorials / home work / group activities

Using: Whiteboard, visualizer and online learning portal (iLearn).

Recommended Literature

Mathematics:

Sterling K. Berberian, A first course in real analysis, Springer-Verlag, c1994

Gilbert Strang., Introduction to linear algebra / 4th ed. Wellesley-Cambridge Press, c2009

Bradley, Teres, Essential mathematics for economics and business, Wiley 2013

Don, Eugene, Schaum's outline of basic business mathematics, 2009
Lerner, Joel J, Schaum's outline of theory and problems of business mathematics, 1985

Puff, F., Mathematik für Wirtschaftswissenschaftler kompakt, 3. Auflage, vieweg+Teubner Verlag, Braunschweig, 2009

Puff, F., Mathematik für Wirtschaftswissenschaftler 2, 1. Auflage, vieweg Verlag, Braunschweig, 1979

Holland, H., Holland, D., Mathematik im Betrieb, 7. Auflage, Gabler Verlag, Wiesbaden, 2004

Auer, B.; Seitz, F.:Grundkurs Wirtschaftsmathematik, Gabler Verlag, 4. Auflage, 2013

Statistics:

Rumsey, D. (2017). Statistics workbook for dummies. Weinheim: Wiley.

Weiss, N.A. (2017). Introductory Statistics. Boston: Pearson.

Bland, M. (2015). An introduction to medical statistics. Oxford: Oxford University Press.

Kabacoff, R.I. (2015). R in action. Shelter Island: Manning.

Jacobsen, K.H. (2017). Introduction to health research methods. A practical guide. Burlington, MA: Jones & Bartlett.

G-03 FOUNDATIONS OF INFORMATICS

Module code	G-03
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G1104 Formal Languages, Data Structure and Algorithms
Lecturer	Prof. Dr. Sascha Kreiskott
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The module is intended to introduce students to the basic concepts of informatics. The goal is to teach students to apply transfer knowledge. Moreover, in the future, data itself will increasingly become the focus of business processes, thereby gaining a role in business life and becoming the basis of business decisions.

Students must be able to apply these capabilities independently of the application software used as an example.

Professional competence

- The students are able to recognise the principles of informatics in modern software applications, interpret them correctly in this context, and apply them.
- They can abstract from the pure application and recognize structures and thus assess the possibilities and limitations of the software.
- They master the basic models and description procedures of digital systems.
- They can apply methodical procedures for the logical design of computer components.

- They have the ability to use system software as users and developers of software products.

Methodological competence

- The students apply different methods of algorithm design and software engineering.
- They use a systematic approach to solving information technology problems.
- They can divide tasks and problems into smaller units that are easier to handle and solve.
- They can use the functions described in the theoretical part identify and evaluate the basic principles learned in modern application systems (e.g. to be able to determine the usage potential or the limits of standard applications)

Personal competence

- The students are able to describe the main features of programming and name common computer models.
- They can algorithmize problems of simple to medium complexity and successfully code them using a programming language (e.g. C or VB).

Social Competence

- Approaches and solutions are developed and discussed in the group.

Applicability in this and other Programs

Software Development, Databases, Foundations of Health Informatics, Medical Documentation, Application Systems of Health Informatics, IT Organisation and Computing Centre Management

Entrance Requirements

none

Learning Content

1. Clarification of concepts
1.1 Science
1.2 Technical language
1.3 Informatics
1.4 System/model
1.5 Information

2. Number Systems, Coding, Boolean Algebra

3. Introduction to algorithms and calculability
3.1 Properties of algorithms
3.2 Complexity of algorithms
3.3 Calculability

4. Introduction to automata theory
4.1 Deterministic finite automaton
4.2 Graphic notation
4.3 Finite automaton as tuple

5. Turing machine

6. Operational machine model
6.1 Three address instruction
6.2 Value assignment
6.3 Direct, indirect and indexed addressing

7. Tasks of a compiler
7.1 Lexical analysis
7.2 Syntax analysis
7.3 Semantic analysis

8. Introduction to programming languages
8.1 Linguistic features (syntax, semantics, and pragmatics)
8.2 Metalanguages
8.3 Backus-Naur form (BNF)
8.4 Syntax diagrams
8.5 Grammars (Chomsky hierarchy)
8.6 Introduction to the semantics of programming languages

9. Introduction to imperative programming languages
9.1 Structuring options: Flow charts, Structograms (Nassi–Shneiderman diagram), Pseudocode
9.2 Concepts of imperative programming languages: Data types, Data structures, Algorithms

10. Practial Exercises: Office applications
10.1 Usage of metalanguage
10.2 Syntax of instructions and macro applications
10.3 Data types and data structures in spreadsheet and databases
10.4 Algorithms in the designing of mail merges
10.5 Correlation between algorithm and data structures
10.6 Addressing in spreadsheet and word processing programs

Student performance is evaluated on the basis of appropriate exercises during the semester to ensure optimum examination requirement.

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Herold, H. / Lurz, B. / Wohlrab, J.: Grundlagen der Informatik, 2. Aktualisierte Auflage, 6/2012, Pearson Studium, ISBN 978-3-8689-4111-1
- Richter, R. / Sander, P. / Stucky, W.: „ Problem Algorithmus Programm“, B. G. Teubner, Stuttgart Leipzig Wiesbaden, 2. Auflage, 1999
- Pomberger, G. / Dobler, H.: „Algorithmen und Datenstrukturen“, Pearson Studium, München, 2008
- Wirth, Niklaus: „Algorithmen und Datenstrukturen“, B. G. Teubner, Stuttgart Leipzig Wiesbaden, 5. Auflage, 1998
- Eirund, H. / Müller, B. / Schreiber, G.: „Formale Beschreibungsverfahren der Informatik“, B. G. Teubner, Stuttgart Leipzig Wiesbaden, 1. Auflage, 2000
- Appelrath, H.-J. / Boles, D. / Claus, V. / Wegener, I.: „Starthilfe Informatik”, B. G. Teubner, Stuttgart Leipzig Wiesbaden, 1998
- Shiffman, D.: „Learning Processing: a beginner's guide to programming images, animation, and interaction“, Morgan Kaufmann, 2009.

G-04 FOUNDATIONS OF SCIENCES

Module code	G-04
Module coordination	Dr. Melanie Kappelmann-Fenzl
Category	Mathematics/ Sciences
Course number and name	G1105 Foundations of Sciences
Lecturer	Dr. Melanie Kappelmann-Fenzl
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The “Basics of Natural Sciences” module aims at providing a basic understanding of the relevant aspects of general biology, physics and chemistry. Biomedical research is currently using a variety of computer-based analyses to analyse genes that are predictive for the prognosis or therapy response of a disease ('personalised medicine').

After completing the Basics of Natural Sciences module, students will have obtained the following learning competencies:

Professional competence

- Students are familiar with the basics of natural sciences, which are needed to understand IT applications in medical and biomedical research.
- In addition, students are familiar with the basics of natural sciences for a career in the technical healthcare environment, and have a structured overview of the main topics of human biology.

Methodological competence

- On the basis of practical examples, students understand what knowledge is required in which areas and therefore also understand the necessity of mastering the basics of natural sciences for the further course of studies and for their professional career.

Students are in a position to apply the basic knowledge they have gained across disciplines.

Applicability in this and other Programs

Evidence-Based Medicine, Medical Technology, Current Aspects of Health Sciences, Data Analytics

Entrance Requirements

None

Learning Content

1. **Biology**
   - 1.1. General cytology
   - 1.2. Genetics (organisation of DNA, regulation of gene expression, signal transduction, selected medical aspects of molecular biology)
   - 1.3. Molecular biological methods and computer-based analysis options
2. **Chemistry**
   - 2.1. Macroscopic forms of appearance of matter
   - 2.2. Structure and properties of matter
   - 2.3. Chemical changes
   - 2.4. Chemistry of biomolecules (carbohydrates, amino acids, peptides, proteins, lipids, fatty acids, nucleotides, nucleic acids, chromatin)
   - 2.5. Vitamins, vitamin derivatives and coenzymes
   - 2.6. Chemical basics of thermodynamics and kinetics
3. **Physics**
   - 3.1. Basic terms of measurement and quantitative description
   - 3.2. Mechanics
   - 3.3. Structure of matter

3.4. Thermodynamics

3.5. Electrical science

3.6. Oscillations and waves

3.7. Optics

3.8. Ionising rays

Teaching Methods

Seminar-like classes, application examples

Remarks

The iLearn teaching and learning platform provides students with additional literature references and learning material to prepare for the lectures.

Recommended Literature

Detailed lecture notes are available online for preparation and follow-up work

- Bannwarth H. (2013). Basiswissen Physik, Chemie und Biochemie: Vom Atom bis zur Atmung- für Biologen, Mediziner und Pharmazeuten, Springer Spektrum, 3. Auflage
- Wenisch T. (2005). Kurzlehrbuch Physik, Chemie, Biologie, Urban & Fischer Verlag/ Elsevier GmbH, 1. Auflage

G-05 GENERAL BUSINESS ADMINISTRATION AND ACCOUNTING

Module code	G-05
Module coordination	Prof. Dr. Robert Feicht
Category	General Foundations
Course number and name	G1106 General Business Administration and Accounting
Lecturer	Prof. Dr. Robert Feicht
Semester	1
Duration of the module	1 semester
Module frequency	
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 90 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Professional and methodological competence
Students develop an understanding of essential concepts, basic tools and functions of business activity, taking the economic framework conditions into account.

Knowledge

- Students have become familiar with the most important functional areas in the overall image of a company and the development of central management approaches.
- Students have a basic understanding of microeconomic and macroeconomic analysis. They understand the interplay between economic regulations, institutional framework and strategic profile of a company and derive their own opinions.
- Students know the essential features of financial and management accounting. They understand the legal foundations and components of bookkeeping and accounting and the resulting obligations for companies.

- Students fully understand the operational functions of financial accounting and the informational expectations on financial accounting.

Skills

- With a view to the practice students can describe and structure planning processes, decision-making processes and control processes in companies.
- Students are able to recognize the interdependencies of markets and companies and derive economic policy recommendations from them.
- They are able to handle complex economic issues graphically, arithmetically and verbally.
- Students are able to evaluate the impact of business transactions on financial accounting.
- Within the scope of double-entry bookkeeping students execute accounting transactions independently.
- They are able to read and interpret annual financial statements in detail.

Personal competence

Social competence

- Students develop communication skills that are supported by tasks and case studies. They are encouraged to discuss critical/controversial topics in an objective atmosphere.
- Students can present their analyzes in a goal-oriented and application-oriented manner matching the target audience.

Autonomy

- They are able to relate their acquired knowledge to other lectures and topics.
- Students can handle complex work and study contexts independently and design them in an application-oriented way.

Applicability in this Program

G-22 ERP-Systems

G-23 Operations Research

G-25 Seminar: Current Aspects of Health Economy

G-29 Social Processes and Communication

G-32 Logistics in Healthcare

Applicability in this and other Programs

The learning outcomes of this fundamental module can be applied in any lectures and other study programs that require a basic understanding of

- business and economic processes and interdependencies,
- bookkeeping, accounting and the assessment of the financial situation of a company.

Entrance Requirements

without

Learning Content

Business Administration

- The environment of business
  - Being ethical and socially responsible
  - Global business
- Business ownership and entrepreneurship
  - Different forms of business ownership
  - Small business, entrepreneurship, and franchises
- Management and organization
  - Management process
  - Creating a flexible organization
- Human resources
  - Attracting and retaining the best employees
  - Motivating and satisfying employees and teams

Economics

- Introduction
  - Ten principles of economics
  - Interdependence and the gains from trade
- Markets and welfare

- Supply, demand, and government policies
- Elasticity
- Consumers, producers, and the efficiency
- Costs of taxation

- The economics of the public sector
  - Externalities
- Firm behavior and the organization of industry
- The data of macroeconomics
  - Measuring a nation's income

Accounting

- Accounting: information for decision making
- Basic financial statements
- The accounting cycle
  - Capturing economic events
  - Accruals and deferrals
  - Reporting financial results
- Financial statement analysis

Teaching Methods

Seminaristic teaching combining topic-oriented lectures, exercises, group work, group presentations, and classroom discussions. Students are encouraged to actively participate in course by choosing appropriate didactical methods. They are strongly invited to discuss real-life problems and applications interactively throughout the lecture.

Recommended Literature

Business Administration and Economics

- *Pride W.M., Hughes R.J., Kapoor J.R.; "Foundations of Business"; 6th edition; Boston, MA: Cengage Learning; 2018.*
- *Mankiw N.G.; "Essentials of Economics"; 8th edition; Boston, MA: Cengage Learning; 2018.*

- Ebert R.J., Griffin R.W.; "Business Essentials"; 11th global edition; Boston: Pearson Education; 2017.
- Nickels W.G., McHugh J.M., McHugh S.M.; "Understanding Business"; 11th. internat. edition; New York: McGraw-Hill Education; 2016.

Accounting

- *Williams J.R., Haka S.F., Bettner M.S., Carcello J.V.; "Financial & Managerial Accounting: The Basis for Business Decisions"; 17th internat. edition; New York: McGraw-Hill Education; 2015.*
- Dyson J.R., Franklin E.; "Accounting for Non-Accounting Students"; 9th edition; Harlow: Pearson Education; 2017.
- McLaney E., Atrill P.; "Accounting and Finance: An Introduction"; 9th edition; Harlow: Pearson Education; 2018.

G-06 AWP (FOREIGN LANGUAGE I)

Module code	G-06
Module coordination	Tanja Mertadana
Category	General Foundations
Course number and name	G1107 Foreign Language I
Semester	1
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	undergraduate
Semester periods per week (SWS)	4
ECTS	4
Workload	Time of attendance: 60 hours self-study: 30 hours virtual learning: 30 hours Total: 120 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The modules Foreign Language I and III aim to equip students with specialized language skills necessary for independent performance in a globalized industrial engineering sector. In doing so, it strives to deepen students' relationship with the English language in business and technical settings so that they can effectively and efficiently implement the language as a practical communication tool.

To this end, the module targets instruction of the four cardinal language skills (listening, reading, speaking, and writing) across a wide range of core business and technical topics related to industrial engineering. Students also craft the content of their own learning through needs analyses and frequent immersive and self-directed projects.

Central to the module is optimizing fluency and communication skills; so too is cultivating a clear understanding of the finer points of textual meaning and meaning produced in dialogue with others. Through a variety of task-based speaking, listening and writing activities, students enhance their oral and aural production and expand their ability to produce clear, concise and coherent pieces of writing – emails, reports, or expository paragraphs on business and technical processes. Particular emphasis will be placed on honing students' public speaking and team skills through work on a team presentation project for each course.

On completion of the module students will have achieved the following learning objectives:

Professional competencies

- Students will have an independent command of specialized business and technical terminology relevant to the field of industrial engineering. Command here refers to oral and written production as well as aural and reading comprehension.
- They will be in a position to deploy study skills such as close reading and coherent writing at a B2/C1-level and for use in niche tasks for the industrial engineering sector.
- They will have gained substantial knowledge of B2/C1-level language registers – both for formal study contexts and for semi-formal to formal professional contexts.
- They will have gained essential experience in presenting on topics related to business and technical English. The goal here is to package niche knowledge in the protocols of a clearly structured, effectively delivered piece of public speaking.

Methodological competencies

- Students will have enhanced their abilities to structure the acquisition of specialized terminology and grammatical items and practiced ways to internalize new language that yield optimal learning benefits.
- They will have extended and refined their practical research skills in English by engaging in at least two research projects – for example, by being asked to present on a discipline-specific topic in an individual or team presentation.

Social competencies

- Students will have gained valuable experience in training other personal effectiveness skills such as team work, integrity, and reliability.

They will have reflected on the learning benefits derived from several immersion projects.

Entrance Requirements

The minimum entry-level requirement is a B2-level of English according to the Common European Framework of Reference for Languages (CEFR) or A-level language skills according to the standards of the German education system. Alternatively, experience living abroad or successful participation in a study exchange may be sufficient.

Learning Content

General Business English

- business basics
- company structures
- markets and market structures
- business startups
- launching a product
- innovation and technology in business
- online business
- marketing
- communication and business correspondence
- business meetings and presentations
- working across cultures

current business topics

Teaching Methods

Instruction and learning methods focus on training the four cardinal language skills (speaking, listening, reading, and writing) and on enhancing professional and social competencies. They include group discussions and group projects, individual and team work (e.g. individual and group presentations), real- and role-playing, close reading and listening activities, grammar games, method of loci, running dictations, translations, peer feedback and review, work with learning stations, and various follow-up viewing and writing activities.

Study assignments will be set on a weekly basis.

Recommended Literature

Brook-Hart, Guy. *Business Benchmark*. 2nd ed.: Upper Intermediate. Cambridge: CUP, 2013.

Business Spotlight: <www.business-spotlight.de>

Butzphal, G., Maier-Fairclough, J. *Career Express. Business English B2*. Berlin: Cornelson, 2015.

Cotton, D., Falvey, D. & Kent, S. *Market Leader Upper Intermediate*. Harlow: Pearson Longman, 2016.

Doyle, Charles. *A Dictionary of Marketing*. 4th ed. Oxford: OUP, 2016.

Duckworth, M., Turner, R. *Business Results Upper Intermediate*. Oxford: OUP, 2008.

Emmerson, P. *Business Vocabulary Builder*. London: Macmillian, 2009.

Emmerson, P. *Business Grammar Builder. Intermediate to Upper-intermediate*. London: Macmillian, 2010.

Foley, M., Hall, D. *MyGrammarLab. Intermediate B1/B2*. Harlow: Pearson, 2012.

Law, Jonathan. *A Dictionary of Business and Management*. 6th ed. Oxford: OUP, 2016.

Rogers, Louis. *Skills for Business Studies*. Upper Intermediate. Oxford: OUP, 2012.

Vince, Michael. *Intermediate Language Practice*. 3rd ed. London: Macmillan, 2010.

G-07 FOUNDATIONS OF LAW

Module code	G-07
Module coordination	Prof. Dr. Thomas Spittler
Category	General Foundations
Course number and name	G2101 Social Security Law G2102 Liability Law
Lecturer	Anna Schmaus-Klughammer
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Learning Outcomes of the Module:

The module is divided into two parts. The course gives students an insight into the legal foundations of “Social Security Law” and “Liability Law”.

Social Security Law

The aim of the Social security course is to familiarize the student with the legal aspects of national and international social security systems.

The Social Security course deals with the basic techniques and principles of national and European Social Security law and refers to:

- The subject, the system and the sources of Social Security Law;
- The fundamental principles of Social Security Law;
- The functions of Social Security Law;
- The legal relations of Social Security;

- The pension insurance, including the complementary pension schemes;
- The health insurance;
- The sickness insurance - persons covered, matters covered, the different benefits;
- The unemployment insurance - companies and workers covered, matters covered, different benefits;
- The administrative and inspective bodies;
- Judicial remedies.

Liability Law

The aim of the Legal Liability course is to familiarize the student with the legal aspects of national and international liability systems.

The Legal Liability course deals with the basic techniques and principles of national and European law and refers to:

- civil law
- criminal law
- ethics

The Legal Liability course will focus on product liability claims associated with the design, development and manufacture, as well as marketing and distribution of medical devices. The various forms of product defect in tort, the concepts of strict liability and negligence, related contractual and warranty theories of recovery, causation, defenses, and damages and informed consent will be considered in this context.

The student will know the legal liability requirements in national and international settings and will be able to explain these.

Professional competences:

- Students are familiar with the basic terms and structures of the Social Security and Legal Liability law.
- They are taught about the foundations of law and understand the terms, their implementation and impact.

Methodical expertise:

- Discuss the burden of social security in different countries of the world.
- Discuss the outcome of applied social security in Germany
- Discuss the challenges of liability law world wide

- Application of liability law to practical cases;

Personal competences:

- Understand Social Security systems
- Ability to understand the meaning of Social Security for a country, business and the employees.
- Understand the importance of liability law for the manufacturer and the end-user

Social competence:

- Working in small groups discussing and presenting various legal issues and challenges in different countries.

