

# Courses taught in English

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## 1 General Information and Provider of Courses

<b>B+W</b>	<b>Department of Business and Industrial Engineering</b>
<b>EMI</b>	<b>Department of Electrical Engineering, Medical Engineering and Computer Science</b>
<b>M+I</b>	<b>Department of Media</b>
<b>M+V</b>	<b>Department of Mechanical and Process Engineering</b>
<b>SZ</b>	<b>Language Center</b>

Students studying for a **Bachelor degree** can usually enroll on **Master degree** courses, provided that they fulfill the requirements. Permission from the department to enroll on Master degree courses is required.

**Some Master degree courses (e.g. RED/PDE/MPE and others) have limited spaces for students.**  
Please check beforehand to see if a space is available for you.

## 2 Bachelor Courses

### 2.1 Department of Business and Industrial Engineering

#### 2.1.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x		<a href="#">Analytics Coaching</a>	Seminar	3	Project Work
x		<a href="#">Business Research Methods</a>	Seminar	3	Project Work
x		<a href="#">Cross-Border Business Issues</a>	Seminar	3	Project Work
	x	<a href="#">Economics</a>	Seminar	3	Term Paper
x		<a href="#">General Business Administration</a>	Lecture	5	Written Exam
x	x	<a href="#">Intercultural Leadership</a>	Seminar	3	Project Work
x	x	<a href="#">Interdisciplinary Project Seminar</a>	Seminar	5	Project Work
x		<a href="#">Qualitative Methods</a>	Seminar	3	Project Work
x		<a href="#">Social Psychology</a>	Lecture	5	Written Exam
	x	<a href="#">Software Implementation Project</a>	Project	6	Project Work
	x	<a href="#">Voice Application Strategy and Prototyping</a>	Seminar	3	Project Work

## 2.1.2 Course Descriptions

Analytics Coaching	
Course ID:	B+W0040W
Level:	Bachelor
Course Type:	Seminar
Semester Hours per Week:	2
Credits:	3
Host Semester:	BW 7 / LH 7 / WI 7
Examination:	Project Work
Module:	BW-31 / LH-28 / WI-26: Electives
Location:	Campus Gengenbach

### Lecturer(s):

Prof. Dr. Mathias Bärthel

### Requirements:

Successful completion of Statistics foundation course

### Objectives and Competences:

Participants will be able to plan, prepare and execute advanced statistical analyses, and to evaluate their results, in order to gain relevant knowledge from business data and effectively inform both daily operations and strategic planning.

### Contents:

- Advanced analytical methods (e.g. ANOVA,  $\chi^2$ -Testing, Clustering, Decision Trees)
- Performance of advanced statistical analyses
- Use cases of business data, and their exploration aided by analytics software and a structured analysis process model

### Literature and Downloads:

- Kahraman, C., Kabak, Ö.: Fuzzy Statistical Decision-Making; Springer International Publishing, 2016.
- Mertens, W., Pugliese, A., Recker, J.: Quantitative Data Analysis; Springer International Publishing, 2017.
- Moore, D.S., McCabe, G.P., Craig, B.A.: Introduction to the Practice of Statistics; Freeman and Co., NY 2009.
- Lane, D.M.: Online Statistics Educations; <http://onlinestatbook.com>.

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<b>Business Research Methods</b>	
<b>Course ID:</b>	B+W0105
<b>Level:</b>	Bachelor
<b>Course Type:</b>	Seminar
<b>Semester Hours per Week:</b>	2
<b>Credits:</b>	3
<b>Host Semester:</b>	
<b>Examination:</b>	Project Work
<b>Module:</b>	WP-06
<b>Location:</b>	Campus Gengenbach

**Lecturer(s):**

Alexander Gehringer, M. Eng.

**Requirements:**

none

**Objectives and Competences:**

The course covers the necessary methodological knowledge and skills to prepare and write scientific texts. Students will be qualified to transfer these skills to a topic of their own choice. In doing so, they acquire the criterion-guided evaluation, selection and citation of scientific sources in research. Students become aware of the processual nature of scientific work through the submission of the outline, a preliminary version and the final scientific work. Training of reflexive action and orientation knowledge within this field of study is supported by constructive feedback from the lecturer.