Applicability in this and other Programs

All courses of the faculty

Entrance Requirements

None

Learning Content

- Basics in Law
- Basic principles of Social Security Law
- Basic principles of Liability Law
- Social Security Law
  - German system
  - Historical development of the German healthcare system
  - European Social Security Systems
  - Social Security Rights
    - Family
    - Health
    - Incapacity
    - Old-age and Survivors
    - Social Assistance

    - Unemployment
    - Moving Abroad
    - Main Residence
  - International Social Security Systems
    - International Labour Organization (ILO)
- Liability Law
  - German law
  - European liability law
  - Public liability law
  - Product liability law
    - Law principles governing liability for defective products
    - development risks defence in an EU context
    - US Products Liability Law
    - Design warnings and the manufacturing defect/design flaw dichotomy in an EU and a US context
    - Compensating consumers (injured by allegedly defective products) in the Common Law World, the EU and the US

Teaching Methods

lectures, case studies, group work

Recommended Literature

Literature for in-depth knowledge

- EU Social Security Law, A Commentary on EU Regulations 883/2004 and 987/2009, Prof. Dr. Maximilian Fuchs, Prof. Dr. Rob Cornelissen, 2015, Nomos Verlag
- European Product Liability (Principles of European Tort Law), Piotr Machnikowski, 2016, Intersentia Verlag

G-08 SOFTWARE DEVELOPMENT

Module code	G-08
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G2103 Software Development
Lecturer	Prof. Dr. Thomas Spittler
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students understand the concepts of object-oriented programming and master the practical handling of these concepts, as well as tools and methods. Programmes are created and practical exercises are carried out using a modern programming environment.

After completing the module, students will have achieved the following learning objectives:

Professional competence

- Students understand the concepts of modular software design.
- They use version control systems such as GIT in the development of software programs.

Methodological competence

- Students have the ability to create programmes using a modern object-oriented programming platform.

- They can describe requirements for software programs and convert them into object-oriented code.

Social competence

- Programming exercises are carried out during the lectures. Students are thereby able to understand and criticise the contents of the programmes created by their colleagues and to complement them with their own programmes.
- They can create programmes in a way that allows cooperation in the team.

Personal skills

- Students can implement their own software-technical ideas and defend them against competing approaches.

Applicability in this and other Programs

This module is the basis for Practice of Programming

Entrance Requirements

Foundation of Informatics

Learning Content

Students learn the theoretical and practical basics of an object-oriented programming language in order to use them to solve simple application problems in business informatics.

1. Introduction
1.1 Paradigms of software development
1.2 What is the difference between procedural and object-oriented programming?
1.3 Advantages and tools of a modern programming environment
1.4 Creation of an initial program in the form of a module test

2. Basics of an object-oriented programming language and revision of basic knowledge from previous courses.
2.1 Which components constitute the syntax of a programming language?
2.2 The function of literals, identifiers, commands, expressions, blocks, basic data types, and control constructs in an object-oriented programming language
2.3 Structure of module tests
2.4 Role and function of modularisation, packets and modules, as well as API libraries
2.5 Correct and consistent formatting of computer programs is the prerequisite for cooperation in a programming team
2.6 The use of basic data types, character strings and arrays

3. Version Control System
3.1 Need for Version Control System
3.2 Version Control with GIT

4. Basic concepts of object-oriented programming
4.1 Object-oriented programming
4.2 Data encapsulation
4.3 Constructors
4.4 Inheritance
4.5 Abstract classes and interfaces
4.6 Declarations and modifiers
4.7 Data and data structures
4.8 Parameterised data types and genericity
4.9 Class variables and class methods
4.10 Enumerations

5. Common concepts of advanced object-oriented programming
5.1 Data types for encapsulating basic data types and their use
5.2 Data structures for managing sets, lists and associative data fields
5.3 Trees
5.4 Error and exception handling

6. Graphical concepts and interaction
6.1 Programming of applications (e.g., Web Application)
6.2 Concepts of event handling

7. Network technologies
7.1 Client and server technology
7.2 Web services

Teaching Methods

Seminar-like classes in the computer lab alternates between the traditional lecture style for the theoretical concepts of object-oriented software technology and the independent solving of programming tasks by students. The lecturer assist the students individually. Students explain their solutions in the form of short presentations.

Recommended Literature

- Balzert, H.: (2012), Lehrbuch der Softwaretechnik: Entwurf, Implementierung, Installation und Betrieb, Spektrum, Heidelberg, Berlin, Oxford
- Fischer, H. et.al. (2014): Geschäftsprozesse realisieren, Vieweg-Verlag, Wiesbaden
- Freund J. (2012), Praxishandbuch BPMN 2.0, 3. Auflage, Hanser-Verlag, München

- Goll, J., Weiß, C., Müller, F. (2000), Java als erste Programmiersprache - vom Einsteiger zum Profi, 3. Aufl., Teuber Verlag, Stuttgart
- Inden, M. (2014), Java 8 – Die Neuerungen, dpunkt-Verlag
- Jung, E. (2007), Java 6 - Das Übungsbuch, mitp, Redline GmbH, Heidelberg
- Ratz, D., Scheffler, J., Seese, D., Wiesenberger, J., (2011), Grundkurs Programmieren in Java, 6. Auflage, Hanser Verlag, München
- Ullenboom, C. (2014), Java ist auch eine Insel, 11. Auflage, Galileo Computing, Galileo Press, Bonn, http://openbook.galileo-press.de/javainsel/
- Preißel, R. (2018), Git: dezentrale Versionsverwaltung im Team: Grundlagen und Workflows, 4. Auflage, dpunkt.verlag, Heidelberg
- Rupp, C. (2012), UML2 glasklar, 4. Auflage, Hanser-Verlag, München
- Seidlmeier, H. (2010), Prozessmodellierung mit ARIS, 3. Auflage, Vieweg-Verlag
- Sommerville, I. (2012), Softwareengineering, 9. Aufl., Verlag Pearson Studium, München
- Kalin, M. (2013). *Java Web Services: Up and Running: A Quick, Practical, and Thorough Introduction*. " O'Reilly Media, Inc.".

Internet Links

- Eclipse Online Documentation, https://eclipse.org/documentation/
- Java developer pages http://www.java.com/
- Java™ Platform Standard Ed. 7, Documentation http://docs.oracle.com/javase/7/docs/api/

G-09 DATABASES

Module code	G-09
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G2104 Databases
Lecturer	Prof. Dr. Thomas Spittler
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

After completing the Databases module, students have achieved the following learning objectives:

Professional competence

- Students understand the importance of databases.
- They know the elements of an entity relationship model.
- They can set up an entity relationship model for a database.
- You can detect anomalies and normalize tables.
- You use the functions of a database management system (DBMS).
- You manage databases using a DBMS.
- You execute database queries with SQL.

Methodological competence

- The students get to know the procedure for creating a data model and can implement it in a concrete database.
- In this course they will learn how to formulate SQL queries to relational databases.
- They develop applications that access the contents of a database.
- The participants acquire knowledge of performance optimization during storage and access to data and understand the interaction of application, presentation and database servers during programming.

Personal competence

- Students reflect on the opportunities and limitations of databases.
- Solutions are independently researched and weighed up.
- A database-oriented task description can be understood.

Social Competence

- In the group, a solution can be described and argued about.

Applicability in this and other Programs

Practice of Programming, Media Management, Web-based Systems, Collaborative Systems, Data Analytics

Entrance Requirements

Foundation of Informatics

Learning Content

1. Introduction to Databases
1.1 Requirements for a database and a database management system
1.2 Tasks and levels of a database management system
1.3 Historical development of databases
1.4 Database Types
1.5 Deepening: relational databases

2. Data modelling
2.1 Entity Relationship Model (ER Model)
2.2 Requirements analysis for database design
2.3 Translation from ER model to tables
2.4 Normalization (first, second, third normal form)
2.5 Practical exercises

3. Formalization of Tables using SQL
3.1 Table Definition with SQL (Data Types, Contraints, Primary and Foreign Keys)

3.2 Inserting, deleting and changing data
3.3 Changing Table Structures
3.4 Simple SQL Queries
3.5 Groupings in SQL
3.6 Nested SQL Queries
3.7 Practical Exercises Using a MySQL Container

4. Transactions
4.1 Dangers of simultaneous use of databases by several users
4.2 Solution approaches

5. Rights and Views
5.1 Rights management taking different DBMS into account
5.2 Views
5.3 Practical exercises

6. Stored Procedures and Triggers
6.1 Stored Procedures under Consideration of Different DBMSs
6.2 Trigger under consideration of different DBMS
6.3 Practical exercises

7. Introduction to JDBC and Hibernate and testing of database systems
7.1 Requests via JDBC
7.2 Prepared SQL Commands
7.3 Using Java Hibernate
7.4 Fundamentals of Testing Database Systems
7.5 JUnit
7.6 Practical exercises

8. NoSQL databases
8.1 Limits of relational databases
8.2 Further development of databases
8.3 Practical exercises

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Kansy, T. (2008), Datenbankprogrammierung mit .NET 3.5, Hanser, München, Bachelor Wirtschaftsinformatik.
- Mertins, D. (2009), SQL Server 2008, Galileo Press, Bonn.
- Preiß, N. (2007), Entwurf und Verarbeitung relationaler Datenbanken, Oldenbourg, München u.a.
- Staud, Josef L. (2005), Datenmodellierung und Datenbankentwurf, Springer, Berlin u.a.
- Steiner, R. (2009), Grundkurs Relationale Datenbanken, Vieweg + Teubner, Wiesbaden.
- Kleuker, S. (2016), Grundkurs Datenbankentwicklung: von der Anforderungsanalyse zur komplexen Datenbankanfrage. Springer-Verlag.
- Williams, N. S. (2014). *Professional Java for web applications*. John Wiley & Sons.
- Gennick, J. (2010). *SQL Pocket Guide: A Guide to SQL Usage*. " O'Reilly Media, Inc.".
- Perkins, L., Redmond, E., & Wilson, J. (2018). *Seven databases in seven weeks: a guide to modern databases and the NoSQL movement*. Pragmatic Bookshelf.
- Kroenke, D., & Auer, D. J. (2015). *Database concepts*. Boston: Pearson,

G-10 FOUNDATIONS OF HEALTH INFORMATICS

Module code	G-10
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G2105 Systems and Applications
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students of the Health Informatics course are familiar with the systems and applications, as well as the prerequisites of the telematics infrastructure in the German healthcare sector, as is required by the new eHealth law, as well as with the basic technical network services.

Students enrolled in the course are able to assess the difference between the term's safety, security and privacy and develop the knowledge for network security associated threats and management/controlling types.

Participants in the module gain insight into the importance of IT-based communication technology for the healthcare industry. They understand the physical and technical fundamentals of setting up and operating communication networks as well as the main components of networking.

After completing the Basics of Health Informatics module, students will have achieved the following learning objectives:

Professional competence

- Students are able to contrast the difference of EMR versus EHR & PHR.

- Students are familiar with network protocols, technologies and associated topologies e.g. (Ring, Star, Mesh, Hybrid, Bus) as well as network applications and management.
- Students are able to familiarize themselves with network components and compare the difference in terms of function between routers, modems, hubs and switches.
- Students tend to develop knowledge regarding network, internet and routing protocols.
- Students set up and operate important network components independently.
- They are familiar with the necessary work steps on suitable network hardware and simulation software.

Methodological competence

- Students acquire knowledge about building local networks and extending local area networks using WAN technologies and routing, and develop the skills required for network applications, network management and network security.
- They are made aware of the threats to IT security and can evaluate, apply and justify measures taken for safeguarding it.

Personal competence

- They can reflect on the requirements of data protection and IT security with respect to networks and apply these in relevant application scenarios.
- Students are in a position to view their own communication situations from the meta-level and to use these competencies in individual and group discussions as appropriate to the situation.

Social competence

- Approaches and solutions are developed and discussed in the group.

Applicability in this and other Programs

Data Protection and Data Security in the Healthcare Industry

Medical Documentation

Clinical Information Systems

Practice of Programming

Entrance Requirements

Foundation of Informatics, Foundation of Medicine

Learning Content

1. Introduction to Health Informatics

1.1 Defining and significance of Health Informatics within healthcare delivery
1.2 Telematics infrastructure applications in the healthcare sector
1.3 Overview to the German Healthcare telematics framework

2. Communication in Healthcare

2.1 Data communication types with examples
2.2 Principles of Synchronous versus Asynchronous communication
2.3 Conceptual framework of data communication in healthcare
2.4 Core components of data communication

3. Communication systems in Healthcare

3.1 Clinical Information systems (CIS)
3.2 Patient data management systems (PAS)
3.3 Electronic patient file (EPF)
3.4 Department systems and special systems
3.5 Medical practice systems and outpatient department systems
3.6 Administrative systems
3.7 Mobile applications

4. Transmission Media

4.1 Overview of factors involved in selecting a transmission media
4.2 Development structure of cabling system according to EN 501173-1
4.3 Guided and unguided Media (wired and wireless)

5. Computer Networks

5.1 Computer network elements
5.2 Network Types (e.g. PAN, LAN, MAN, WAN)
5.3 Ethernet Network (e.g. Fast Ethernet, Gigabit-Ethernet,..)
5.4 Network topologies (Ring, Star, Hybrid, Bus, Mesh)
5.5 Network applications and network management
5.6 Network Threats (e.g. Viruses and malwares, SPAMS, Phishing scenarios, Passwords attackers, Hackers, Trojan Horses, Zombie Computer and Botnets).
5.7 Network Security Types (e.g. Network Access Control, Firewall protection, Antiviruses and Antimalware Software, Virtual Private Network (VPN).

6. Network/internet/routing Protocols

6.1 Introduction to OSI 7-Layers model
6.2 Application Protocols (HTTP, DNS, FTP, STMP, TelNet)
6.3 Network Layer (IPX and IP Protocols)

6.4 Transport Layer (TCP and SPX Protocols)
6.5 TCP/IP Protocol
6.6 Presentation Layer (Encryption/decryption/SSL Proxy)
6.7 URL components
6.8 Routing Protocols

7. Electronic Health Records and Data Standards and Exchange

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Comer, D., Computer-Netzwerke und Internets, Prentice-Hall, 2003
- Kurose, J., Ross, K., Computernetzwerke: Der Top-Down-Ansatz, 6. Auflage, Pearson Studium, 2014
- Jehle, R., Czeschik, C., Freund, T., Wellnhofer, E.: Medizinische Informatik Kompakt, deGruyter, Berlin, 2015
- Lehmann, T.: Handbuch der Medizinischen Informatik, Hanser, München 2005
- Haas, P.: Medizinische Informationssysteme und elektronische Krankenakten, Springer, 2005
- Hoyt R.E., Yoshihashi A. (2014): Health Informatics: Practical Guide for Healthcare and Information Technology Professionals. 6th.
- Karen A. Wager, Frances W. Lee, John P. Glaser (2013), Health Care Information Systems: A Practical Approach for Health Care Management, 3rd Edition

- Schug, SH. (2011). European and International Perspectives on Telematics in Healthcare “ International study of the Health Telematics action Forum in Germany”.
- Federal Ministry of Health (BMG) (2006)” Electronic health cards - European perspectives”, Germany.
- Dhotre I.A. & V.S.Bagad.(2006), Data Communication and Networking, Technical Publications pune.
- Freer J (2005). Introduction to Computer Communications and Networks. 2nd edition.

G-11 MATHEMATICS AND STATISTICS

Module code	G-11
Module coordination	Prof. Dr. Thomas Spittler
Category	Mathematics/ Sciences
Course number and name	G2106 Mathematics II G2107 Statistics II
Lecturers	Ibrahim Bader Prof. Dr. Agnes Nocon
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Professional competence

- Students create implementation-oriented formulations of questions.
- They carry out appropriate preparation, presentation and discussion of the study results.
- They can implement the most common questions of discrete mathematics, linear algebra and analysis.

Methodological competence

- Students are familiar with the methodological foundations of empirical surveys and can apply them, for example, to empirical project work.
- They can implement execution, evaluation and interpretation of studies using multivariate and explorative methods

- Students analyse and evaluate methodological approaches in the context of multivariate experimental designs

Personal competence

- Students can explain and defend their results in front of the class.
- They are able to explain their assessment of alternative courses of action and impugn the plausibility of using models. This interactive character of the lectures and tutorials strengthens the student's discussion and presentation skills in the academic context.
- Students can self-responsibly deal with unstructured data and select appropriate statistical models.
- Students can handle complex work and study contexts independently and design them in an application-oriented way.
- Students are able to relate their acquired knowledge to other lectures and topics.
- Students use the help options of the R software to broaden their statistical skills according to the specific analytical task

Social Competence

- Small work groups are defined to solve (research) problems and case studies. Close cooperation deepens student's social competences and fosters a team-oriented working style.

Applicability in this and other Programs

Mathematics and statistics is essential for most of the scientific courses, like Practice of Programming, Knowledge-based Systems, Data Analysis

Entrance Requirements

Basics of Mathematics and Statistics

Learning Content

In Mathematics:

1. Differential calculus
1.1 Real functions of one variable, continuity, differentiability, curve sketching
1.2 Real functions of multiple variables, partial derivatives, total differential, conditions for minima and maxima even under additional conditions.

2. Gaussian algorithm and linear equation system

3. Eigenvalue and eigenvectors

4. Graphtheorie
4.1 General theorie
4.2 Trees
4.3 Traversing of graphs
4.4 Directed graph

In Statistics:

1. Inferential statistics within the context of the research process
1.1 Study designs and research questions
1.2 Formulation of statistical hypotheses

2. Hypothesis testing
2.1 Hypotheses on population parameters (one sample t-test)
2.2 Hypotheses on differences (t-test, ANOVA, Chi square test)
2.3 Hypotheses on associations (correlation analysis, regression analysis, logistic analysis, measures of agreement)
2.4 Hypotheses on changes

3. Chosing the right statistical test

4. R software
4.1 Installation of packages
4.2 Complex scripting
4.3 Commands for hypothesis testing
4.4 Creating, adjusting and saving graphs

Teaching Methods

Lecture, seminar-like set up, exercises, group work

Recommended Literature

Mathematics:

Sterling K. Berberian, A first course in real analysis, Springer-Verlag, c1994

Gilbert Strang., Introduction to linear algebra / 4th ed. Wellesley-Cambridge Press, c2009

Bradley, Teres, Essential mathematics for economics and business, Wiley 2013

Don, Eugene, Schaum's outline of basic business mathematics, 2009
Lerner, Joel J, Schaum's outline of theory and problems of business mathematics, 1985

Puff, F., Mathematik für Wirtschaftswissenschaftler kompakt, 3. Auflage, vieweg+Teubner Verlag, Braunschweig, 2009

Puff, F., Mathematik für Wirtschaftswissenschaftler 2, 1. Auflage, vieweg Verlag, Braunschweig, 1979

Holland, H., Holland, D., Mathematik im Betrieb, 7. Auflage, Gabler Verlag, Wiesbaden, 2004

Auer, B.; Seitz, F.:Grundkurs Wirtschaftsmathematik, Gabler Verlag, 4. Auflage, 2013

Statistics:

Rumsey, D. (2017). Statistics workbook for dummies. Weinheim: Wiley.

Weiss, N.A. (2017). Introductory Statistics. Boston: Pearson.

Bland, M. (2015). An introduction to medical statistics. Oxford: Oxford University Press.

Kabacoff, R.I. (2015). R in action. Shelter Island: Manning.

Jacobsen, K.H. (2017). Introduction to health research methods. A practical guide. Burlington, MA: Jones & Bartlett.

G-12 COMPLIANCE AND RISK MANAGEMENT

Module code	G-12
Module coordination	Prof. Dr. Horst Kunhardt
Category	General Foundations
Course number and name	G2108 Compliance and Risk Management G2109 Data Protection and IT Security
Lecturer	Prof. Dr. Thomas Spittler
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

The students of the Computer Science in Health Informatics course know the prophylactic methods of risk and compliance management. They become acquainted with the legal norms of the most important areas of civil law, multimedia law and data protection law relevant to a business economist and acquire the ability to recognise legal problems in these areas and to solve simpler cases independently in professional practice. The graduates are sensitised to the business and legal requirements of a legally secure company organisation.

Graduates of the course of studies computer science in Health Informatics work in the middle management at the interface IT in institutions of the health economy with the special requirements to a law-conformal data processing with consideration of the double meaning of the IT in this range. On the one hand the "compliance of IT", on the other hand the "compliance through IT". IT today offers a basis for achieving the goals that are to be achieved through compliance; at the same time, however, IT in the healthcare industry must also comply with the manifold laws, specifications and regulations that are expressed through compliance. The methodology of risk management with risk analysis, risk assessment, risk documentation and risk communication must also be evaluated economically in terms of costs and benefits. The interplay of compliance, risk management and governance support is of fundamental importance today due to the high level of IT penetration in companies.