**Contents:**

- Understanding scientific working
- Learning about methodological backgrounds of academic research
- Retrieving and evaluating scientific sources
- Formulating research questions
- Learning about research methods
- Preparing and writing scientific texts

**Literature and Downloads:**

- Collis, J. & Hussey, R. (2021) Business Research: A Practical Guide for Undergraduate & Postgraduate Students, 5th edition. Palgrave: London.
- Bell, E., Brymann, A. & Harley, B. (2019) Business Research Methods, 5th edition. Oxford University Press: Oxford, UK.
- Saunders, M., Lewis, P. & Thornhill, A. (2019) Research Methods for Business Students, 8th edition. Pearson: Harlow.
- Sandberg, Berit, 2017. Wissenschaftliches Arbeiten von Abbildungen bis Zitat. Berlin: De Gruyter-Verlag
- Weber, Daniela, 2015. Wissenschaftliches Arbeiten für Wirtschaftswissenschaftler. Weinheim: Wiley-Verlag
- Ebster, Claus und Stalzer, Lieselotte, 2013. Wissenschaftliches Arbeiten für Wirtschafts- und Sozialwissenschaftler. 4., überarbeitete Auflage. Wien: Facultas-Verlag
- Kornmeier, Martin, 2007. Wissenschaftstheorie und wissenschaftliches Arbeiten. Heidelberg: Physika-Verlag

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Cross-Border Business Issues	
Course ID:	B+W0053W
Level:	Bachelor
Course Type:	Seminar
Semester Hours per Week:	2
Credits:	3
Host Semester:	BW 7 / LH 7 / WI 7
Examination:	Project Work
Module:	BW-31 / LH-28 / WI-26: Electives
Location:	Campus Gengenbach

**Lecturer(s):**

Prof. Dr. Andreas Klasen / Prof. Enrico Prinz

**Requirements:**

None

**Objectives and Competences:**

This module aims to develop student skills to understand international business objectives, placing particular emphasis on those complicating issues not found in a one-country business context. Participants will examine the principles and issues that underpin the management of firms engaged in international business from both a theoretical and practical standpoint. The module is therefore concerned with business in a globalised environment but also cross-border transaction and foreign exchange risk. Participants will be able to produce solutions to practical decision-making related to foreign exchange, political and economic risk. On successful completion of this module, students will also be able to identify and evaluate key aspects of financing trade as well as foreign direct investment.

**Contents:**

- Business in a globalized environment
- Cross-border transactions and foreign exchange risk
- Foreign exchange risk management
- Assessing political and economic risk in trade
- Mitigating risk in financing trade transactions
- Introduction to foreign direct investment

**Literature and Downloads:**

Provided in class

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<b>Economics</b>	
<b>Course ID</b>	B+W0159
<b>Level</b>	Bachelor
<b>Course Type</b>	Seminar
<b>Hours per Week</b>	2
<b>Credits</b>	3
<b>Host Semester</b>	BW 6
<b>Examination</b>	Term Paper
<b>Module</b>	BW-21
<b>Location</b>	Campus Gengenbach

**Lecturer(s):**

Prof. Dr. Philipp Eudelle

**Requirements:**

None

**Objectives and Competences:**

- The students will gain a knowledge about analyzing current economic policy issues
- The students will gain a knowledge about various economic recommendations for action

**Contents:**

- Analytical basics for individual decision -making problems exemplified by market situations and current economic topics
- Analytical solutions for individual decision -making problems simplified by market situations and current economic topics

**Literature and Downloads:**

Provided in class

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General Business Administration	
Course ID	B+W0101
Level	Bachelor
Course Type	Lecture
Hours per Week	4
Credits	5
Host Semester	BW 1 / LH 1 / WI 1
Examination	Written Exam
Module	BW-01 / LH-01 / WI-01: Betriebswirtschaftslehre
Location	Campus Gengenbach

**Lecturer(s):**

Prof. Dr. Andreas Klasen

**Requirements:**

None

**Objectives and Competences:**

The purpose of this course is to provide a comprehensive overview of key elements of the business organization and to competing theories and models of the firm. It will provide a critical perspective on the main functional areas of business and management including strategy and decision making, logistics and production, marketing and sales, as well as accounting and finance. The course aims to build a foundation of knowledge on the different theoretical approaches to management. On completion of the course, the student will be able to understand the evolution of the business organization and management thought, identifying the interconnections between developments in these areas, discuss and compare different models and approaches, and evaluate the significance of contemporary issues in business.

**Contents:**

- Understanding the business organization
- Strategy and decision making
- Supply chain, logistics and production
- Marketing and sales
- Accounting
- Finance and investment

**Literature and Downloads:**

- Cavusgil, S.T., Knight, G. & Riesenberger, J. (2017) International Business. Harlow, Pearson.
- Deresky, H. (2017) International Management. Harlow, Pearson.
- Morschett, D., Schramm-Klein, H. & Zentes, J. (2015) Strategic International Management. Wiesbaden, Springer Gabler.
- Nickels, W.G., McHugh, J.M. & McHugh, S.M. (2016) Understanding Business. New York, McGrawHill.

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Intercultural Leadership	
Course ID	B+W0043W
Level	Bachelor
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BW 7 / LH 7 / WI 7
Examination	Project Work
Module	BW-31 / LH-28 / WI-26: Electives
Location	Campus Gengenbach

**Lecturer(s):**

Mr. Siefert (Guest Lecturer)

**Requirements:**

Basic understanding of corporate structures and communication

**Objectives and Competences:**

- Having knowledge and a keen sense of leadership situations
- Finding appropriate ways of leadership
- Exercising a successful performance management system

**Contents:**

This course provides knowledge about the influence of leadership behaviour on different corporate situations. The course establishes an understanding of how leadership behaviour exerts influence on performance in regards to an international company's cultural diversity and communication.

- First part:
  - Definition and objectives of leadership management
  - Different leading concepts and leading styles
  - Changes in leadership management models
  - Influence of different cultural backgrounds on companies and corporate culture
  - Influence of a leader's personality and communication skills on performance in different situations
  - Communication dynamics between manager and staff
- Second part:
  - Different approaches of leadership management in different situations
  - Modelling a performance management system
- Workshop:
  - Analyzing leadership management in different corporate situations
  - Designing performance measures in leadership management
  - Developing a performance management system

**Literature and Downloads:**

Provided in class

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Interdisciplinary Project Seminar	
Course ID	B+W0162
Level	Bachelor
Course Type	Seminar
Hours per Week	4
Credits	5
Host Semester	
Examination	Project Work
Module	BW-23
Location	Campus Gengenbach

**Lecturer(s):**

Prof Dr Klasen

**Requirements:**

**Objectives and Competences:**

**Contents:**

- Methods and processes of initiating, founding and implementing research-based learning in an interdisciplinary context.
- Theoretical approaches and practical phenomena in economics, business administration, law, sociology and political science
- Significance of projects for action in internationally active business enterprises as well as standard instruments for strategy development
- Methods for planning and implementing a project such as requirements analysis, business case and structural planning
- Calculation and interpretation of progress indicators and trend statements on the basis of actual and plan data as well as forms of reporting
- Methods of evaluating an interdisciplinary project in an international context

**Literature and Downloads:**

The final and updated literature list will be given to students at the start of the term.

- Weidinger, Christina/Fischler, Franz/Schmidpeter, René, Sustainable Entrepreneurship, Heidelberg 2014.
- Manktelow, Aidan, Guide to Emerging Markets, 3. Aufl., London 2014.
- August, R., Mayer, D., and Bixby, M., International Business Law, Harlow 2013.
- Cavusgil, Tamer, Doing Business in Emerging Markets, London 2012.
- Grath, Anders, The Handbook of International Trade and Finance, 2. Aufl., London 2012.
- Hill, Charles, International Business, New York 2011.
- Pless, Nicola/Maak, Thomas, Responsible Leadership, Dordrecht 2011.
- Hofstede, Geert/Hofstede, Gert Jan/Minkov, Michael, Cultures and Organizations, 3. Aufl., New York 2010.
- Holtbrügge, Dirk/Welge, Martin, Internationales Management, Stuttgart 2010.
- Backhaus, Klaus/Voeth, Markus, Internationales Marketing, Stuttgart 2010.
- Tietje, C., Internationales Wirtschaftsrecht, Berlin, 2009.
- Sperber, Herbert/Sprink, Joachim, Internationale Wirtschaft und Finanzen, München 2007.

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Qualitative Methods	
Course ID	B+W0022W
Level	Bachelor
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BW 7 / LH 7 / WI 7
Examination	Project Work
Module	BW-31 / LH-28 / WI-26: Electives
Location	Campus Gengenbach

**Lecturer(s):**

Prof. Dr. Andreas Klasen

**Requirements:**

None

**Objectives and Competences:**

The purpose of this course is to equip students to sensitively and critically design, carry out, report, read, and evaluate qualitative research. The module will provide an overview of the principles and practice of qualitative research. Participants will learn to collect data using observation, interview and focus groups, and become familiar with methodologies and methods such as grounded theory. The course has the dual aims of equipping students with both conceptual understandings of current academic debates regarding different methods, and the practical skills to put those methods into practice. It will provide students with a solid understanding of the core methods of qualitative data collection and analysis, as well as critical skills in interpreting and evaluating reports of qualitative studies.