"Data" represent values for a company, the loss of which can have a variety of consequences resulting from the violation of laws. Personal data enjoys the highest level of protection and must be specially protected in accordance with an IT security guideline. In addition to legally compliant data processing, aspects such as availability, integrity of the data and authenticity of the data also play an important role. The students learn about the various internal and external threats to company data and about suitable countermeasures and protection mechanisms.

After completing the Compliance and Risk Management module, the students have achieved the following learning objectives:

Professional competence:

- The students know and understand the methods of risk management based on the BSI Standard 100-3 (risk analysis based on IT-Grundschutz) and their application to the achievement of compliance.

- They are able to reflect the requirements of data protection and IT security and to transfer them to relevant application scenarios.

- The students know the basic IT security models, standards and certifications according to Common Criteria, ITSEC and ISO 27001.

Methodological competence:

- The students know the methods of risk management based on the IT-Grundschutzkatalog of the BSI (Bundesamt für Sicherheit in der Informationstechnik);

- They know the dangers of IT security and can evaluate, apply and justify measures for security.

Personal competence:

- The students have the ability to reflect social and communicative processes in the planning and application of compliance, data protection and data security. Through reflection rounds, key topics of everyday professional life are analysed and related to module topics.

- Students are able to look at their own communication situations from the meta level and to use these competencies in individual and group discussions in a situation-adequate manner.

Applicability in this and other Programs

Data Protection and Data Security in the Healthcare Industry

Entrance Requirements

none

Learning Content

1. introduction to compliance management

- Legal regulations and standards for IT use

- Main features of contract management

- Fundamentals of the provisions of the German Commercial Law (HGB) and the law governing partnerships and corporations

- Fundamentals of the right of entrepreneur liability (managing director compliance)

- Fundamentals of data protection law, Internet and multimedia law (Cyberlaw), in particular contract forms in the IT area (contract types for standard and individual hardware, standard and individual software)

- Maintenance contracts, online contracts, mailbox contracts, copyright for computer programs and databases, intellectual property rights and computer criminal law

- GRC (Governance, Risk and Compliance)

- IT compliance

- Compliance as behaviour and system of prevention

- Compliance as a State

- Compliance as a management system

- Compliance as an Institution

- Compliance maturity models

- Corporate Governance Code

- case study

2. Risk management

- Risk definiton

- Risk and avoidance strategies

- Risk management processes

- Risk identification

- Risk analysis

- Risk assessment

- Risk control and monitoring

- Risk-cost-benefit analysis

- Risk communication

- Risk documentation

- Methodology of the risk matrix

- Case study

3. Data protection and IT security

- Protection goals

- Threats to IT security

- Pecurity engineering

- Evaluation criteria for IT security

- Security models and architectures

- Application of the IT basic protection catalogues

- Trends and further development

- case study

Teaching Methods

Seminar, writing workshop, presentations, discussions

Recommended Literature

- Leitfaden Compliance?Quelle: http://www.bitkom.org/de/publikationen/38337_75247.aspx
- Gründendahl, Ralf-T.: Das IT-Gesetz: Compliance in der IT-Sicherheit, Springer, 2012
- Deutscher Governance-Kodex, www.corporate-governance-code.de
- Hauschka, G.: Corporate Compliance – Handbuch der Haftungsvermeidung im Unternehmen, München, 2007
- Rath, M., Sponholz, R.: IT-Compliance, Erich Schmidt Verlag, Berlin, 2009 ?
- Eckert, C.: IT-Sicherheit, Oldenbourg, München, Wien, 8. Auflage, 2013

Poguntke, W.: Basiswissen IT-Sicherheit, W3L-Verlag, Dortmund, 2013

G-13 AWP (FOREIGN LANGUAGE II)

Module code	G-13
Module coordination	Tanja Mertadana
Category	General Foundations
Course number and name	G2110 Foreign Language II
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	2
ECTS	2
Workload	Time of attendance: 30 hours self-study: 30 hours Total: 60 hours
Type of Examination	written ex. 60 min.
Duration of Examination	60 min.
Language of Instruction	English

Module Objective

The modules Foreign Language II and IV aim to equip students with specialized language skills necessary for independent performance in a globalized industrial engineering sector. As a specialty the students can either choose an English course or vote between other languages such as Italian, Spanish or French.

Business English: Writing and communication skills

On completion of the module students will have achieved the following learning objectives:

Professional competencies

- Students will have an independent command of specialized business terminology relevant to the field of industrial engineering. Command here refers to oral and written production as well as aural and reading comprehension.
- They will be in a position to deploy study skills such as close reading and coherent writing at a B2/C1-level and for use in niche tasks for the industrial engineering sector.
- They will have gained substantial knowledge of B2/C1-level language registers – both for formal study contexts and for semi-formal to formal professional contexts.

- They will have gained essential experience in presenting on topics related to business English. The goal here is to package niche knowledge in the protocols of a clearly structured, effectively delivered piece of public speaking.

Methodological competencies

- Students will have enhanced their abilities to structure the acquisition of specialized terminology and grammatical items and practiced ways to internalize new language that yield optimal learning benefits.
- They will have extended and refined their practical research skills in English by engaging in at least two research projects – for example, by being asked to present on a discipline-specific topic in an individual or team presentation.

Social competencies

- Students will have gained valuable experience in training other personal effectiveness skills such as team work, integrity, and reliability.

They will have reflected on the learning benefits derived from several immersion projects.

Other language course
Please see the respective course descriptions.

Entrance Requirements

English course: The minimum entry-level requirement is a B2/C1-level of English according to the Common European Framework of Reference for Languages (CEFR) or A-level language skills according to the standards of the German education system. Alternatively, experience living abroad or successful participation in a study exchange may be sufficient.
Other language: Please see the respective course descriptions.

Learning Content

Business English: Writing and communication skills

Writing and communication skills in business, including a review and consolidation of the business topics dealt with in Foreign Language I (General Business English).

- review and consolidation of FL I topics
- job satisfaction
- success in business
- business correspondence
- meetings, negotiations and presentations

- international marketing
- working across cultures

current business topics

Teaching Methods

Instruction and learning methods focus on training the four cardinal language skills (speaking, listening, reading, and writing) and on enhancing professional and social competencies. They include group discussions and group projects, individual and team work (e.g. individual and group presentations), real- and role-playing, close reading and listening activities, grammar games, method of loci, running dictations, translations, peer feedback and review, work with learning stations, and various follow-up viewing and writing activities.

Study assignments will be set on a weekly basis.

Recommended Literature

Recommended reading for Business English: Writing and communication skills

Black, John, Hashimzade, Nigar & Myles, Gareth. *A Dictionary of Economics*. 5th ed. Oxford: OUP, 2017.

Brook-Hart, Guy. *Business Benchmark*. 2nd ed.: Upper Intermediate. Cambridge: CUP, 2013.

Business Spotlight: <www.business-spotlight.de>

Butzphal, G., Maier-Fairclough, J. *Career Express. Business English B2*. Berlin: Cornelson, 2015.

Cotton, D., Falvey, D. & Kent, S. *Market Leader Upper Intermediate*. Harlow: Pearson Longman, 2016.

Doyle, Charles. *A Dictionary of Marketing*. 4th ed. Oxford: OUP, 2016.

Duckworth, M., Turner, R. *Business Results Upper Intermediate*. Oxford: OUP, 2008.

Law, Jonathan. *A Dictionary of Business and Management*. 6th ed. Oxford: OUP, 2016.

McCarthy, Michael & O'Dell, Felicity. *Academic Vocabulary in Use*. Cambridge: CUP, 2016.

Murphy, Raymond. *English Grammar in Use*. Klett Verlag, 2012.

Rogers, Louis. *Skills for Business Studies*. Upper Intermediate. Oxford: OUP, 2012.

Recommended reading for other language

Please see the respective course descriptions for literature references.

G-14 AWP

Module code	G-14
Module coordination	Tanja Mertadana
Category	General Foundations
Course number and name	G2111 AWP
Semester	2
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	2
ECTS	2
Workload	Time of attendance: 30 hours self-study: 30 hours Total: 60 hours
Type of Examination	course assessment
Language of Instruction	English

Module Objective

The AWP subjects (Electives) provide the students with the opportunity to gain knowledge and skills in other fields than their chosen field of study. Students can choose both instructor-led inhouse courses and courses of the Virtual University of Bavaria (vhb).

The contents of the courses cover the following areas:

- Languages
- Didactical-educational area
- Social sciences
- Psychological-sociological area
- Technical-scientific area
- Philosophical and socio-ethical area
- Business area

The students can choose their courses from the AWP-module according to their own preferences.

Entrance Requirements

For advanced language courses, students have to prove the required language skills (for example through successful completion of a lower level).

Electives may not have thematic overlaps with the actual study course.

The module can also be chosen by students of other fields of study.

Learning Content

Please see the respective course descriptions for specific information on contents.

Teaching Methods

Seminar, exercises, class presentations, classroom pair/group work

Recommended Literature

Please see the respective course descriptions for literature references.

G-15 MEDICAL DOCUMENTATION

Module code	G-15
Module coordination	Prof. Dr. Thomas Spittler
Category	Health
Course number and name	G3101 Medical Documentation
Lecturer	Prof. Dr. Georgi Chaltikyan
Semester	3
Duration of the module	1 semester
Module frequency	
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students of the Health Informatics course know the interdisciplinary requirements of medical documentation at the interface of health economics, informatics, data protection and compliance, bio signal processing and image processing.

Participants in the module gain insight into the objectives of medical documentation as a support process in patient care, the fulfilment of compliance requirements (documentation obligation), in administration and billing (DRG billing), quality management (§135a and §137 of SGB V (Social Security Code, Volume 5)), in care research and training, and development in the healthcare industry.

After completing the Medical Documentation module, students will have achieved the following learning objectives:

Professional Competence

- Students know and understand the requirements of medical documentation as an interdisciplinary task in compliance with legal regulations and standards.
- Students understand the processes of DRG billing and the requirements of data transmission to the back offices of health insurance companies in accordance with § 301.

- Students know the basics of the billing systems (§21 Data) and the working methods of the InEK (Institute for the Hospital Remuneration System), as well as the basics of KV (Association of Statutory Health Insurance Physicians) billing for established physicians.
- Students are familiar with the German Coding Guidelines (DKR) and the Outpatient Coding Guidelines (AKR)

Methodological Competence

- Students gain knowledge of the structure of medical documentation through research and application of the data from DIMDI and InEK, and can apply the various medical classification systems (ICD, ICF, ICPM, OPS, IND, SNOWMED, LOINC, TISS)
- They know the working methods and function of grouper systems.

Personal Competence

- They are in a position to reflect upon the requirements of medical documentation and to apply them to relevant application scenarios in institutions from the healthcare industry.
- They can think critically about the problem of the so-called secondary use of medical documentation and to discuss its advantages and disadvantages for care research
- Students can critically question the quality of medical documentation and understand it as a collaborative, multi-professional product.

Social Competence

- Approaches and solutions are developed and discussed in the group.

Applicability in this and other Programs

Clinical information systems

Data Protection and Data Security in the Healthcare Industry

Entrance Requirements

Foundations of Sciences

Learning Content

1. Introduction to medical documentation
1.1 Legal foundations
1.2 Documentation obligations

2. Conceptual, organisational and classification systems in medicine and the healthcare industry
2.1 Basic terms
2.2 Medical subject headings (MeSH)
2.3 Organisational and classification systems
2.4 ICD system
2.5 OPS system

3. DRG system
3.1 Coding in the DRG system
3.2 Practical exercises with grouper systems

4. Other classification systems
4.1 SNOMED and SNOMED-CT
4.2 AO classification
4.3 LOINC (Logical Observation Identifiers Names and Codes)
4.4 ICF
4.5 Drugs catalogue

5. Secondary use medical data

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Jehle, R., Czeschik, C., Freund, T., Wellnhofer, E.: Medizinische Informatik Kompakt, deGruyter, Berlin, 2015
- Haas, P.: Medizinische Informationssysteme und elektronische Krankenakten, Springer, 2005

- Lehmann, T.: Handbuch der Medizinischen Informatik, Hanser, München 2005
- www.dimdi.de
- www.g-drg.de
- https://www.who.int/classifications/en/

G-16 APPLICATION SYSTEMS OF HEALTH INFORMATICS

Module code	G-16
Module coordination	Prof. Dr. Thomas Spittler
Category	Health
Course number and name	G3102 Application Systems of Health Informatics
Lecturer	Prof. Dr. Thomas Spittler
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students of the Health Informatics course receive an overview of the application systems used in telematics and medical technology, which are then taught in greater depth in the subsequent modules of Medical Technology and in the specialised mandatory elective module (FWP) subject Telematics in the Healthcare Industry.

Participants in the module gain an insight into the objectives of using IT application systems in telematics and medical technology in the networked healthcare industry.

After completing the Application Systems used in the Healthcare Industry module, students will have achieved the following learning objectives:

Professional Competence

- The students know and understand the requirements of a networked healthcare industry and can assess and evaluate the role of telematics and medical technology.

- They can describe the interfaces between computer science and medical technology and develop solution-oriented proposals for specific areas of application.
- They can summarize and explain the principles and IT units of functional diagnostics and imaging procedures.
- You can transfer the acquired knowledge in usability engineering to medical devices.
- You will be able to identify and implement sustainable medical devices.

Methodological Competence

- Students work with web-based telemedicine applications.
- They will be able to use strategic planning tools in health care.

Personal Competence

- They can critically reflect upon the requirements of telematics and are aware of the role of data protection and data security.
- They are able to describe the telematic infrastructure of a country and can name the legal framework for medical technology products as well as telematic applications in the health care sector.

Social Competence

- Approaches and solutions are developed and discussed in the group.

Applicability in this and other Programs

Medical technology

FWP-subject Telematics in the Healthcare Industry

Entrance Requirements

Foundation of Sciences, Foundation of Health Informatics

Learning Content

Telematics:

1. Basics of network medicine

2. Definitions, differentiations, basics and delimitations in telematics

3. Legal aspects and regulatory environment
3.1 Ban on telemedicine
3.2 Billing of tele medical services

4. Cloud computing possibilities

5. Mobile applications (apps, smartphones, sensors)
5.1 General overview
5.2 Wearables and smart clothes
5.3 Analysis of a mobile application using SWOT
5.4 Case Study: Generate an idea for a possible health app (various questions)

6. Application systems of telematics
6.1 Teleradiology
6.2 Telepathology
6.3 Teledermatology
6.4 Acute Care and Emergency Telemedicine
6.5 Telesurgery
6.6 Telemonitoring
6.7 TeleCare

7. Practical exercises with web-based systems
7.1 Case.io
7.2 CAMPUS MEDICUS
7.3 Telemedical Assistance System by using iHealth

Medical Device Technology:

1. Basics of image and signal processing

2. Functional Diagnostics
2.1 Cardiology
2.2 Pneumology
2.3 Gastroenterology

3. Imaging Techniques
3.1 With X-rays
3.2 Molecular Imaging
3.3 Other species

4. Usability Engineering
4.1 Definitions of terms
4.2 Usability of medical technology
4.3 Methodical procedure in practice
4.4 Application examples

5. Sustainability of Medical Devices

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Bartmann, F.J.: Telemedizinische Methoden in der Patientenversorgung – Anwendungsspektrum, Chancen und Risiken, Deutscher Ärzteverlag, Köln, 2012
- Kumar, P.: Security Issues in Healthcare Applications Using Wireless Medical Sensor Networks: A Survey, 2012
- Böckmann, Frankenberger: MPG & Co.: Eine Vorschriftensammlung zum Medizinprodukterecht mit Fachwörterbuch, TÜV Media GmbH, 2010
- Gärtner: Kommunizierende medizinische Systeme und Netzwerke, Springer, Berlin, 2011
- ec.europa.eu/health/medical-devices
- Backhaus, C.: Usability-engineering in der Medizintechnik: Grundlagen-Methoden-Beispiele. Springer-Verlag, 2009.
- Mitsch, D.: Das Design nachhaltiger Medizinprodukte. Springer-Verlag, Wiesbaden, 2018

G-17 INFORMATION SYSTEMS IN HEALTH CARE

Module code	G-17
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G3103 Medical- and Nursing Documentation System G3104 Data Protection and Data Security in Health Economy
Lecturer	Prof. Dr. Thomas Spittler
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The students describe processes in healthcare institutions and characterize their multi-professional cooperation and interdisciplinarity. They can safely apply the methods of process analysis, process documentation and process visualisation to examples. The students transfer the methodology of process analysis to medical and nursing documentation systems and analyse the needs of the different user groups. Using case studies (treatment pathways, guidelines), process visualization is practiced and evaluated.

The students deepen their basic knowledge from the Compliance and Risk Management module with regard to the applications and requirements in the healthcare industry. The participants of the module gain an insight into the special requirements of data protection and data security in the collection, storage and processing of health data.

After completing the Clinical Information Systems module, students have achieved the following learning objectives:

Professional competence

- The students learn to think in processes and recognize processes in companies of the health care industry as a central success factor for the implementation of services and the existence on the market.
- You will be able to model, analyse and improve processes using common tools and methods.
- You can characterize medical and nursing documentation systems.
- The students know and understand the legal requirements for data protection and data security for patient data and health data.
- Students know the relevant encryption systems and the difference between anonymization and pseudonymization.

Methodological competence

- Students learn to think in networked, integrated processes and are familiar with common tools and methods of process management.
- They can apply the common encryption systems to concrete data sets and use various protection mechanisms in test environments.

Personal competence

- Despite existing obstacles and conflicts, students can implement processes by finding solutions for different interests and solving interpersonal tensions constructively.
- They are able to critically reflect and discuss the requirements of data security and data protection for health data.

Social Competence

- The students have an insight into the solution of problems through group work and teamwork.
- By reflecting on familiar, often hierarchical structures in the healthcare industry and working through different interests, the students strengthen their ability to classify competing needs in a professional context and to develop goal-oriented, consensual solutions

Applicability in this and other Programs

Operations Research, ERP-Systems, IT-Project Management, Managment and IT-Consulting, Medical Technology, FWP Telematic in Health Economy

Entrance Requirements

Foundations of Infromatics, Foundations of Health Informatics, General Business Management and Accounting, Compliance and Risk Management

G3103 MEDICAL- AND NURSING DOCUMENTATION SYSTEM

Objectives

Students of the Health Informatics course learn to think in processes in institutions from the healthcare industry. Processes in the healthcare sector are characterised by interdisciplinary and multi-professional collaboration. Students can name the problems arising from a pure functional orientation and from the viewpoint of a department, and confidently apply and evaluate the methods of process analysis, process documentation and process visualisation in sample cases.

Students apply the process analysis methodology to medical and care documentation systems, and analyse the needs of different user groups. By means of process visualisation and process simulation, case studies are tried out and evaluated on the basis of the so-called treatment pathways and guidelines. After completing the module, the students are confident about the classification of medical and care documentation systems and know the essential application systems in practice, based on their own experience.

After completing the Clinical Information Systems module, students will have achieved the following learning objectives:

Professional competence

- Students learn to think in processes and identify processes in companies in the healthcare industry as the central success factor for the implementation of services and survival in the market.
- They can model and analyse processes and improve them in a targeted manner.
- They make use of established tools and methods for this.

Methodological competence

- Students learn to think in networked, integrated processes and are familiar with the established tools and methods of process management.

Personal skills

- Despite existing obstacles and conflicts, students can implement processes by finding solutions for different interests and constructively resolving interpersonal tensions.

Learning Content

- Presenting processes
  - Presentation of processes (e.g., with BPMN)
  - Process modelling tools
- Processes in companies
  - Business process management
  - Process analysis methods
  - Methods for targeted process improvement
  - Continuous improvement
- Process optimisation methods, e.g.,
  - Process simulation (basics)
  - Queueing theory (basics)
- Medical and care documentation systems
  - Characteristics of medical documentation systems

Entrance Requirements

Basics of Mathematics and Statistics, Mathematics and Statistics, Basics of Informatics, General Business Administration and Accounting

Type of Examination

part of module exam

Methods

Seminar-like classes, exercises

Remarks

Exercises in the ORBIS system and OpenMed from AGFA Health Care GmbH with anonymised real data.