**Contents:**

- Foundations
- Qualitative and quantitative methods
- Methodology and methods
- Data collection and analysis
- Qualitative methods in a business administration, management and marketing environment

**Literature and Downloads:**

- Bryman, A. and Bell, E. (2015) Business Research Methods. Oxford: Oxford University Press.
- Collis, J. and Hussey, R. (2013) Business Research. New York: Macmillan.
- Flick, U., Kardorff, E.v. and Steinke, I. (2005) Qualitative Forschung: Ein Handbuch. Reinbek: Rowohlt.
- Saunders, M.N.K., Lewis, P. and Thornhill, A. (2015) Research Methods for Business Students. Harlow: Pearson.

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Social Psychology	
Course ID	B+W0377
Level	Bachelor
Course Type	Lecture
Hours per Week	4
Credits	5
Host Semester	
Examination	Written Exam
Module	WP-04
Location	Campus Gengenbach

**Lecturer(s):**

Dr Simon

**Requirements:**

**Objectives and Competences:**

**Contents:**

**Literature and Downloads:**

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Voice Application Strategy and Prototyping	
Course ID	B+W0061W
Level	Bachelor
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BW 7 / LH 7 / WI 7
Examination	Project Work
Module	BW-31 / LH-28 / WI-26: Electives
Location	Campus Gengenbach

**Lecturer(s):**

Mrs. Annebeth Demaeght

**Requirements:**

None

**Objectives and Competences:**

By the end of the workshop students

- have comprehensive knowledge of the effects and applications of voice user interfaces in digital communication and marketing management
- are familiar with conversational interfaces, voice personas, dialog trees, voice UX, conversational analytics and their strategic use in customer experience management
- understand how to use voice user interfaces along the customer journey
- have basic knowledge of voice assistant technologies, e.g. functionalities and technological setup
- can develop project ideas and simple prototypes

**Contents:**

Voice assistants like Alexa and Google Assistant offer a new marketing channel for brands, products and services. This workshop provides students with a basic understanding of how voice interaction works. It covers the fields of conceptualizing, designing and prototyping dialogs for voice applications.

The central focus is set upon:

- Strategies for voice user interfaces
- Conversational design
- Use cases
- Voice UX and UX-testing
- Voice interactions prototyping (e. g. with voiceflowProject kick-off meeting)

**Literature and Downloads:**

Slides of the course will be available in moodle. Additional Literature Recommendations:

- Kahle, T.; Meißner, D. (2020): All About Voice. Konzeption, Design und Vermarktung von Anwendungen für digitale Sprachassistenten. Freiburg: Haufe.
- Kreutzer, R. T. und Seyed Vousoghi, D. (2020): Voice-Marketing. Der Siegeszug der digitalen Sprachassistenten. Wiesbaden: Springer Gabler.
- Pearl, C. (2016): Designing Voice User Interfaces. Principles of Conversational Experiences. Sebastopol, CA: O'Reilly Media.
- Further literature will be provided during the course.

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## 2.2 Department of Electrical Engineering, Medical Engineering and Computer Science

### 2.2.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x		<a href="#">Communications Systems Lab</a>	Lecture	2	Lab Work
	x	<a href="#">Digital Signal Processing Lab</a>	Lecture	2	Lab Work
	x	<a href="#">Operating Systems</a>	Lecture	2	Written Exam
	x	<a href="#">Operating Systems Lab</a>	Lab	3	Lab Work
	x	<a href="#">Software Defined Radio</a>	Lecture	2	TBD

## 2.2.2 Course Descriptions

Communication Systems Lab	
Course ID:	EMI230
Level:	Bachelor
Course Type:	Lab
Semester Hours per Week:	2
Credits:	2
Host Semester:	El 3
Examination:	Lab Work
Module:	El-15 Grundlagen der Nachrichtentechnik
Location:	Campus Offenburg

### Lecturer(s):

Prof. Dr.-Ing. Stefan Pfletschinger

### Requirements:

None

### Objectives and Competences:

The participants understand the representation and transmission of information by analogue electrical signals. They are able to classify signals and understand basic modulation schemes in theory and practical application.