Recommended Literature

- Hermann J. Schmelzer, Wolfgang Sesselmann: Geschäftsprozessmanagement in der Praxis, 8. Auflage, Hanser, München, 2013 (ISBN 9783446434608)
- Andreas Gadatsch: Grundkurs Geschäftsprozess-Management, 7. Auflage, Springer, Wiesbaden, 2012 (ISBN 978-3-8348-2428-8)

- Andreas Gadatsch: IT-gestütztes Prozessmanagement im Gesundheitswesen, Springer, Wiesbaden, 2013 (ISBN 978-3-658-01166-6)
- Jörg Becker, Martin Kugeler, Michael Rosemann: Prozessmanagement, 7. Auflage, Springer, Wiesbaden, 2012 (ISBN 978-3-642-33844-1)
- Thomas Allweyer: BPMN 2.0 – Business Process Model and Notation, Norderstedt, Books on Demand, 2009 (ISBN 9783839121344)
- David R. Anderson, et. al.: An Introduction to Management Science, 2nd Ed., Cengage Learning EMEA, Cheriton House, UK, 2014 (ISBN 9781408088401)
- Frederick S. Hillier, Gerald J. Lieberman: Introduction to Operations Research, 10th Ed., McGraw-Hill, NY, USA, International Edition 2014 (ISBN 9781259253188)
- Frederick S. Hillier, Mark S. Hillier: Introduction to Management Science, 5th Ed., McGraw-Hill, NY, USA, International Edition 2014 (ISBN 9781259010675)
- Cliff Ragsdale: Spreadsheet Modeling & Decision Analysis, 7th Ed., Cengage Learning, Stamford, USA, 2015 (ISBN 9781285418681)
- John A. Lawrence, Barry A. Pasternack: Applied Management Science, 2nd Ed., John Wiley & Sons, Hoboken, NJ, USA, 2002 (ISBN 9780471391906)
- Bernhard W. Taylor: Introduction to Management Science, 11th Ed., Pearson, Boston, USA, 2013 (ISBN 9780273766407).
- Güttler, K., Schoska, M., Görres, S.: Pflegedokumentation mit IT-Systemen, Publisher Hans Huber, 2010

G3104 DATA PROTECTION AND DATA SECURITY IN HEALTH ECONOMY

Objectives

Students of this course expand on their basic knowledge of the Compliance and Risk Management module in relation to the applications and requirements of the healthcare industry.

Participants in the module gain insight into the special requirements for data protection and data security when collecting, storing and processing health-related data.

After completing the Data Protection and Data Security in the Healthcare Industry module, students will have achieved the following learning objectives:

Professional competence

- Students know and understand the legal requirements for data protection and data security of patient and health-related data.
- They can identify the relevant laws (BDSG, IuKDG, TKG, TMG, SGB V, StGB, SiG (Security Act)) with regard to patient and health-related data and apply them in various areas.
- Students know the relevant encryption systems and the difference between anonymization and pseudonymisation.

Methodological competence

- Students can apply common encryption systems to specific databases and use various protection mechanisms in test environments.

Personal skills

- They can critically reflect upon and discuss data security and data protection requirements for health-related data.

Learning Content

- Definitions and concepts
- Anonymisation and pseudonymisation of health-related data
- Cryptography and cryptoanalysis
- Legal requirements of data protection in healthcare and welfare
  - Federal Data Protection Act (BDSG)
  - Information and Communications Services Act (IuKDG)
  - Telecommunications Act (TKG)
  - German Teleservices Act (TMG)
  - Social Security Code, Vol. 5 (SGB V)
  - Penal Code (StGB)
  - Application scenarios when using application systems in the healthcare industry
- Special requirements
  - Clinical research
  - Telemedicine
- Threat analysis in application systems of the healthcare industry

- Clinical information systems
- Practical information systems
- Mobile applications

- Solutions
  - Telematics infrastructure for eGK (electronic health insurance card)
  - Public key infrastructure (PKI)
  - Digital signature
  - Digital certificates
- Attack and protection scenarios
  - Data security threats
  - Security measures in accordance with the IT Baseline Protection Catalogue of BSI

Case studies on data protection and data security in organisations working in the healthcare industry

Entrance Requirements

None

Type of Examination

part of module exam

Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

Practical exercises based on case studies. Exercises in the network lab of the Deggendorf Institute of Technology.

Guest lectures by data protection officers of the clinics in the administrative district of Deggendorf and by the IT Head of Bezirksklinikum (district hospital) Mainkofen.

Recommended Literature

- Jehle, R., Czeschik, C., Freund, T., Wellnhofer, E.: Medizinische Informatik Kompakt, deGruyter, Berlin, 2015
- Lehmann, T.: Handbuch der Medizinischen Informatik, Hanser, München 2005
- Bake, C., Blobel, B.: Handbuch Datenschutz und Datensicherheit im Gesundheits- und Sozialwesen, Datakontext, Frechen, 2009
- Hauser, A., Haag, I.: Datenschutz im Krankenhaus, Deutsche Krankenhausverlagsgesellschaft, 2012
- IT-Grundschutzkataloge, www.bsi.de

G-18 MEDIA MANAGEMENT

Module code	G-18
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G3105 Media Management
Lecturers	Bernadette Busler Prof. Dr. Thomas Spittler
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

Students acquire knowledge and practical experience of standards, authoring languages and development systems for the implementation of distributed applications.

After completing the module, students will have achieved the following learning objectives:

Professional competence

- Students are familiar with the criteria for assessing the quality of texts in technical (and other) documentation. They master the content-related, technical and organisational aspects of web content management systems.
- Students are in a position to publish high quality content on the Internet.
- They are familiar with various types of experimental designs.
- They can estimate the disturbance variables of experiments: Experimenter effects (Rosenthal effect), subject effects.

- They are familiar with design thinking method in order to walk from a problem to a solution.

Methodological competence

- Students are in a position to create factual texts systematically and publish them in an appealing form on the Internet.
- They assign plans and evaluation procedures.
- They use evidence-based approaches in medicine.
- They analyse and evaluate methodological approaches as part of various experimental designs.

Personal competence

- By working in a team, students can achieve their own goals and take on leadership roles or become involved in the project team.
- They can realistically assess their own abilities and limits in decision-making.
- They evaluate their own overall expertise in a realistic way.
- They are able to work with each other to accomplish practical tasks.
- They recognise and take into account the ethical aspects of the domain.

Social competence

- By handling texts, students improve their ability to express themselves in a professional context and to make themselves understood.

Applicability in this and other Programs

Knowledge Management

Medical Information Systems

Entrance Requirements

Databases

Foundation of Health Informatics

Foundation of Mathematics and Statistics

Learning Content

Content Management and Document Engineering

1. Concepts of web publishing - problems of traditional web publishing, difference between traditional web publishing and web publishing with a web content management system (WCMS), definition of WCMS, delimitation of WCMS - document management systems

2. Web content - presentation of different content sources and their requirements for editorial processes and technology; significance, characteristic forms, legal aspects and technical standards of content syndication; special content-related requirements with regard to internationalisation and search engines; contents of a style guide

3. Functions of a WCMS - presentation of functions in the area of ??asset management, workflow management, user and access management, import/export interfaces, presentation of different server concepts

4. WCMS introduction - presentation of tasks during the introduction of a WCMS from a content-related, design-related, organisational and technical point of view

5. WCMS market - types of WCMS systems, pricing models, market surveys

6. Practical work with WCMS systems

7. Legal and linguistic framework conditions for the editorial creation and production of texts.

8. Management of documentation projects.

9. Knowledge of the lifecycle of a document and the software-technical support for creating, editing, publishing and archiving in a team.

10. Formatting documents with appropriate software systems for efficient and systematic processing.

11. Tool-aided standardisation and modularisation

12. Management of versions and variants of large documentation with particular regard to translations into various national languages

13. Search methods for document inventories

14. Organisation and IT infrastructure for a specialist editorial office, quality assurance of technical documentation

15. In the practical part of the lecture, students learn how to handle professional word processing and management systems. During this process, they practise the application as well as the administration of such systems.

Human Factors

1. Introduction to the field of human-computer interaction
1.1 Designing of everyday objects

1.2 Cognitive foundations
1.3 Phenomena and mechanisms of attention

2. Information design
2.1 Presentation of information
2.2 Principles of display design

3. Usability
3.1 Terms, models, process
3.2 Analysis Methods
3.3 Evaluation Methods

4. Decision ergonomics
4.1 Phenomena and mechanisms
4.2 Applications and design

5. Use case: Design Thinking

The broad field of evidence-based medicine should be depicted in as versatile a manner as possible, given its connections to the relevant associated disciplines. The following topics should be taken into account.

Teaching Methods

Seminar-like classes, exercises on the PC

Practical software development in a team

Presentation of the results as a system presentation of the created programme

Recommended Literature

Content Management and Document Engineering

- Langer, I., Schulz v. Thun, F., Tausch, R. (2006), Sich verständlich ausdrücken, 8. Auflage, Reinhardt, München
- Löffler, M. (2014), Think Content!: Content-Strategie, Content-Marketing, Texten fürs Web, Galileo Computing
- Zschau, O., Traub, D., Zahradka, R. (2002), Web Content Management - Websites professionell planen und betreiben, 2. Auflage, Galileo Press, Bonn

Human Factors:

- Ariely, D. (2009), Predictably Irrational, Harper, New York
- DIN EN ISO 9241-11 (1998). Anforderungen an die Gebrauchstauglichkeit.

- DIN EN ISO 9241-210 (2010). Prozess zur Gestaltung gebrauchstauglicher interaktiver Systeme.
- Kahneman, D. (2012), Schnelles Denken, langsames Denken, Siedler, München
- Heinecke, A. M. (2011), Mensch-Computer-Interaktion, Springer Berlin, Berlin
- Krug, S. (2009), Rocket Surgery Made Easy: The Do-It-Yourself Guide to Finding and Fixing Usability Problems, 1 edition, New Riders, Berkeley, CA
- Krug, S. (2013), Don't Make Me Think: A Common Sense Approach to Web Usability, 3rd revised edition, New Riders
- Norman, D. A. (1993), Things that make us smart: defending human attributes in the age of the machine, Addison-Wesley Publishing Company, Basic Books, Massachusetts [etc.]; New York
- Norman, D. A. (2013), The design of everyday things, Basic Books, New York, NY
- Pruitt, J., & Adlin, T. (2006), The persona lifecycle keeping people in mind throughout product design, Elsevier: Morgan Kaufmann Publishers, an imprint of Elsevier, Amsterdam, Boston
- Pruitt, J., & Adlin, T. (2010), The essential persona lifecycle your guide to building and using personas, Morgan Kaufmann, Elsevier Science [distributor], San Francisco, Calif, Oxford
- Richter, M., & Flückiger, M. D. (2013), Usability Engineering kompakt benutzbare Produkte gezielt entwickeln, Springer Vieweg, Berlin
- Sarodnick, F., & Brau, H. (2010), Methoden der Usability Evaluation: Wissenschaftliche Grundlagen und praktische Anwendung. Publisher Hans Huber, Bern
- Shneiderman, B., & Plaisant, C. (2010), Designing the user interface: strategies for effective human-computer interaction, Addison-Wesley, Boston
- Stapelkamp, T. (2010a), Informationsvisualisierung: Web - Print - Signaletik. Erfolgreiches Informationsdesign: Leitsysteme, Wissensvermittlung und Informationsarchitektur, Springer Berlin, Berlin
- Stapelkamp, T. (2010b), Interaction- und Interfacedesign: Web-, Game-, Produkt- und Servicedesign; Usability und Interface als Corporate Identity, Springer, Heidelberg
- Thaler, R., Sunstein, C. (2009), Nudge. Improving Decisions About Health, Wealth, and Happiness, Penguin, New York, London
- Tufte, E. R. (2001), The Visual Display of Quantitative Information, 2nd edition, Graphics Pr.

- Tufte, E. R. (2006), Beautiful evidence, Graphics Press, Cheshire, Conn.
- Tufte, E. R. (2010), Visual explanations: images and quantities, evidence and narrative, Graphics Press, Cheshire, Conn.
- Tufte, E. R. (2011), Envisioning information, Graphics Press, Cheshire, Conn.
- Ware, C. (2008), Visual thinking for design. Burlington, Morgan Kaufmann, MA
- Ware, C. (2013). Information visualization: perception for design, 3rd revised edition, Morgan Kaufmann
- Wickens, C. D., Hollands, J. G., Parasuraman, R. (2013). Engineering Psychology and Human Performance, Pearson Education, Upper Saddle River

G-19 INNOVATION AND COMPLEXITY MANAGEMENT

Module code	G-19
Module coordination	Prof. Dr. Horst Kunhardt
Category	General Foundations
Course number and name	G3106 Innovation and Complexity Management
Lecturers	Prof. Dr. Bernhard Bleyer Prof. Dr. Michelle Cummings-Koether
Semester	3
Duration of the module	1 semester
Module frequency	
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	3
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students of the Health Informatics course are aware of the significance of innovation management for the further development of what the 1st and 2nd healthcare industry offers. Medical technical progress is one of the main drivers of growth in the healthcare industry. Students are familiar with the processes in innovation management and evaluate different technical trends with respect to technology impact assessment. Innovation management is the skill to recognize new trends and processes in innovation. The ways that innovation and new product development are implemented will help students be able to detect new ways of thinking in the health informatics sector.

Students recognize the complexity of the healthcare industry and can classify the various stakeholders, user groups, levels of self-governance, and the role of associations. Complex non-linear systems involve interactions and effects that can no longer be explained by simple chains of cause and effect. Students recognize the dependencies of non-linear dynamics and can assess instabilities and identify opportunities for innovation pushes. The interplay between collective social orders and the macro-dynamics of order parameters meets the notions of individuals. Students

can identify and critically assess the possibilities of self-organization in complex social systems, and identify the risks and opportunities of uncertain information spaces.

After completing the Innovation and Complexity Management module, students will have achieved the following learning objectives:

Professional competence

- Students will learn how innovation and new product development works and is implemented.
- Students will learn how innovation affects management processes
- Students learn to systematically plan, control and evaluate innovations in the healthcare industry
- They will know the different innovation process models and the relevant influencing factors
- Students are sensitized towards thinking in complex, non-linear systems
- They can classify complexity and probability.
- Recognizing how new trends are affecting innovation

Methodological competence

- Students will learn to spot new trends and innovation, and how to respond to these.
- Students learn to think in networked systems.
- They use the tools and methods of innovation management.
- They are familiar with the methods of technological impact assessment and can apply an HTA (Health Technology Assessment).

Personal skills

- Despite the existing obstacles and conflicts, students can implement innovation in complex systems by finding solutions for different interests and constructively resolving tensions between different stakeholders.
- Will learn how to analyze new ways of thinking and make sense of these

Applicability in this and other Programs

Collaborative Systems

Analyzing new approaches

Entrance Requirements

Basics of Mathematics and Statistics

Mathemantics and Statistics

Learning Content

- **Innovation management in the healthcare industry**
  - New product development
  - Innovation strategies and filters
  - Innovation process models
  - Closed vs. open innovation projects
  - Systemic innovation management
  - Trends in innovation
  - Market systems
  - Start-up thinking and design
- **Complexity management**
  - Introduction to system theory
  - Self-organisation in complex systems
  - Complexity and calculability
  - Complexity and probability
  - Complexity in the healthcare industry
  - Complexity in society
- **Complexity management methods**
  - Cause-and-effect chains
  - Simulation models
  - Technology impact assessment
  - HTA (Health Technology Assessment)

Teaching Methods

Interactive teaching in a seminar style, group discusccions, case studies

Remarks

Exercises using Consideo Modeler

Recommended Literature

- Goffin, K. & Mitchell, R. (2016) *Innovation Management: Effective strategy and implementation. New York*: Red Globe Press.
- Gaubinger, K. (2014). *Innovation and Product Management: A Holistic and Practical Approach to Uncertainty Reduction*. Berlin: Springer.
- Ries, E. (2017). *Innovation and Product Management: A Holistic and Practical Approach to Uncertainty Reduction.* Heidelberg: Springer Nature.

G-20 AWP (FOREIGN LAGUAGE III)

Module code	G-20
Module coordination	Tanja Mertadana
Category	General Foundations
Course number and name	G3107 Foreign Language III
Semester	3
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	4
Workload	Time of attendance: 60 hours self-study: 60 hours Total: 120 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The modules Foreign Language I and III aim to equip students with specialized language skills necessary for independent performance in a globalized industrial engineering sector. In doing so, it strives to deepen students' relationship with the English language in business and technical settings so that they can effectively and efficiently implement the language as a practical communication tool.

To this end, the module targets instruction of the four cardinal language skills (listening, reading, speaking, and writing) across a wide range of core business and technical topics related to industrial engineering. Students also craft the content of their own learning through needs analyses and frequent immersive and self-directed projects.

Central to the module is optimizing fluency and communication skills; so too is cultivating a clear understanding of the finer points of textual meaning and meaning produced in dialogue with others. Through a variety of task-based speaking, listening and writing activities, students enhance their oral and aural production and expand their ability to produce clear, concise and coherent pieces of writing – emails, reports, or expository paragraphs on business and technical processes. Particular emphasis will be placed on honing students' public speaking and team skills through work on a team presentation project for each course.

On completion of the module students will have achieved the following learning objectives:

Professional competencies

- Students will have an independent command of specialized business and technical terminology relevant to the field of industrial engineering. Command here refers to oral and written production as well as aural and reading comprehension.
- They will be in a position to deploy study skills such as close reading and coherent writing at a C1-level and for use in niche tasks for the industrial engineering sector.
- They will have gained substantial knowledge of C1-level language registers – both for formal study contexts and for semi-formal to formal professional contexts.
- They will have gained essential experience in presenting on topics related to business and technical English. The goal here is to package niche knowledge in the protocols of a clearly structured, effectively delivered piece of public speaking.

Methodological competencies

- Students will have enhanced their abilities to structure the acquisition of specialized terminology and grammatical items and practiced ways to internalize new language that yield optimal learning benefits.
- They will have extended and refined their practical research skills in English by engaging in at least two research projects – for example, by being asked to present on a discipline-specific topic in an individual or team presentation.

Social competencies

- Students will have gained valuable experience in training other personal effectiveness skills such as team work, integrity, and reliability.
- They will have reflected on the learning benefits derived from several immersion projects.

Entrance Requirements

The minimum entry-level requirement is B2/C1-level of English according to the Common European Framework of Reference for Languages (CEFR) or A-level language skills according to the standards of the German education system. Alternatively, experience living abroad or successful participation in a study exchange may be sufficient.

Learning Content

Technical English (C1)

Course content is divided across a set of mandatory topics that the lecturer chooses and non-mandatory topics that students elect to work on.

Mandatory topics include, but are not restricted to the following:

- Mathematical operations and numbers
- Measurements and units
- Geometric forms
- Fundamentals of physics (e.g. forces)
- Materials and their properties
- Case study on an area related to technology/design/engineering
- Communication skills (e.g. presentations)
- Grammar items (e.g. passive vs active, tenses, conditionals)

Examples of non-mandatory topics include the following:

- Renewable energy
- E-mobility
- Basic electrical engineering
- Computing
- Geo-information systems
- Work safety

Teaching Methods

Instruction and learning methods focus on training the four cardinal language skills (speaking, listening, reading, and writing) and on enhancing professional and social competencies. They include group discussions and group projects, individual and team work (e.g. individual and group presentations), real- and role-playing, close reading and listening activities, grammar games, method of loci, running dictations, translations, peer feedback and review, work with learning stations, and various follow-up viewing and writing activities.

Study assignments will be set on a weekly basis.

Recommended Literature

Astley, Peter, and Lewis Lansford. *Engineering 1: Student's Book*. Oxford: Oxford UP, 2013. Print.

Bauer, Hans-Jürgen. *English for Technical Purposes.* Berlin: Cornelson, 2000. Print.

Blockley, David. *Engineering: A Very Short Introduction.* Oxford: OUP, 2012. Print.

Büchel, Wolfram, et. al. *Englisch-Grundkurs für technische Berufe*. Stuttgart: Klett, 2001. Print.

engine: Englisch für Ingenieure. Darmstadt. <www.engine-magazin.de>

Foley, Mark, and Diane Hall. *MyGrammarLab*. Harlow: Pearson, 2012. Print.

Glendinning, Eric H., and Alison Pohl. *Technology 2*. Oxford: Oxford UP, 2008. Print.

Glendinning, Eric H. and Norman. *Oxford English for Electrical and Mechanical Engineering*. Oxford: OUP, 2001. Print.

Hollett, Vicki and John Sydes. *Tech Talk: Intermediate.* Oxford: OUP, 2010. Print.

Ibbotson, Mark. *Cambridge English for Engineering.* Cambridge: Cambridge UP, 2008. Print.

Lansford, Lewis, and Peter Astley. *Engineering 1*. Oxford: Oxford UP, 2013. Print.

Möllerke, Georg. *Modern English for Mechanical Engineers.* Munich: Carl Hanser Verlag, 2010. Print.

Puderbach, Ulrike, and Michael Giesa. *Technical English - Mechanical Engineering*. Haan-Gruiten: Verl. Europa-Lehrmittel Nourney, Vollmer, 2012. Print.

G-21 MEDICAL TECHNOLOGY

Module code	G-21
Module coordination	Prof. Dr. Thomas Spittler
Category	Health
Course number and name	G4101 Medical Technology
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students of the Health Informatics course expand on their basic knowledge of the Application Systems of the Healthcare Industry in the Medical Technology module.

Participants in the module are familiar with the process of risk classification of medical products and can apply and implement the various standards. Students are familiar with the delimitation of informatics in the healthcare sector and the classic organisational assignment of medical technology, and can demonstrate solutions for the integration of both disciplines.

Students are familiar with the future issues of medical technology and can classify the current development of solutions in the field of the Internet of Things (IoT), and develop and evaluate solutions for the improvement of quality and processes in medical technology.

After completing the Medical Technology module, students will have achieved the following learning objectives:

Professional competence

- Students know and understand the differences between functional security and patient security in a networked system of IT application systems and medical devices/medical products.

- They can identify the relevant laws of the Medicinal Devices Act, the Medical Devices Operator Ordinance and international standards, and apply them in various areas.
- Students know the steps of risk classification of software and risk management in accordance with DIN EN ISO 14971:2013.

Methodological competence

- Students can create risk analysis for a concrete system and derive a risk matrix from it.
- Students can apply and evaluate risk analysis methods such as Fault Tree Analysis (FTA), Failure Mode Effect Analysis (FMEA) and Preliminary Analysis of Hazard (PAH), as well as Hazard Analysis and Critical Control Points (HACCP) for specific applications.

Personal competence

- They can critically reflect upon and discuss the requirements related to medical technology at the interface between informatics and technology.
- Students can analyse and critically discuss current developments, such as RFID tags, smart labels and mobile apps, with regard to their opportunities and risks.

Social competence

- Approaches and solutions are developed and discussed in the group.

Applicability in this and other Programs

Medical Technology

Application Systems of Health Informatics

Clinical Information Systems

FWP-subject Telematics in the Healthcare Industry

Entrance Requirements

keine

Learning Content

1. Introduction to Medical Technology
1.1 Definitions
1.2 Applications of Medical Technology in Healthcare Sector
1.3 Germany's Medical Technology Industry Works

1.4 Challenges and Ethical issues in Medical Technology
1.5 Future trends in Medical Technology

2. Medical devices
2.1 Introduction to Medical device safety and Risk Management (e.g. HACCP, FEMA, PAH)
2.2 Phases in the life span of a medical device (lifecycle approach)
2.3 Classification of Medical devices in Europe
2.4 Risk management process as defined by ISO 14971
2.5 Participants/Players in ensuring the safety of medical devices
2.6 Governmental regulation of medical devices
2.7 Assignment: regulatory framework of medical devices for assigned countries: E.g.: Canada, India, U.S.A., China & Russia
2.8 Conformity assessment elements
2.9 Types of specifications in standards;
2.10 Overview to the Global Harmonization Task Force (GHTF)

3. Software as a medical device (SaMD)
3.1. Overview to the concept of using software as a medical device
3.2. Software classification in component with/out a medical device
3.3. EU requirements on medical devices software
3.4. Implications, Challenges and associated strategies for companies developing SaMD
3.5. Steps involved in the Software Development Lifecycle (SDLC)
3.6. Different Models of SDLC (e.g. Waterfall model, Iterative model)
3.7. SaMD Lifecycle Phases

4. Software Risk Management
4.1 Software Risk Management (ISO 14971)
4.2 Software risk management process requirement extensions from IEC 62304
4.3 Analysis of software contributing to hazardous situations
4.4 Software risk control measures
4.5 Software verification and validation
4.6 Risk management of software changes

5. Internet of Things (IoT)
5.1 Device connection
5.2 Data sensing
5.3 Communication
5.4 Artificial Intelligence
5.5 Data value and Human value

6. Network Security in healthcare industry
6.1 Network elements
6.2 Network applications and network management
6.3 IT applications systems
6.4 Network Security types (functional security and patient security)
6.5 Network Security threats

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

In short: Lectures, Demonstrations, Exercises, Assignments, Videos Links, Short Quizzes

Remarks

Visit to the Technical and IT departments of Bezirksklinikum Mainkofen or Rottal-Inn Kliniken.

Recommended Literature

- Jehle, R., Czeschik, C., Freund, T., Wellnhofer, E.: Medizinische Informatik Kompakt, deGruyter, Berlin, 2015
- Lehmann, T.: Handbuch der Medizinischen Informatik, Hanser, München 2005
- Deutsche Krankenhausgeselleschaaft e.V. (German Hospital Federation): Anwendungen des risikomanagements für IT-Netzwerke, die Medizinprodukte beinhalten - Umsetzungshinweise für Krankenhäuser, 2011
- DIN VED Taschenbuch 354/1: Gebrauchstauglichkeit von Software – Grundsätzliche Empfehlungen für Produkt- und Prozessgestaltung, DIN e.v., Beuth Verlag, 2011
- Vogel: Medical Device Software-Verification, Validation and Compliance, Boston, Artech house, 2011
- Mildner: Regulatorische Anforderungen an Medizinprodukte. Einführung und Handlungshilfen von klinischer Bewertung bis HTA, Medizinische Wissenschaftliche Verlagsgesellschaft, 2011
- Elahi B. (2018). Safety Risk Management For Medical Devices. 1st Edition, eBook ISBN: 9780128130995.
- Fiedler B. A. (2017). Managing Medical Devices within a Regulatory Framework. 1st Edition

- Clifton A. Ericson (2005). Hazard Analysis Techniques For System Safety. A John Wiley & Sons, Interscience.
- Kuan Zhang, ?Xuemin (Sherman) Shen (2015): Security and Privacy for Mobile Healthcare Networks.
- Hoyt R.E., Yoshihashi A. (2014): Health Informatics: Practical Guide for Healthcare and Information Technology Professionals. 6th.
- Ciampa M. & Revels M. (2012): Introduction to healthcare information technology.
- https://www.bundesgesundheitsministerium.de

G-22 ERP-SYSTEMS

Module code	G-22
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G4102 ERP-Systems
Lecturer	Stefan Kahlert
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Professional competence

- Students know the objective and purpose of ERP systems in operational use. The main providers are SAP, Oracle, Salesforce and Microsoft, but also numerous other ERP systems are available from various vendors. The focus is on how to integrate and utilise such systems. Also, the students should understand the various modules within an ERP system like, supply chain management, human resources, materials management, customer relationship management, sales and marketing, production / manufacturing, inventory, finance and controlling.
- Students are able to outline the typical steps and critical points of an ERP implementation project. They recognise the importance of an ERP system in a company and its key position in an IT application landscape.
- The module deals with the organisational structures and master data necessary for the successful execution of processes. Students are aware of the technical meaning of objects, i.e., the associated business-management backgrounds and technical dependencies. They obtain an insight into the customisation of an SAP system.

- By means of exercises, case studies and project tasks, students learn the practical handling of ERP systems. They can implement reference processes practically and explain the interplay between them.
- Students obtain an insight into advanced ERP techniques and other processes (e.g., PLM, CRM, SCM), and can classify them in business-management contexts.

Methodological competence

- Students gain insight into the typical working methods and procedures in ERP consulting and design.

Personal competence

- Processing of case studies on an ERP system develops time and self-management skills.

Social competence

- Students apply selected knowledge in various teams on the basis of a practice-oriented software or organizational project. This promotes the ability to cooperate and communicate as well as the ability to deal with conflicts.

Applicability in this and other Programs

Management and IT consulting

Entrance Requirements

Databases

Learning Content

1. Introduction ERP

History Of ERP: ERP Inventory Module, Organisational structures, Master data, Case study MM

2. ERP Production Planning Module

ERP Purchasing Module, ERP Inventory Module, Organisational structures, Master data, Purchasing processes, Case study MM

3. ERP Finance Module

Financial management, management of capital inflow and outflow, Standard Accounting and Finance transactions like expenditures, general ledger, balance sheet, bank reconciliation, tax management, and payments, Financial reports for different departments and business units.

4. ERP Controlling

Integration aspects between financial accounting and controlling, Overhead cost management, Cost-type accounting, Cost centre accounting, Cost centre planning, Reporting systems, Cost centre overview, Organisation elements of financial accounting, Creation of master data, Suppliers, Customers, G/L accounts, Depiction of simple business processes, Invoice entry, Entry of outgoing invoice, Settling of open items, Account analysis

5. ERP utilisation

Use of business-management standard software, Introduction to ERP software components, Examples of ERP software, Utilisation ERP software, Types of ERP software, Factors to consider when choosing ERP software, ERP software cost, Potential issues with ERP software, Latest ERP trends

6. Human Resource Management

This module features standard HRMS tools like time tracker, timesheet, and database for employee records, job profiles, and skills matrix. HRM module also include performance reviews and payroll system. The latter is closely integrated with the financial management module to manage wages, travel expenses and reimbursements. Some ERP solutions also feature a training or LMS function under HRM.

7. Sales and Marketing

The module handles sales workflows like sales inquiries, quotations, sales orders and sales invoices. The more advanced ERP also features taxation rules and shipping tracker. The Sales and CRM modules work together to speed up the sales cycle and earn the company more profits.

8. Customer Relationship Management (CRM)

The CRM module supports customer service and profit per capita. It manages leads, opportunities and customer issues. Likewise, it provides a 360-degree profile of customers by consolidating data like social media activities, purchase history and past interactions with support representatives. In an ERP setup, CRM is closely integrated with Sales module to fast track conversions.

9. Manufacturing

Sometimes referred to as engineering or production, this module helps businesses make manufacturing more efficient in areas such as product planning, materials sourcing, daily production monitoring, and product forecasting. Some of the key functionalities in this module are bill of material, production scheduling, shop floor control, and distribution planning. The module is tightly integrated with SCM and inventory modules especially in areas like product planning and inventory control.

10. Supply Chain Management Logistics

This module covers key aspects of the supply chain including purchase and order management. It manages product flow from production to consumer and, occasionally, vice-versa for returns or recalls. A key feature of the SCM module is process automation, which streamlines entire supply chain and makes it adaptive to sudden market shifts.

11. Inventory

Also known material management module. Inventory module supports to measure stock targets, standardize replenishments, and other inventory goals. It uses product serial numbers to track and locate items in an organization. This module is closely integrated with the Purchase module.

12. Purchasing

This module manages the processes involved in materials procurement. These include supplier listings; quotation requests and analysis; purchase orders; Good Receipt Notes; and stock updates. As such, it functions closely with SCM or Inventory modules.

Teaching Methods

Seminar-like classes, exercises and group work, case studies

Recommended Literature

General:

- Magal, S. R., Word, J. (2012), Integrated Business Processes with ERP Systems, Wiley, Hoboken, NJ, USA, (ISBN 978-0-470-47844-8)
- Schulz, O. (2013), Der SAP-Grundkurs fu?r Einsteiger und Anwender, 2. Auflage, Galileo Press, Bonn, (ISBN 978-3-8362-2034-7)
- Gronau, N, (2017), Enterprise Resource Planning: Architektur, Funktionen und Management, De Gruyter, Oldenburg 3.Auflage
- Law, C.H. (2019), Managing Enterprise Resource Planning Adoption and Business Processes, Cambridge Scholars Publishing; 1 edition

Sales and materials management:

- Benz, J., Höflinger, M. (2011) Logistikprozesse mit SAP, 3. Auflage, Vieweg-Teubner, Wiesbaden, (ISBN 978-3-8348-1484-5)
- Kappauf, J., Koch, M., Lauterbach, B. (2012): Discover Logistik mit SAP, 2. Auflage, Galileo Press, Bonn, (ISBN 978-3-8362-1857-3)
- Rimmelspacher, U. (2014), Vertriebsprozesse mit SAP, Springer Vieweg, Wiesbaden, (ISBN 978-3-658-00570-2)

- Then, T. (2013), Vertrieb mit SAP - Der Grundkurs fu?r Einsteiger und Anwender, Galileo Press, Bonn, (ISBN 978-3-8362-1836-8)
- Then, T. (2011), Einkauf mit SAP - Der Grundkurs fu?r Einsteiger und Anwender, Galileo Press, Bonn, (ISBN 978-3-8362-1712-5)

Production planning and control:

- Benz, J., Höflinger, M. (2011), Logistikprozesse mit SAP, 3. Auflage, Vieweg-Teubner, Wiesbaden, (ISBN 978-3-8348-1484-5)
- Dickersbach, J. T., Keller, G. (2014), Produktionsplanung und -steuerung mit SAP ERP, 4. Auflage, Galileo Press, Bonn, (ISBN 978-3-8362-2708-7)
- Goldratt, E. M. (2002), Das Ziel: Ein Roman u?ber Prozessoptimierung, 3. Auflage, Campus Verlag, (ISBN 978-3593367019)

Finance and controlling:

- Forsthuber, H., Siebert, J. (2013), Praxishandbuch SAP-Finanzwesen, SAP- Press, Bonn u. a.
- Maassen, A., Schoenen, M., Werr, I. (2005), Grundkurs SAP R/3, 3. Auflage, Vieweg Verlag, Wiesbaden
- Gadatsch, A., Frick, D. (2005), „SAP-gestütztes Rechnungswesen“, 2. Auflage, Vieweg Verlag, Wiesbaden
- Friedl, G., Hilz, Ch., Pedell, B. (2008) „Controlling mit SAP“, 5. Auflage, Vieweg Verlag, Wiesbaden

G-23 OPERATIONS RESEARCH

Module code	G-23
Module coordination	Prof. Dr. Robert Feicht
Category	Informatics
Course number and name	G4103 Operations Research
Lecturer	Prof. Dr. Robert Feicht
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 90 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Professional and methodological competence
Students acquire knowledge of mathematical modeling in Operations Research with a focus on linear optimization and graph theory.

Knowledge

- The students are qualified to build up comprehensive and detailed mathematical models.
- They estimate the complexity, and choose and apply appropriate solution methods.
- Knowing the advantages and disadvantages of individual methods, students can assess the approaches' plausibility under different conditions.
- They apply the acquired knowledge of Operations Research unerringly to problems in related fields.

Skills

- Students will expand and deepen their quantitative skills.

- In practice, students can analyze decision-making processes in companies on their own and in a structured manner, by applying and interpreting appropriate modeling and problem-solving methods.
- They are able to model linear programming problems using spreadsheet software packages and their implemented Solver add-ins.

Personal competence

Social competence

- In group work, students master problem specific tasks, which require the handling of conflicting goals of the company and the development of convincing argumentation.
- The interactive character of lectures, exercises and group work strengthens the student's discussion and presentation skills in the academic context.

Autonomy

- Students are able to acquire skills outside their lectures from literature as well.
- They are able to relate their acquired knowledge to other lectures and topics.
- Students can handle complex work or study contexts independently.

Applicability in this Program

G-31 IT-Projekt Management

G-32 Logistics in Healthcare

G-39 Seminar: Management and IT-Consulting in health service

Applicability in this and other Programs

The learning outcomes of this module can be applied in any lectures and other study programs that require a basic understanding of mathematical modeling and quantitative decision support systems.

Entrance Requirements

G-02 Foundations of Mathematics and Statistics
G-03 Foundations of Informatics
G-07 General Business Admininstration and Accounting
G-08 Software Development
G-11 Mathematics and Statistics

Learning Content

- Introduction to quantitative analysis and decision making
- Linear programming
  - Introduction
  - Sensitivity analysis
  - Applications
- Distribution and network models
- Integer linear programming

Teaching Methods

Seminaristic teaching combining topic-oriented lectures, exercises, group work, group presentations, and classroom discussions. Students are encouraged to actively participate in course by choosing appropriate didactical methods. They are strongly invited to discuss real-life problems and applications interactively throughout the lecture.

Recommended Literature

- **Anderson D.R., Sweeney D.J., Williams T.A., Camm J.D., Cochran J.J.; "An Introduction to Management Science"; 14th edition; Boston, MA: Cengage Learning; 2016.**
- Ragsdale C.T.; "Spreadsheet Modeling and Decision Analysis"; 8th edition; Boston, MA: Cengage Learning; 2017.
- Taylor B.W.; "Introduction to Management Science"; 12th global edition; Harlow: Pearson Education; 2016.
- Lawrence J.A., Pasternack B.A.; "Applied Management Science. Modeling, Spreadsheet Analysis, and Communication for Decision Making"; 2nd edition; New York: Wiley; 2002.

G-24 PRACTICE OF PROGRAMMING

Module code	G-24
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G4104 Practice of Programming
Lecturer	Prof. Dr. Thomas Spittler
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Students acquire knowledge and practical experience for the implementation of distributed business applications.

After completing the module, students will have achieved the following learning objectives:

Professional competence

- Students understand the implementation of complex application systems.
- They are familiar with interfaces on different devices
- They identify various influences and determinants that affect working and interaction quality.

Methodological competence

- With the distributed development of software in a team, students have the ability to use programming patterns in a purpose-oriented manner.
- They are capable of systematic analysis and classification of situational influences.

- They systematically analyse the sources and types of error.

Personal competence

- By working in a team, students can achieve their own goals and take on leadership roles or become involved in the project team
- Furthermore, team members temporarily assume the roles of programmers, database administrators and web developers.
- They assess influences on the work situation in the medical environment.

Social competence

- Students are capable of precise and goal-oriented communication as a result of working on a complex product in a team.

Applicability in this and other Programs

The IT-Project Management and Collaborative Systems modules can be based on the experiences of students in this module. The joint development of software is a collaborative task that can be accomplished with the help of online tools. Experience from the programming project can be incorporated into module IT-Project Management.

The students benefit from this experience for the Media Management module.

Entrance Requirements

The module is based on the modules Foundation of Infomatics, Software Development, Databases, Media Management and Foundations of Health Informatics.

Learning Content

1. Process modelling
2. Process models with focus on agile development methods
3. Requirements engineering
4. Object-oriented analysis and design (OOA, OOD) using UML as an example
5. Design and development of selected medical application systems using modern software development environments
6. Setting up application-specific information units and establishing relationships between them, as well as establishing interaction and navigation methods
7. Programming with Servlets and Java Beans and the necessary basic technologies for the construction of a distributed web-based application.
8. Development of an application for mobile devices (e.g. Android)
9. Practical exercises using Internet standards and languages
10. System design and programming using an application server
11. Quality assurance (e.g. Unit Test, Test environment)

Teaching Methods

- Seminar-like classes, exercises on the PC
- Practical software development in a team
- Presentation of the results as a system presentation of the created programme
- Working with collaboration systems that are available online

Remarks

Students define the software to be implemented themselves.

Recommended Literature

- Bauer, C., King, G. (2007), Java-Persistence mit Hibernate, Hanser Verlag
- Breidenbach, R., Walls, C. (2012), Spring im Einsatz, Hanser Verlag
- Fowler, M. (2002) Patterns of Enterprise Application Architecture, Addison Wesley
- Hennebrüder, S. (2007), Hibernate, Das Praxisbuch für Entwickler, Galileo Computing
- Kim, G. (2014) The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win, It Revolution Press
- Oates, R., Langer, T., Wille, S., Lueckow, T., Bachlmayr, G. (2008), Spring & Hibernate - eine praxisbezogene Einführung, Hanser Verlag
- Deitel, P. J. (2013). Android: How to program (2nd ed.). Upper Saddle River, NJ: Pearson Education.
- Jackson, W. (2017). Android apps for absolute beginners (Fourth edition). Place of publication not identified, New York, NY: Apress; Distributed to the book trade worldwide by Springer Science+Business Media New York.
- Badke-Schaub, P., Hofinger, G., & Lauche, K. (2012). Human Factors. Heidelberg: Springer.
- Casey, S. M., & Casey, S. M. (2006). The Atomic Chef: And Other True Tales of Design, Technology, and Human Error. Santa Barbara, CA: Mcgraw-Hill.
- Casey, S. M., & Casey, S. M. (2008). Set Phasers on Stun: And Other True Tales of Design, Technology, and Human Error (edition: 2 Sub.). Santa Barbara: Atlantic Books.
- Kahneman, D. (2012). Schnelles Denken, langsames Denken. Mu?nchen: Siedler.

- Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: a failure to disagree. American Psychologist, 64(6), 515.
- Klein, G. (1999). Sources of Power: How People Make Decisions (Auflage: Revised.). Cambridge, Mass.: MIT Pr.
- Lee, J. D., & Kirlik, A. (2013). The Oxford Handbook of Cognitive Engineering. New York: Oxford University Press.
- Norman, D. A. (2013), The design of everyday things, Basic Books, New York, NY
- Sarodnick, F., & Brau, H. (2010), Methoden der Usability Evaluation: Wissenschaftliche Grundlagen und praktische Anwendung. Verlag Hans Huber, Bern
- Rasmussen, J. (1997). Risk management in a dynamic society: a modelling problem. Safety Science, 27(2–3), 183–213. doi:10.1016/S0925-7535(97)00052-0
- Reason, J. (1990). Human error. Cambridge [England], New York: Cambridge University Press.
- Salvendy, G. (2012). Handbook of Human Factors and Ergonomics. Hoboken: John Wiley.
- Shneiderman, B., & Plaisant, C. (2010), Designing the user interface: strategies for effective human-computer interaction, Addison-Wesley, Boston
- Vicente, K. (2006). The Human Factor: revolutionizing the way people live with technology. New York: Taylor & Francis Group
- Ware, C. (2013). Information visualization: perception for design, 3rd revised edition, Morgan Kaufmann
- Wickens, C. D., Hollands, J. G., Parasuraman, R. (2013). Engineering Psychology and Human Performance, Pearson Education, Upper Saddle River

G-25 SEMINAR: CURRENT ASPECTS OF HEALTH ECONOMY

Module code	G-25
Module coordination	Prof. Dr. Horst Kunhardt
Category	Health
Course number and name	G4105 Current Aspects of Health Economy
Lecturers	Prof. Dr. Georgi Chaltikyan Prof. Dr. Horst Kunhardt
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Health Economics

The module is designed to enable students to identify and assess the basic economic connections in the healthcare sector. Medical services must be rendered effectively and economically and availed of only to the extent necessary. The key component is the application of the methodology of health-economic evaluation, as well as the knowledge of the methods of evidence-based medicine (EbM).

After completing the Health Economics module, students will have achieved the following learning objectives:

Professional competence

- Students learn the basic principles of health-economic evaluation and classification into direct, indirect and intangible costs.
- They make use of established tools and methods for this.

Methodological competence

- They can apply comparative and non-comparative methods, such as cost-cost comparison and cost-utility comparison.
- Students know the methodology of health technology assessment and can apply it with the help of examples.

Personal skills

- Students can address and critically discuss ethical and moral issues of economisation in the healthcare sector.

Current Aspects of the Healthcare Industry

Students acquire knowledge about current developments and trends in the healthcare industry, which is increasingly characterised by further digitalisation and service orientation. Students are made aware of the current developments in laws, such as prevention law, supply enhancement act, billing of telemedicine services, further development of eGK, and services not covered by health insurance. In seminar-like exercises and case discussions, students develop and reflect on the opportunities and risks of the further penetration of IT in the healthcare industry.

In addition, students learn about the latest developments and methods in biomedical research. Using examples from medical and natural-science research, students are introduced to innovative, computer-based evaluation methods, and a variety of evaluation options.

After completing the Current Aspects of Health Sciences module, students will have achieved the following learning objectives:

Professional competence

- Assessment of the development from a sectoral to a networked healthcare industry with assessment competence of what the 1st and 2nd healthcare markets have to offer
- Differentiation and assessment of welfare state regulations and individual initiatives, self-help groups in the field of health promotion and prevention
- Identification and assessment of web-based programmes for individual health management and differentiation from occupational health management
- Knowledge of regional and national networks in the healthcare market
- Knowledge of biomedical evaluation methods in the field of molecular research
- Overview of web-based programmes for evaluating medical and natural science data records and their informative value (*data readout)*

Methodological competence

- Implementation of personal empirical investigations, such as healthpanel.de in the healthcare industry
- Application of the HTA (health technology assessment) methodology for specific services and offers in the healthcare industry
- Handling biomedical databases (Ensemble, NCBI, SWISSPROT etc.)

Personal skills

- Critical reflection of the developments in the 1st and 2nd health market, and critical discussion of the topic of the welfare state vs. the personal responsibility of the consumer/patient
- Critical consideration of biomedical, computer-based data analysis with knowledge of the various evaluation methods available

Applicability in this and other Programs

Health Economics

Managed Care

FWP Evidence-Based Medicine

Simulation Game Medical Information Systems

Current Aspects ot the Healthcare Industry

The In-Service Course (PLV) and Internship module can be based on the experiences of students in this module.

Entrance Requirements

Health Economics

None

Current Aspects of the Healthcare Industry

The module is based on the modules Application Systems of Health Informatics, Basics of Natural Sciences and Data Protection.

Learning Content

Health Economics

- Tasks and objectives of health economics
  - Basic terms

- Institutions of costs and benefit assessment in the German healthcare sector
- Rationalisation and rationing
- Objectives of health economics
- Critical discussion of the economic approach in the healthcare sector

- Evidence-based medicine (EbM)
  - Basics of research in medical databases
  - Assessment of different study designs
  - Evidence grade
  - Guidelines and treatment pathways
  - HTA (Health Technology Assessment)
- Methods of health economics evaluation
  - Basics of evaluation
  - Evaluation procedures
    - Medical cost analysis
    - Cost-effectiveness analysis
    - Cost-benefit analysis
    - Cost-utility analysis
    - Cost types and their application in practice
  - User considerations
  - Methods of measuring the quality of life
- Case study: Reflection on the methodology of benefit assessment of the IQwIG (Institute for Quality and Efficiency in Health Care)

Current Aspects of the Healthcare Industry

- Prevention and health promotion in the 1st and 2nd healthcare markets
  - Welfare state vs. personal responsibility
  - Classic prevention
  - Health promotion by health insurance companies
  - Forms of self-responsible and operational health promotion

- Markets, stakeholders and offer design in the healthcare industry
  - Opportunities and risks of what the 2nd healthcare market has to offer
- Cooperation forms and networks in the healthcare industry
- Opportunities and perspectives in the healthcare industry
- Case studies
  - Regional, communal health management
  - Services not covered by health insurance
  - Offers of individual prevention with IT support
  - Further development of IT for the healthcare industry
- Opportunities and perspectives in the healthcare industry
  - Biomedical databases
  - Biomedical research and computer-based evaluation methods
  - Relevance of the evaluation of biomedical data records for the healthcare industry

Teaching Methods

Health Economics

Seminar-like classes, exercises

Current Aspects of the Healthcare Industry

Seminar-like classes, exercises on the PC along with HTA

Working with statute books and databases that are available online

Remarks

Health Economics

Exercises in the ORBIS system and OpenMed from AGFA Health Care GmbH with anonymised real data.

Recommended Literature

Health Economics

- Porzsolt, F., Williams, A.R., Kaplan, R.M.: Klinische Ökonomik, ecomed, Landsberg am Lech, 2003

- Lauterbach, K., Lüngen, M., Schrappe, M.: Gesundheitsökonomie und Evidence based Medicine, Schattauer, Stuttgart, 2010
- IQwiG Methodenpaier, http://www.iqwig.de
- Schöffski, v.d. Schulenburg, Gesundheitsökonomische Evaluationen, Springer, Berlin, 2008
- Hannoveraner Konsens – Deutsche Empfehlungen zur gesundheitsökonomischen Evaluation
- http://www.ifeg.de/cms/upload/pdf/SD253_GQ.pdf

Current Aspects of the Healthcare Industry

- Dostal, A., Dostal, G.: Produktivitätsfaktor Gesundheit: Märkte, Trends und Potenziale für Prävention, individuelle und betriebliche Gesundheitsförderung, dostal & partner management-beratung, gmbh, Vilsbiburg, 2015
- Kursheid, C., Beivers, A.: Gesundheits- und Sozialpolitk, Kohlhammer, Stuttgart, 2014
- www.dimdi.de (HTA)
- Selzer, P.M., R. Marhöfer, and A. Rohwer, *Angewandte Bioinformatik: Eine Einführung*. 2013: Springer Berlin

G-26 AWP (FOREIGN LANGUAGE IV)

Module code	G-26
Module coordination	Tanja Mertadana
Category	General Foundations
Course number and name	G4106 Foreign Language IV
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	2
ECTS	2
Workload	Time of attendance: 30 hours self-study: 30 hours Total: 60 hours
Type of Examination	written ex. 60 min.
Duration of Examination	60 min.
Language of Instruction	English

Module Objective

The modules Foreign Language II and IV aim to equip students with specialized language skills necessary for independent performance in a globalized industrial engineering sector. As a specialty the students can either choose an English course or vote between other languages such as Italian, Spanish or French.

Presentation skills for technical purposes (C1)

On completion of the module students will have achieved the following learning objectives:

Professional competencies

- Students will have an independent command of specialized technical terminology relevant to the field of industrial engineering. Command here refers to oral and written production as well as aural and reading comprehension.
- They will be in a position to deploy study skills such as close reading and coherent writing at a C1-level and for use in niche tasks for the industrial engineering sector.
- They will have gained substantial knowledge of C1-level language registers – both for formal study contexts and for semi-formal to formal professional contexts.

- They will have gained essential experience in presenting on topics related to technical English. The goal here is to package niche knowledge in the protocols of a clearly structured, effectively delivered piece of public speaking.

Methodological competencies

- Students will have enhanced their abilities to structure the acquisition of specialized terminology and grammatical items and practiced ways to internalize new language that yield optimal learning benefits.
- They will have extended and refined their practical research skills in English by engaging in at least two research projects – for example, by being asked to present on a discipline-specific topic in an individual or team presentation.

Social competencies

- Students will have gained valuable experience in training other personal effectiveness skills such as team work, integrity, and reliability.
- They will have reflected on the learning benefits derived from several immersion projects.

Other language course

Please see the respective course descriptions.

Entrance Requirements

The minimum entry-level requirement is C1-level of English according to the Common European Framework of Reference for Languages (CEFR) or A-level language skills according to the standards of the German education system. Alternatively, experience living abroad or successful participation in a study exchange may be sufficient.

Learning Content

Presentation skills for technical purposes (C1)

Communication skills for technical contexts, including a review and consolidation of the topics dealt with in Foreign Language III (Technical English (C1)), with a special focus on presentations.

- technical presentations, discussions and negotiations
- commercial correspondence on technical topics
- renewable energies and sustainability
- product and project management
- complaint management, service and repair

- the future of cars
- case study on an area related to technology/design/engineering
- review of some grammar items

Teaching Methods

Instruction and learning methods focus on training the four cardinal language skills (speaking, listening, reading, and writing) and on enhancing professional and social competencies. They include group discussions and group projects, individual and team work (e.g. individual and group presentations), real- and role-playing, close reading and listening activities, grammar games, method of loci, running dictations, translations, peer feedback and review, work with learning stations, and various follow-up viewing and writing activities.

Study assignments will be set on a weekly basis.

Recommended Literature

Recommended reading for Presentation skills for technical purposes (C1)

Bonamy, David. *Technical English 4*. Harlow, England: Pearson Education, 2011. Print.

Dunn, Marian, David Howey, and Amanda Ilic. *English for Mechanical Engineering in Higher Education Studies Coursebook*. Reading: Garnet Education, 2010. Print.

engine: Englisch für Ingenieure. Darmstadt. <www.engine-magazin.de>

Ibbotson, Mark. *Professional English in Use Engineering Technical English for Professionals.* Cambridge: Cambridge UP, 2009. Print.

Inch. *Inch, das neue Sprachmagazin für technisches English.* <inchbyinch.de>

Möllerke, Georg. *Modern English for Mechanical Engineers.* Munich: Carl Hanser Verlag, 2010. Print.

Recommended reading for other language

Please see the respective course descriptions for literature references.

G-27 AWP

Module code	G-27
Module coordination	Tanja Mertadana
Category	General Foundations
Course number and name	G4107 AWP
Semester	4
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	2
ECTS	2
Workload	Time of attendance: 30 hours self-study: 30 hours Total: 60 hours
Type of Examination	course assessment
Language of Instruction	English

Module Objective

The AWP subjects (Electives) provide the students with the opportunity to gain knowledge and skills in other fields than their chosen field of study. Students can choose both instructor-led inhouse courses and courses of the Virtual University of Bavaria (vhb).

The contents of the courses cover the following areas:

- Languages
- Didactical-educational area
- Social sciences
- Psychological-sociological area
- Technical-scientific area
- Philosophical and socio-ethical area
- Business area

The students can choose their courses from the AWP-module according to their own preferences.

Entrance Requirements

For advanced language courses, students have to prove the required language skills (for example through successful completion of a lower level).

Electives may not have thematic overlaps with the actual study course.

The module can also be chosen by students of other fields of study.

Learning Content

Please see the respective course descriptions for specific information on contents.

Teaching Methods

Seminar, exercises, class presentations, classroom pair/group work

Recommended Literature

Seminar, exercises, class presentations, classroom pair/group work

G-28 INTERNSHIP (18 WEEKS)

Module code	G-28
Module coordination	Prof. Dr. Marcus Herntrei
Course number and name	G5101 Internship (18 weeks) G5102 Block Seminar to accompany the internship (PLV) 1 G5103 Block Seminar to accompany the internship (PLV) 2
Semester	5
Duration of the module	1 semester
Module frequency	
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	30
Workload	Time of attendance: 60 hours self-study: 840 hours Total: 900 hours
Language of Instruction	English

Module Objective

Participants intensify the knowledge they have acquired of contemporary conceptualisation, consulting, design and optimisation of IT solutions in institutions working in the healthcare industry, in production companies, trading companies, service companies, administrative companies, and software or consulting firms using modern software tools, and by combining theory and practice.

The required team work actively promotes the leadership and communication skills of students.

The general objective of the internship is that students should apply the knowledge they have acquired in practice, and simultaneously learn about the operational processes in a company. In addition, the internship semester offers the participants an opportunity to improve their cooperation and communication skills by making presentations or presenting reports of what they have achieved.

After completing the Structures of the Healthcare Industry module, students will have achieved the following learning objectives:

- Students have an overview of the working methods and workflows of a company and an insight into the complexity of business processes.

- Students intensify and extend the expertise they have acquired by using it in practical applications.
- Depending on the field of application, students work in the areas of conceptualisation, consulting, design and optimisation of IT solutions in production companies, trading companies, service companies, administrative companies, and software or consulting firms, and use modern software tools.

Applicability in this and other Programs

Bachelor thesis

Entrance Requirements

Admission to the practical study semester requires that students earn at least 100 ECTS credit Points (see § 7 of the Study amd Examination Regulations)

Learning Content

Training content of internship:

Wherever possible, students should assist in tasks that are related to their future competence fields, and complete sub-tasks independently and with individual responsibility. The degree of difficulty of these tasks should be commensurate to the level of training and subsequent work as Bachelor of Arts.

The minimum internship period in the training organisation must not be less than 18 full weeks. Together with the two PLV blocks, this makes it a minimum required internship period of 20 weeks. The internship can also be completed abroad.

In addition to the 18 weelks in a training organisation, students need to complete two PLV weeks during the internship semester.

PLV 1

The first PLV week comprises Career Service seminars. PLV are practice-oriented courses which students must have attended by the start of the internship semester in the 5th semester. Every student is required to attend three seminars from the “Study and Personality Competence” category and two seminars from the “Professional Competence” category. Students can download the confirmation form for the seminars from iLearn.

Students are responsible for completing the five seminars by the beginning of the internship. They can sign up for the Career Service seminars at www.th-deg.de/seminare/ec. Different seminars are offered every semester.

PLV 2

The second PLV is offered as a block event (date to be announced). Registration for the PLV is carried out in the corresponding iLearn course for that particular semester.

Teaching Methods

practical units

Remarks

See the respective description of the current PLV in the curriculum

G-29 SOCIAL PROCESSES AND COMMUNICATION

Module code	G-29
Module coordination	Prof. Dr. Agnes Nocon
Category	General Foundations
Course number and name	G6101 Social Processes and Communication
Lecturer	Prof. Dr. Agnes Nocon
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

Graduates of the Health Informatics course assume leading positions in institutions and organisations in the healthcare sector and healthcare industry. Accordingly, they will need social skills that enable them to act appropriately in a complex, multi-professional and inter-cultural environment. In the “Social Processes and Communication” module, students acquire the ability to understand social processes in professional interaction situations, to analyse them, and to shape them through situation-appropriate communication.

After completing the module, students will have achieved the following learning outcomes:

- They will have experienced diverse manifestations of social and group-dynamic processes. Students can analyse experiences from the course against the background of psychological group models. They check their relevance for appropriate professional situations, and have the ability to use and apply selected theoretical concepts.
- Students know and understand basic communication models. They can evaluate the application of these models, and are able to apply them in relevant professional contexts.

- Students practice conversational and advisory skills (formulating their own point of view, showing interest and listening actively, leading and structuring conversations, using meta-communication and feedback, applying questioning techniques, assessing the importance of body language signals, etc.). They are able to use these competences in individual and group discussions as appropriate to the situation.
- Students have the ability to reflect on social and communicative processes. Key issues of everyday professional life are analysed and reflected on in relation to the content taught. Students are able to view their own communication situations from a meta-level.

Applicability in this and other Programs

none

Entrance Requirements

None

Learning Content

1. Structures and processes in groups
   - 1.1. Characteristics of groups
   - 1.2. Group dynamics and phases of group development
   - 1.3. Role types
2. Basic communication models
   - 2.1. Overview of communication theories
   - 2.2. The communication model according to Paul Watzlawick
   - 2.3. Communication square according to Friedeman Schulz von Thun
3. Conversation and communication skills
   - 3.1. Techniques to establish a positive relationship: Active listening, verbalisation
   - 3.2. Techniques to structure a conversation: asking questions, summarizing
   - 3.3. Using feedback and meta-communication
   - 3.4. Identifying factors that disturb a conversation
   - 3.5. Dealing with demanding communication situations

4. Reflection on social processes

    4.1. Reflection methods

    4.2. Basic psychological requirements

Teaching Methods

Lectures, roleplays, video analyses, discussions, group work

Recommended Literature

- Hogg, M., Vaughan, G. (2017). Social Psychology. Pearson.
- Matsumoto, D. (2010). APA Handbook of Intercultural Communication. American Psychology Association.
- Hargie, O. (2018). The Handbook of Communication Skills. Routledge.

G-30 KNOWLEDGE-BASED SYSTEMS

Module code	G-30
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G6102 Knowledge-based Systems
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Knowledge acquisition of the essential methods of the application-oriented field of Artificial Intelligence (AI) and the ability to apply them to the issues of health sciences and professional practice. As an educational goal, students experience the scope of "artificial intelligence" and can generate knowledge using AI methods.

Participants become acquainted with the knowledge management process and learn to optimise its sub-processes in the professional environment of the healthcare sector. To do so, they now pay particular attention to "soft factors" and the knowledge culture in their professional environment in the healthcare sector.

As a result of the interdisciplinary approach, participants acquire the corresponding methodological competence in knowledge logistics, such as knowledge modelling and knowledge representation, as well as knowledge assessment procedures with an intellectual capital report in order to become a role model and lead knowledge management projects. They can assess the different research directions.

After completing the module, students will have achieved the following learning objectives:

Professional competence

- Students have basic knowledge of soft factors and knowledge culture, of the knowledge management process, knowledge search, the knowledge representation methods (such as ontologies), knowledge assessment methods (such as intellectual capital report), knowledge management software (such as knowledge portals), chatbots and methods of machine learning (such as neural networks and 4.0 techniques).
- Using Information Visualization Methods for Different Data Types
- Design interactive visualization systems for data from different application areas
- Combine visualization and automated data processing to solve big data problems
- Apply knowledge about main characteristics of human visual perception in information visualization and visual analytics

Methodological competence

- Students have an in-depth knowledge of programming with a logic programming language (PROLOG), with the Artificial Intelligence Modelling Language (AIML), of handling an NN toolbox, and the application of software for generating an intellectual capital report.
- They can deal with the basic concepts of AI and know which knowledge representation formalisms are appropriate for which problems, and can map domains in suitable formalisms. They can create a concept of “virtual training for increasing the human capital” for their institute and also set up the concept of how to “successfully introduce knowledge management”.

Personal competence

- Students can implement their own knowledge-based ideas and defend them against competing approaches.
- The students are able to deepen their own time management and self-study, as they work on smaller parts of self-study.

Social competence

- Students gain an insight into solving problems through group work and team work.

Applicability in this and other Programs

Data Analytics

Entrance Requirements

Knowledge from the Foundation of Informatics, Databases, Practice of Programming lecture

Learning Content

Knowledge Management

1. Foundations and history of artificial intelligence

2. Knowledge management process and its sub-processes

3. Knowledge-based methods (knowledge representation such as ontologies, search methods, case-based closing, planning, machine learning, user modelling)

4. Knowledge management methods, such as those for promoting knowledge, exchange and the use of knowledge, knowledge visualisation, and knowledge assessment methods such as the intellectual capital report

5. Knowledge management software tools such as OpenKM.

6. Knowledge management systems (reference model, integrated systems such as in IBM), WMS in the healthcare sector. Architectures of knowledge management system couplings

7. Case study of knowledge management in hospitals using methods of optimised introduction of such knowledge management systems

8. Machine learning methods, in particular, neural networks in the theory of backpropagation using the Tensorflow software

9. Chatbot programming

10. Expert systems

11. Recommender systems

Information Visualization and Visual Analysis

1. Overview of information visualization and visual analytics

2. Data presentation and data transformation

3. Visual representation of bivariate and multivariate data as well as time series and evaluation scales

4 Visual Analytics
4.1 Big Data
4.2 Data Mining

5. Case Study

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Lehner, F., Wissensmanagement, Hanser Verlag, München, 4. Aufl. 2012
- *Popp, H., Kreupl, S., Mößlein, W.* Die Wissensbilanz, in WISU- Das Wirtschaftsstudium, 2012, Heft 5, S675ff.
- Silke Kreupl, Heribert Popp: Wissensmanagement an der Hochschule Deggendorf. Wissensmanagement, Heft 6/2010, 2010, S.18-21
- Armutat, Sascha, u.a., Wissensmanagement erfolgreich einführen, DGFP, 2002
- Görz, Günther, Rollinger, Claus-Rainer und Schneeberger, Josef, Handbuch der Künstlichen Intelligenz, Oldenbourg Verlag München, 4. Aufl., 2012
- Popp, H., Lödel, D., Fuzzy Techniques and User Modelling in Sales Assistants, in: User Modeling and User Adapted Interaction, 5, S. 349-370, 1995
- Popp, H., Protzel, P., Wallrafen, J., Mertens, P., Soft-Computing-Methoden für die Kreditwürdigkeitsprüfung, in: Kleinschmidt, P., Bachem, A., Derigs, U., Fischer, D., Leopold-Wildburger, U., Möhring, R. (Hrsg.), Operations Research Proceedings 1995, 305-310, 1996
- Russell, Stuart, Norvig, Peter, Artificial Intelligence: A Modern Approach, The Intelligent Agent Book, Prentice Hall, 2003
- Kohlhammer, J.: Visual Business Analytics : effektiver Zugang zu Daten und Informationen, dpunkt Verlag, Heidelberg, 2. Aufl., 2018
- Stapelkamp, T.: Informationsvisualisierung : Web - Print - Signaletik, Springer Vieweg, Berlin, 2013

o Preim, B.: Interaktive Systeme /1: Grundlagen, Graphical User Interfaces, Informationsvisualisierung, Springer, Berlin [u.a.], 2. Aufl., 2010

G-31 IT-PROJEKT MANAGEMENT

Module code	G-31
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G6103 IT-Project Management
Semester	6
Duration of the module	1 semester
Module frequency	
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

Professional competence

- Students acquire knowledge about planning, monitoring and controlling projects, and designing structural and process organisation.
- They can differentiate and apply different process models.

Methodological competence

- Students can apply selected procedures/methods for simple problems in practice.

Personal competence

- Students acquire knowledge in self-organisation.

Social competence

- Students use selected knowledge in various teams with the help of practice-oriented software or an organisational project. This promotes cooperation and communication skills, as well as conflict skills.

Applicability in this and other Programs

This module can be used in module G38 IT Organisation and Computer Centre Management.

Entrance Requirements

Software development, Practice of Programming

Learning Content

1. Basics
1.1 Characteristics of projects
1.2 Requirements on and tasks of a project manager

2. Project organisation
2.1 Different forms of organisation
2.2 Project managers vs line managers
2.3 Composition/tasks/competencies of other committees

3. Project planning and controlling
3.1 Types of project plans
3.2 Project planning
3.3 Risk management in projects
3.4 Project management and control
3.5 Procedures and approaches
3.6 Process Models
3.7 Software Tools

4. Project phases

5. Techniques
5.1 Soft skills of a project manager (creativity techniques, moderation, presentation, self-organisation)
5.2 Staff Management

6. Case Study

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Kerzner, H. (2003), Projektmanagement Fallstudien, mitp-Verlag, Bonn
- Kuster, J. et al. (2011), Handbuch Projektmanagement, 3. Auflage, Springer Verlag, Berlin
- Martinelli, R.J., Milosevic, D.Z. (2016), Project Management ToolBox - Tools and Techniques for the Practicing Project Manager, 2. Auflage, Wiley, Hoboken
- Project Management Institute (Hrsg.) (2013), A guide to the project management body of knowledge. PMBOK(R) Guide, 5. Auflage, Project Management Institute, Newtown Square, Pa
- Verzuh, E. (2015), The Fast Forward MBA in Project Management, 5. Auflage, Wiley, Hoboken, NJ
- Sutherland, J. (2015), Scrum: the art of doing twice the work in half the time, Random House Business Books, London
- Wysocki, R. (2014), Effective project management: traditional, agile, extreme, Wiley, Indianapolis
- Schröder, A. (2017), Agile Produktentwicklung : schneller zur Innovation - erfolgreicher am Markt, Hanser, München

G-32 LOGISTICS IN HEALTHCARE

Module code	G-32
Module coordination	Prof. Dr. Horst Kunhardt
Category	Health
Course number and name	G6104 Logistics in Healthcare
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

After completing the Logistics in the Healthcare Sector module, students will have achieved the following learning objectives:

Professional competence

- Students learn the basics and the meaning of logistics and understand how to apply the models of logistics in the healthcare sector.
- Students learn tasks and the structural and process organisation of logistics.

Methodological competence

- Students learn about the goals and mechanisms of logistics and the mechanisms of logistics policy and can apply their essential features.
- Students identify the functions and processes in materials, production and logistics management in theory and practice.
- They perform requirements calculations, accounting and order calculations to solve simple logistical problems.

Personal skills

- Students reflect upon the goals of exemplary logistics instruments in healthcare.

Applicability in this and other Programs

General Business Administration and Accounting.

Entrance Requirements

Basics of Mathematics and Statistics

Learning Content

Materials and production management:

- Basics of entrepreneurial service provision
  - Needs as prerequisites for economic activity
  - Division of work
- Entrepreneurial service process
- Production
- Procurement
  - Basics of procurement
    - Definition of terms
    - Strategic objectives of purchasing
    - Importance of the procurement function in a company's success
    - Current trends in purchasing - job profile in transition
  - Discussion: Logistics crisis
  - Procurement processes
    - Classification of material requirement
    - Material numbering
    - Classification by significance
    - Needs assessment
    - Material requirement types
    - Deterministic needs assessment

- Stochastic needs assessment
- Searching for and selecting suppliers
- Conclusion of contract
- Tendering
- Analysis and negotiation
- Commissioning (awarding of contract)
- Order calculation and warehousing
- Warehousing
- Optimum order quantity
- Reorder point procedure
- Assessment of suppliers

Teaching Methods

Seminar-like classes, exercises

Virtual teaching and learning platform (iLearn)

Recommended Literature

- Buchanan, D., Huczynski, A. (2006), Organizational Behaviour, , 6th ed., Lon-don
- Schulte, G. (2001), Material- und Logistikmanagement, 2nd significantly expanded and improved edition, Munich
- Schulte, C. (2012): Logistik – Wege zur Optimierung der Supply Chain, 6th edition, Munich
- Hübner, U., Elmhorst, M.A., eBusiness in Healthcare: From eProcurement to Supply Chain Management, Springer, London, 2010

G-33 COLLABORATIVE SYSTEMS

Module code	G-33
Module coordination	Prof. Dr. Horst Kunhardt
Category	Informatics
Course number and name	G6105 Collaborative Systems
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The "Collaborative Systems" module deals with the understanding of social interaction and the designing, implementation and evaluation of IT based systems to support social interaction.

- Students learn about the origins and goals of collaborative systems and their relevance to companies and collaboration of groups across borders.
- The theory of scale-free networks and social network analysis are recognised as the basis of collaborative systems.
- The terms “Web 2.0”, “social software” and the possibilities of collaboration via the Internet are illustrated by means of case studies.
- Students recognise the interdisciplinary approach of collaborative systems in context and their implementation in the form of groupware systems.

After completing the Collaborative Systems module, students will have achieved the following learning objectives:

Professional competence

- Students know the basics of network theory and can differentiate between the main taxonomies and models, and groupware and collaborative work
- Students are familiar with the areas of application of groupware in the networked healthcare sector and in modern social networks.
- They know the essential key figures for describing social networks

Methodological competence

- They can use the methods of network analysis and scale-free networks.
- Students know the methodology of sociograms and can apply and analyse various software tools for network analysis based on affiliation matrices.

Personal skills

Students can critically discuss the legal, ethical and moral issues of modern social networks and their application in the field of communication in the healthcare sector.

Applicability in this and other Programs

Simulation Game Medical Information Systems

Entrance Requirements

None

Learning Content

- Introduction to the basics of collaborative systems
  - Computer-supported cooperative work
  - Network theory and network research
  - Scale-free networks as per Barabasi
  - Self-organisation in networks, autopoiesis, dissipative structures, Emergenc
  - Case study: Small world project
- Requirements of collaborative software and/or groupware
  - Space-time taxonomy of groupware
  - 3-K model for groupware
  - Awareness
  - Examples of "social software" from Web 2.0

- Interdisciplinary aspects of collaborative systems
  - Network analysis of social structures
  - Macro and micro approach of social systems
  - Analysis levels dyads, triads
  - Sociograms and graph theory
  - Indices of network analysis
  - Case study: Network analysis
- Practical examples and case studies
- Collaborative systems and applications
  - Collaborative software development in open source
  - Wikipedia
  - Collaborative tagging (del.icio.us)
  - Collaboration platforms: Wikis, PhpGroupware, Plone, Joomla etc.
  - Social networks (online): Xing, Facebook
  - Collaboration in 3D environments: Second Life, etc.
  - Commercial collaboration platforms: Sharepoint Services, FastViewer

Teaching Methods

Seminar-like classes, exercises

Remarks

Exercises on network analysis using computer-aided tools such as netdraw or gephi

Recommended Literature

- Böttger C. (Hrsg.), iX Studie Groupware, Kommerzielle und Open-Source-Groupware-Systeme im Vergleich, Heise Verlag, 2007
- Borghoff, U., Schlichter, J., Rechnergestützte Gruppenarbeit, Springer Verlag, 2000
- Case Study Masterfoods USA Case Study: Driving Innovation in R&D with Network Analysis

- Jansen, D., Einführung in die Netzwerkanalyse, Leske + Budrich, utb, 2. Auflage, 2003
- Koch, M., Richter, A., Enterprise 2.0, Oldenbourg, München, 2007
- Camarinha- Collaborative Systems for Smart Networked Environments: 15th IFIP WG 5.5 Working Conference on Virtual Enterprises Matos, L.M., Afsarmanesh, H., Springer, 2014
- ACM Conference on Computer Supported Cooperative Work and Social Computing, http://cscw.acm.org/2014/
- Fachgruppe CSCW & Social Computing der Gesellschaft für Informatik, http://www.fgcscw.de/

Basic literature for in-depth knowledge:

- Gross, T., Koch, M., Herczeg, M., Computer-Supported Cooperative Work, Oldenbourgh, München, 2007
- Pentland, A., Social Physics: How Social Networks Can Make Us Smarter, Penguin Books, Ney York, 2015

G-34 FWP-1* EVIDENCE-BASED MEDICINE

Module code	G-34
Module coordination	Prof. Dr. Georgi Chaltikyan
Category	Health
Course number and name	G6106 Evidence-based Medicine
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

After completing the “Evidence-Based Medicine” module, students will have achieved the following learning objectives:

Professional competence

- Students have knowledge of the various types of experimental designs.
- They can estimate the disturbance variables of experiments: Experimenter effects (Rosenthal effect), subject effects

Methodological competence

- They assign plans and evaluation procedures.
- They take the use of the evidence-based approach in medicine into account.
- They are familiar with the analysis and assessment of methodical approaches within the framework of various experimental designs.

Personal skills:

- Students realistically assess their own abilities and limits in decision-making.
- They evaluate their own overall expertise in a realistic way.

- They take into account (interdisciplinary) collaboration during practical tasks.
- They recognise and take into account the ethical aspects of the domain.

Entrance Requirements

Statistics 1 and 2

Learning Content

The broad field of evidence-based medicine should be depicted in as versatile a manner as possible, given its connections to relevant associated disciplines. The following topics should be taken into account.

The area of ??**decision-making** is a focus point and a framework for many aspects of EBM.

The following issues are dealt with in this context:

- dealing with uncertainties, probabilities,
- risk perception,
- decision distortions and heuristics
- and, in general, the area of ??"medical decision making"

Various **experimental designs** are examined to supplement statistical training. Suitable methods for their evaluation are also discussed.

The following additional aspects complete the course content:

- **Evaluation**: Evaluation of interventions
- **Survey:** Tests, questionnaires, interviews
- Evaluation of the **quality of studies:** from individual case to systematic review
- **Expertise:** Strengths, mechanisms and limits
- **Ethical aspects** and principles of medical research

Teaching Methods

Lecture, seminar-like set up, exercises, group work

Recommended Literature

- Bortz, J. & Döring, N. (2006; 2015) Forschungsmethoden und Evaluation für Human-und Sozialwissenschaftler. Berlin: Springer.

- Gigerenzer, G. (2013). Risiko: Wie man die richtigen Entscheidungen trifft. Mu?nchen: C. Bertelsmann Verlag.
- Gigerenzer, G., & Gray, J. A. M. (2013). Bessere Ärzte, bessere Patienten, bessere Medizin. Aufbruch in ein transparentes Gesundheitswesen. Forum Reports. Berlin: MWV Medizinisch Wissenschaftliche Verlagsgesellschaft.
- Greenhalgh, T. (2014). How to Read a Paper: The Basics of Evidence-Based Medicine. Chichester, West Sussex: Wiley John + Sons.
- Huber, O. (2013). Das psychologische Experiment: Eine Einführung. Bern: Verlag Hans Huber.
- Hunink, M. G. M., Weinstein, M. C., Wittenberg, E., Drummond, M. F., Pliskin, J. S., Wong, J. B., & Glasziou, P. P. (2014). Decision Making in Health and Medicine: Integrating Evidence and Values. Cambridge: Cambridge University Press.
- Kahneman, D. (2012). Schnelles Denken, langsames Denken. Mu?nchen: Siedler.
- Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: a failure to disagree. American Psychologist, 64(6), 515.
- Klein, G. (1999). Sources of Power: How People Make Decisions (edition: Revised.). Cambridge, Mass.: MIT Pr.
- Motulsky, H. (2013). Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking. New York: Oxford Univ Press.
- Sox, H. C., Higgins, M. C., & Owens, D. K. (2013). Medical Decision Making. Chichester, West Sussex, UK: John Wiley & Sons.
- Slovic, P. (2010). The Feeling of Risk: New Perspectives on Risk Perception (edition: new). London?; Washington, DC: Routledge Chapman & Hall.
- Straus, S. E., Howerton, L. J., Richardson, W. S., & Haynes, R. B. (2010). Evidence-Based Medicine: How to Practice and Teach it. Edinburgh: Elsevier Ltd, Oxford

G-35 FWP-2* TELEMATICS IN HEALTH ECONOMY

Module code	G-35
Module coordination	Prof. Dr. Thomas Spittler
Category	Health
Course number and name	G6107 Telematics in Health Economy
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

The “Telematics in the Healthcare Industry” module is designed to give students an insight into the structures and framework conditions of the healthcare industry and the use of telematics applications in a modern, networked healthcare sector.

Telematics applications play an important role in the establishment and operation of healthcare networks (medical networks, ambulatory healthcare centres), and in the cooperation between clinics and established physicians, as well as in the field of cross-border healthcare management. The module also gives students insight into the special features of modern, internationally networked healthcare provision.

Upon completion of the module, students should be able to distinguish between telematics applications, to conceptualise them, evaluate them economically, and to work with telematics systems, as well as to provide consultation to companies in the healthcare industry.

Professional Competence

- Students know the framework conditions for the use of telematics and can classify the various communication standards (HL7, DICOM, IHE, xDT, CDA)
- Students know the basics of image processing

- They are familiar with the telematics infrastructure for the application of the eGK (electronic health card).

Methodological Competence

- They can differentiate between different digital media formats and apply them with the help of exercises using DICOM viewers

Personal Competence

- Students are familiar with the legal and economic issues of telematics and can discuss its application critically.

Social Competence

- In the group, a solution can be described and argued about.

Applicability in this and other Programs

Simulation Game Medical Information Systems

Entrance Requirements

General Business Administration and Accounting, Application Systems of Health Informatics

Learning Content

1. Framework conditions for the use of telematics in healthcare provision
1.1 Social Security Code
1.2 Data protection acts
1.3 Ban on telemedicine

2. Basics and terms
2.1 Communication standards (HL7, DICOM)
2.2 Telematics
2.3 Telemedicine
2.4 Telematics infrastructure for introducing the eGK (electronic health insurance card)

3. Integration of eMedicine, Telemedicine, eHealth and mHealth

4. Sensors, Devices, Implantables, and Signal Processing

5. Application scenarios
5.1 Teleradiology, Telecardiology, Telemdermatology, Teleaudiology, Teleoncology, etc.
5.2 Web-based electronic patient files
5.3 Care research – secondary use of clinical data

4. Cost-benefit analysis

Teaching Methods

Seminar-like classes, exercises

Remarks

- Exercises using the DICOM viewer and web-based telematics solutions, e.g., www.case.io or CAMPUS MEDICUS
- Online parts from the vhb (Virtuelle Hochschule Bayern - Bavarian Virtual University) lecture “Telematics in the healthcare sector”
- Visit of a local company which are in the field of Skin Imaging.

Recommended Literature

- Jehle, R., Czeschik, C., Freund, T., Wellnhofer, E. (Hrsg.), Medizinische Informatik Kompakt, de Gruyter, Berlin, 2015
- Lehmann, T.: Handbuch der Medizinischen Informatik, Hanser, München, 2005, ISBN 3-446-22701-6

G-36 FWP-3* DATA ANALYTICS

Module code	G-36
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G6108 Data Analysis and Data-Mining
Semester	6
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

After completing the module, the students have achieved the following learning objectives:

Professional competence

- Students can describe the Data Analytics lifecycle and apply it in projects.
- They can understand, implement and apply the different analysis methods and machine learning techniques in health care.
- They are able to differentiate between different analysis methods and to transfer practical tasks to their respective theoretical problem.
- They can adapt the techniques to specific health-related applications.
- They will be able to understand and develop further techniques based on literature.

Methodological competence

- The students know the different analysis methods and can use and analyze software tools.
- They are capable of systematic analysis and classification of situational influences.

Personal competence

- By working in a team, students are able to achieve their own goals and to take on leadership tasks or to contribute to the project team.

Social competence

- By working in a team on a complex question, the students are able to communicate precisely and purposefully.

Applicability in this and other Programs

Knowledge-based Systems

Entrance Requirements

Foundation of Informatics, Practice of Programming, Databases, Mathematics and Statistics, Application Systems of Health Informatics

Learning Content

1. Introduction to Big Data Analytics

2. Data Analytics Lifecycle
2.1 Overview
2.2 Discovery
2.3 Data Preparation
2.4 Model Planning
2.5 Model Building
2.6 Communicate Results
2.7 Operationalize
2.8 Case Study

3. Basic Data Analytic Methods Using R for Java
3.1 Introduction to R
3.2 Exploratory Data Analysis
3.3 Statistical Methods for Evaluation

4. Cluster Methods
4.1 K-means
4.2 OPTICS
4.3 Additional Algorithms

5. Association Rules
5.1 Apriori Algorithm
5.2 Evaluation of Candidate Rules
5.3 Applications of Association Rules
5.4 Case Study

6. Regression
6.1 Linear Regression
6.2 Logistic Regression
6.3 Additional Regression Models

7. Classification
7.1 Decision Trees
7.2 Naive Bayes
7.3 Additional Classification Methods

8. Time Series Analysis

9. Text Analysis

10. Case Study

Teaching Methods

The module provides a framework for self-organised learning in order to support students in the reflection and further development of professional, methodological and social competencies. In addition to theoretical inputs, interaction exercises, problem-solving tasks and role-plays are also used as the key methods. Guided feedback sessions sensitise students to their communication style, their role behaviour in groups, and the conditions for successful collaboration.

In this setting, students have the opportunity to increase their observation skills, communication skills, cooperation skills, reflection skills, self-competence and team skills.

Remarks

In practical exercises based on case studies, students are required to implement the knowledge and skills that they have acquired in the lecture. By working in project teams, presenting solutions and discussing the results, students learn skills that meet the practical requirements of healthcare companies.

Recommended Literature

- Dietrich, D., Heller, B., & Yang, B. (2015). Data Science & Big Data Analytics: Discovering. *Analyzing, Visualizing and Presenting Data*.
- Runkler, T. (2012). *Data analytics : models and algorithms for intelligent data analysis*. Wiesbaden: Springer Vieweg.
- Davis, N. A., & Shiland, B. J. (2015). *Statistics & Data Analytics for Health Data Management*. St. Louis: Elsevier Health Sciences.

- Ghavami, P. (2014). Clinical intelligence: The big data analytics revolution in healthcare–A framework for clinical and business intelligence. *Seattle, WA: CreateSpace Independent Publish-ing Platform*.
- Giabbanelli, P., Mago, V., Papageorgiou, E. (2018). *Advanced Data Analytics in Health*. Cham: Springer International Publishing.
- Ohlhorst, F. (2012). *Big data analytics: turning big data into big money* (Vol. 65). John Wiley & Sons.

G-37 MANAGED CARE

Module code	G-37
Module coordination	Prof. Dr. Thomas Spittler
Category	Health
Course number and name	G7101 Managed Care
Semester	7
Duration of the module	1 semester
Module frequency	
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The “Managed Care” module is designed to give students an insight into the basics of healthcare systems.

Managed care was developed as a health economic management control system in USA and has since been applied to other healthcare systems. Implementation goals include more cost-effective care, as well as improvement in quality and in interface management. Given the structural inefficiencies in the German healthcare sector, students also recognise the opportunities and potentials of individual managed care instruments, such as integrated medical care, structural contracts, selective contracting, doctors' networks, ambulatory healthcare centres and DMP.

Upon completion of the module, students should be able to distinguish between different managed care instruments, to evaluate them economically, and to provide consultation to companies in the healthcare industry.

Professional Competence

- Students know the framework conditions of the application of managed care and can classify its various characteristics
- Students know the basics of managed care instruments

- They are familiar with the assessment and classification systems of managed care

Methodological Competence

- They can analyse the various managed care instruments and perform sample calculations

Personal Competence

- Students can compare the legal, economic and ethical issues related to the application of managed care and discuss the application critically.

Social Competence

- Approaches and solutions are developed and discussed in the group.

Applicability in this and other Programs

Bachelor Thesis

Entrance Requirements

Medical Documentation, Seminar: Current Aspects of Health Economy

Learning Content

1. Historical development of managed care

2. Selective contracting

3. Gatekeeping

4. Utilisation review and management

5. Disease management

6. Case management

7. Guidelines

8. Remuneration systems

9. Quality management

10. HMO (Health Management Organisations) in different countries

11. Legal framework conditions for new forms of care
11.1 Model projects
11.2 Structural contracts
11.3 Integrated medical care
11.4 Ambulatory healthcare centres

11.5 CMP
11.6 Outpatient structures

12. Assessment methods
12.1 Capitation models
12.2 Problems of selecting policy holders

13. Case study
13.1 Doctors' networks
13.2 Models of employers mutual insurance association

Teaching Methods

Seminar-like classes, exercises

Recommended Literature

- Wiechmann, M.: Managed Care, Deutscher Universitätsverlag, Wiesbaden, 2003
- Amelung, V. E.: Managed Care – Neue Wege im Gesundheitsmanagement, Gabler, Wiesbaden, 2012
- Amelung, V. E.: Leuchtturmprojekte Integrierter Versorgung und Medizinischer Versorgungszentren: Innovative Modelle der Praxis, BMC, 2006
- Jochheim, R. J.: Managed Care & Integrierte Versorgung in den USA, Deutschland und Österreich: Modelle für die Zukunft des Gesundheitswesens?, Grin Verlag, Norderstedt, 2011
- www.bmcev.de

G-38 IT-ORGANISATION AND COMPUTER CENTER MANAGEMENT

Module code	G-38
Module coordination	Prof. Dr. Horst Kunhardt
Category	Informatics
Course number and name	G7102 IT-Organisation
Semester	7
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	2
ECTS	5
Workload	Time of attendance: 30 hours self-study: 22.5 hours virtual learning: 22.5 hours Total: 75 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The “IT Organisation and Computing Centre Management” module is intended to provide students with solid knowledge and skills in the organisation of IT processes and in the management of computing centres.

The planning and design of effective organisational structures is one of the basic prerequisites for secure and efficient IT operation. In addition to process orientation and a focus on standards such as ITIL, the computing centre operation is characterised by new organisational forms such as cloud integration, virtualisation, and partial or complete outsourcing regulations due to technical development. Students learn to plan, decide, implement and evaluate in this process, which involves many interfaces.

Upon completion of the module, students should be able to distinguish between different organisational forms in the computing centre, to conceptualise them, to evaluate them economically, and to provide consultation to companies in the healthcare industry.

Professional competence

- Students are aware of the framework conditions of computing centre operation and IT organisation in companies that work in the healthcare industry, and can classify the different forms of architecture and operator models
- They are familiar with the basics of structured cabling in accordance with DIN EN ISO 50173 and DIN EN 50600
- They know the assessment and classification systems of computing centres

Methodological competence

- They can analyse the different IT organisational forms and create contingency and recovery plans for computing centres

Personal skills

- Students are familiar with the legal and economic issues of IT operations and IT organisation and can discuss their application critically.

Entrance Requirements

None

Learning Content

- IT risk management in the data centre (analysis and evaluation)
- Basics data centre architecture
- Standards in Data Center Architecture, Planning and Operation
- Power supply systems (design and redundancy concepts)
- Air conditioning (design and redundancy concepts)
    - Safety technology and equipment
    - Structured data cabling (data centre and IT)
    - Building management systems
    - Requirements Laws, directives and standards
- Maintenance and repair (strategy and concepts)
- Organizational, operational and service processes (if necessary also ITIL)
- Data centre usage and management strategies
- Evaluation and classification bases of data centres
- Data centre operation:

- Virtualization
- Storage management
- Procurement

Emergency and restart system

Teaching Methods

Seminar-like classes, exercises

Remarks

Exercises in the test computing centre of DIT in the network lab

Visiting the computing centres of clinics

Recommended Literature

- Schlegel, H.: Steuerung der IT im Klinikmanagement, Vieweg und Teubner, Wiesbaden, 2010
- Böttcher, R.: IT-Servicemanagement mit ITIL, Heise-Verlag, Hanover, 2013
- Standards of the Beuth-Verlag
- ITIL
- DIN EN 50173
- www.bitkom.de
- www.bsi.de

G-39 SEMINAR: MANAGEMENT AND IT-CONSULTING IN HEALTH SERVICE

Module code	G-39
Module coordination	Prof. Dr. Horst Kunhardt
Category	Informatics
Course number and name	G7103 IT-Organisation and Computer Center Management
Semester	7
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	4
ECTS	5
Workload	Time of attendance: 60 hours self-study: 45 hours virtual learning: 45 hours Total: 150 hours
Type of Examination	assignment
Language of Instruction	English

Module Objective

Professional competence

- Students acquire an understanding of fundamental principles of thinking, such as lean thinking and the theory of constraints.
- They can carry out a “business analysis” and derive action recommendations for IT.
- Students can formulate the basics of an IT strategy.
- They are familiar with IT frameworks, especially ITIL and ISO.
- Having developed a good understanding of IT frameworks, students can define appropriate IT services and associated IT processes for an organisation.

Methodological competence

- Students learn how to think in entrepreneurial contexts.
- They acquire the competence to use the knowledge acquired in other subjects and to apply it for targeted problem-solving in a comprehensive context.

Social and personal skills

Students have to develop a solution using their personal and social skills and to defend it in front of people with varying opinions.

Entrance Requirements

General Business Administration,

Process Management, ERP Systems

Learning Content

Management and IT Consulting in the Healthcare Sector

- Basic “principles of thinking”, e.g.,
  - Lean management
  - Theory of constraints
- Business analysis and enterprise architecture management (EAM)
  - Business analysis
  - EAM basics
  - Basics of an IT strategy
- Case study: consulting project

IT service management

Modelling methods, IT Infrastructure Library (ITIL)

The module structure is based on the ITIL lifecycle:

1. The service strategy presents guidelines and goals.
2. Service Design, Service Transition and Service Operation are progressive lifecycle phases that include changes and transformations.

   Continual service improvement involves learning and improvement

Teaching Methods

Seminar-like classes, case study

IT service management as a course offered by the Virtuelle Hochschule Bayern:

Self-learning course for the “blended learning” method with

- tele-tutorial support (Prof. Dr. Hopf, TH GSO Nuremberg/Prof. Dr. Fischer, DIT)
- virtual discussion rooms
- audio/video supported teaching and learning material

and project tasks with feedback

Remarks

IT service management is provided as a course offered by the Virtuelle Hochschule Bayern:

Recommended Literature

- James P. Womack, Daniel T. Jones: Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Free Press, New York, USA, 2003 (ISBN 978-0743249270)
- Eliyahu M. Goldratt: Das Ziel: Ein Roman über Prozessoptimierung. Campus Verlag, 3. Auflage, 2002 (ISBN 978-3593367019)
- Inge Hanschke, Gunnar Giesinger, Daniel Goetze: Business-Analyse, Hanser, 2013 (ISBN 978-3-446-42937-6)
- Arno Müller, Hinrich Schröder, Lars von Thienen: Lean IT-Management, Gabler, Wiesbaden, 2011 (ISBN 978-3-8349-2910-5)
- Inge Hanschke: Enterprise Architecture Management, Hanser, 2012 (ISBN 978-3-446-42936-9)
- Hermann J. Schmelzer, Wolfgang Sesselmann: Geschäftsprozessmanagement in der Praxis, 8. Auflage, Hanser, München, 2013 (ISBN 9783446434608)
- Markus Huber, Gerda Huber: Prozess- und Projektmanagement für ITIL, Vieweg Teubner, Wiesbaden 2011 (ISBN 978-3-8348-1482-1)

IT service management

- Beims, M. (2010), IT-Servicemanagement in der Praxis mit ITIL ® 3, Hanser
- Böttcher, R. (2012), IT-Servicemanagement mit ITIL V3 – Einführung, Zusammenfassung und Übersicht der elementaren Empfehlungen, Heise,
- Office of Government Commerce (OGC): ITIL Service Strategy (German Translation)
- itSMF e.V.: ITIL in der Öffentlichen Verwaltung – Planung, Einführung und Steuerung von IT-Service-Prozessen, Symposion Publishing GmbH, Düsseldorf, 2007

- Online management lexicon: http://www.olev.de/, last visited on 22.10.2014
- tSMF e.V.: Foundations in IT Service Management Based on ITIL, Van Haren Publishing, 2006

G-40 BUSINESS GAME: MEDICAL INFORMATION SYSTEMS

Module code	G-40
Module coordination	Prof. Dr. Horst Kunhardt
Category	Health
Course number and name	G7104 Business Game: Medical Information Systems
Semester	7
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	2
ECTS	2
Workload	Time of attendance: 30 hours self-study: 30 hours virtual learning: 30 hours Total: 90 hours
Type of Examination	written ex. 90 min.
Duration of Examination	90 min.
Language of Instruction	English

Module Objective

The “Simulation Game: Medical Information Systems” module aims to provide students with an insight into the interaction between various components of a clinical information system.

Medical and clinical information systems form the basis for the processes of collaborative diagnostics, treatment, care and administration.

In the realistic but computer-simulated world of a large hospital, participants in hospital simulation learn in a targeted manner about the strongly networked relationships between their decisions, a dynamic environment and incomplete information about the future.

Interactions between commercial and medical care decisions quickly become apparent during training on the simulator. The goal is to develop strategies that make it possible for the student's own, virtual hospital to achieve both a handsome profit and excellent quality of care.

After completing the module, students should be able to work in a team on different tasks in a model system, taking on different roles. In this way, students should be

taught that different professions represent very different documentation processes and work in a collaborative manner.

Professional competence

- Students can practically operate and classify the various components of a medical information system
- They know the differences between open source and commercial documentation systems as a result of case studies

Methodological competence

- They can operate and manage various information systems in the healthcare sector based on case studies from the simulation game

Personal skills

Students can compare the legal and economic issues related to the use of medical information systems based on their own experience from the simulation game and critically discuss the collaborative processes.

Entrance Requirements

None

Learning Content

1. **Introduction** to the simulation game using collaborative processes
    - Administration
    - Anamnesis
    - Diagnostics
    - Therapy
    - Care
    - Aftercare
    - Interfaces to other documentation systems
    - Evaluation of the results of the simulation game
    - Discussion

2. Simulation game KLIMAFORTE© strategy simulation for implementation-oriented hospital management

Groups of three participants each take over the management of virtual hospitals. As in the real world, they compete with other hospitals in their area to win the goodwill of referrals and patients. Together, each team determines the strategic orientation of its hospital. Then, each group formulates the operational goals that it wants to achieve in individual decision-making sessions. These goals form the basis for assessing the group. They faces various challenges in the process: How can they make best use of the hospital capacity? Should the clinic specialise and/or cooperate with other hospitals (e.g., also with hospital chains from USA)?

How many beds should be reduced, if at all? Should the hospital be converted into a health centre or should it start an ambulatory healthcare centre? Each team can have the quality management system of their clinic certified. Once a year, there are discussions about the treatment spectrum and investment in modern medical equipment. In the case of continued high utilisation, the group can have an extension built. It is particularly important to coordinate staffing levels and patient volumes. In the event of a staff shortage, the team faces the challenge of attracting qualified, new employees and keeping their best staff on board. An essential condition for the success of the simulation is a continuously updated, complete overview of how the hospital compares with the hospitals of other teams. For this purpose, a clearly structured hospital information system (KIS) provides participants with all the controlling data required for their decisions. The knowledge acquired in the previous courses, particularly on hospital management, is applied in practice in the simulation game.

Teaching Methods

- Introductory lecture on the KLIMAFORTE© computer simulation
- Moderated discussions on the formulation of strategy and target system with subsequent presentation by the participant groups
- Decision making in the groups, supported by the simulation management
- Detailed and realistic simulation of every decision-making session in the KLIMAFORTE© software
- Simulation of up to 10 decision periods to show the correlation between team decisions and their consequences
- Regular analysis of the decision process in the teams and in the plenum
- Short lectures on current hospital management topics
- Reading of required passages from seminar documents
- Regular announcement of intermediate results
- Final evaluation

Remarks

An in-depth discussion between the simulation game management and the participants about questions concerning the implementation of experience in practice is essential for the success of the course.

Recommended Literature

- OpenSource clinical documentation system www.mycare2x.de
- Commercial test system OpenMed and ORBIS from AGFA Health Care GmbH
- Haas, P.: Medizinische Informationssysteme und Elektronische Krankenakten, Springer, Wiesbaden, 2005
- Scarlat, A.: Electronic Health Record: A Systems Analysis of the Medications Domain, CRC Press, Boca Raton, 2012
- Sittig, D.F.: Electronic Health Records: Challenges in Design and Implementation, CRC Press, Boca Raton, 2014
- Mycare2x Open Source Medical Documentation System, http://www.mycare2x.de/
- TOPSIM Documentation, 2018

G-41 BACHELOR THESIS

Module code	G-41
Module coordination	Prof. Dr. Thomas Spittler
Category	Informatics
Course number and name	G7105 Bachelor Thesis
Semester	0
Duration of the module	1 semester
Module frequency	annually
Course type	required course
Niveau	Undergraduate
Semester periods per week (SWS)	0
ECTS	12
Workload	Time of attendance: 0 hours Total: 0 hours
Type of Examination	bachelor thesis
Language of Instruction	English

Module Objective

Students show that – based on the theoretical and practical knowledge gained during their studies – they are able to independently resolve a scientifically and practically relevant problem by studying the facts, providing new insights, drawing conclusions and giving recommendations in a limited period of time. They are able to organize their workflow in order to meet the demands of the problems formulated in their thesis, as well as to monitor progress and make necessary amendments. Finally, students are able to document their approach and their results to meet the requirements of a scientific publication.

Professional competence

- When working on their bachelor thesis topic, students gain in-depth specialised knowledge in their respective field. Students have the ability to independently apply the knowledge and skills acquired during their studies to complex tasks and present them in an appropriate written format.

Methodological competence

- By planning the work steps, their execution and the conclusion in the form of a document, the students acquire the ability to complete an extensive project independently and successfully.

Personal competence

- The students learn to deal intensively with a question over a longer period of time.

Social competence

- Bachelor theses are often completed in cooperation with companies in the region. Students thereby acquire the ability to overcome personal challenges in social contexts.

Applicability in this and other Programs

Master programmes

Entrance Requirements

According to § 10 of the Study and Examination Regulations, students who have obtained at least 160 ECTS credit points can apply for the bachelor thesis.

Learning Content

The bachelor thesis is a written piece of work. It is assigned by an authorised examiner (professor, lecturer) and is supervised and evaluated by him/her. The student can make suggestions for the topic.

The processing time is usually three months. However, the maximum time is five months - from assignment of the topic to submission (according to § 11 APO (General Examination Regulation)). As a rule, the thesis should not exceed 40 pages. The bachelor thesis can be written on any topic whose content can be assigned to one of the course modules.

Teaching Methods

The bachelor thesis can be written in German or English in consultation with the examiner.

Remarks

The bachelor thesis should be written in accordance with the guidelines of the framework examination regulations (RaPO) and the general examination regulations (APO).

Recommended Literature

The thesis must contain a complete list of the literature used, of the information received, and of other sources. For formal requirements, please refer to:

- Lück, W. (1990), Technik des wissenschaftlichen Arbeitens, 4. Auflage, Oldenbourg, München, Seite 10ff.

- Lück, W., Henke, M. (2009), Technik des wissenschaftlichen Arbeitens, Seminararbeit, Diplomarbeit, Dissertation, 10. überarbeitete und erweiterte Auflage, Oldenbourg, München
- Anson, C.M. & Schwegler, R.A. (2005): The Longman Handbook for Writers and Readers. London: Pearson Education[4].
- Brunt, P.; Horner, S.; Semley, N. (2017): Research Methods in Tourism, Hospitality & Events Management. London: SAGE.
- Coles, T.; Duval, D.T.; Shaw, G. (2013). Student's Guide to Writing Dissertations and Theses in Tourism Studies and Related Disciplines. Abingdon: Routledge.
- Finn, M.; Walton, M.; Elliott-White, M. (2000). Tourism and Leisure Research Methods: Data Collection, Analysis, and Interpretation. London: Pearson Education.
- Jennings, G. (2011). Tourism Research. Hoboken/ NY: Wiley.
- Phillimore, J. & Goodson, L. (2004). Qualitative Research in Tourism: Ontologies, Epistemologies and Methodologies. London: Psychology Press.
- Ritchie, B.W.; Burns, P.; Palmer, C. (2005). Tourism Research Methods: Integrating Theory with Practice. Wallingford: CABI.
- Veal, A.J. (2006). Research Methods for Leisure and Tourism: A Practical Guide. London: Pearson Education.