### Contents:

- Lab 1: Diodes for signal limitation
- Lab 2: Amplifier with transistors
- Lab 3: Power amplifier
- Lab 4: Oscillators
- Lab 5: Amplitude modulation
- Lab 6: Frequency modulation

### Literature and Downloads:

Provided in class

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Digital Signal Processing Lab	
Course ID	EMI241
Level	Bachelor
Course Type	Lab
Hours per Week	2
Credits	2
Host Semester	El 6
Examination	Lab Work
Module	El-21 Digitale Signalverarbeitung
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr.-Ing. Stefan Pfletschinger

**Requirements:**

None

**Objectives and Competences:**

TBD

**Contents:**

Lab experiments:

- Matlab applications
- Analog/Digital- and Digital/Analog conversion
- FFT
- Non-recursive (FIR-) filters
- Recursive (IIR) filters

**Literature and Downloads:**

Provided in class

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Operating Systems + Lab	
Course ID	EMI110 and EMI111
Level	Bachelor
Course Type	Lecture and Lab
Hours per Week	2 and 2
Credits	2 and 3
Host Semester	AI 2
Examination	Written Exam and Lab Work
Module	AI-07 Betriebssysteme
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Tobias Lauer

**Requirements:**

Procedural Programming

**Objectives and Competences:**

- Students learn to understand the role of the operating system as part of a system architecture. You know the basic terms, components and functions of an operating system
- Students become familiar with operating system problems and learn how to use solutions
- Through practical exercises the students are able to develop an application using operating system interfaces
- Students can use tools and utilities at the operating system level in a practical way

**Contents:**

- Architecture of computers and operating systems
- Principles and operating modes of operating systems forming the interfaces between hardware and software
- Synchronisation of processes and threads
- Memory, E/A, and file management
- Selected operating systems: Windows and Linux
- Optional lab: Windows und Linux

**Literature and Downloads:**

Provided in class

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Software Defined Radio	
Course ID	EMI865
Level	Bachelor
Course Type	Lab
Hours per Week	2
Credits	2
Host Semester	EI
Examination	Lab Work
Module	EI-37
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Pfletschinger

**Requirements:**

None

**Objectives and Competences:**

TBD

**Contents:**

In this course, a functional digital transmission system will be set up, going through the following subsections:

- Installation of the software and commissioning of the SDR transceiver
- Spectral analysis of existing signals
- Modulation and demodulation
- Synchronization on receiver side
- Transmission and detection of data

**Literature and Downloads:**

- B. Stewart, K. Barlee, D. Atkinson, L. Crockett, Software Defined Radio using Matlab and Simulink and the RTL-SDR. [www.desktopsdr.com](http://www.desktopsdr.com), 2015.
- T. F. Collins, R. Getz, D. Pu, A. M. Wyglinski, Software-Defined Radio for Engineers. Artech House, 2018.
- M. Rice, Digital Communications: A Discrete-Time Approach, Pearson, 2009.

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## 2.3 Department of Media

### 2.3.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x	x	<a href="#">Animation 1</a>	Seminar	4	Project Work
x	x	<a href="#">Animation 2</a>	Seminar	4	Project Work
x	x	<a href="#">Film 1</a>	Seminar	4	Project Work
x	x	<a href="#">Film 2</a>	Seminar	4	Project Work
	x	<a href="#">Security of Web Applications</a>	Lecture	2,5	Written Exam
	x	<a href="#">Security of Web Applications Lab</a>	Lecture	2,5	Lab Work
	x	<a href="#">Software Engineering</a>	Lecture	3	Written Exam
	x	<a href="#">Software Engineering Lab</a>	Lab	2	Lab Work

## 2.3.2 Course Descriptions

Animation 1 and 2	
Course ID	M+I261n and M+I262n
Level	Bachelor
Course Type	Hands-on Seminar with Team Work in Studios and Labs
Hours per Week	4
Credits	8
Host Semester	N/A
Examination	Project Work
Module	mgp-26
Location	Campus Offenburg

### Lecturer(s):

Prof. Götz Gruner

### Requirements:

Basic design-oriented courses

### Objectives and Competences:

Ability to develop and produce a media production, in this case animation, VFX and media art

### Contents:

- Screenplay, storyboard, conception of installations and performances
- Production of an animated film or a media art project

### Literature and Downloads:

Provided in class

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<b>Film 1 and 2</b>	
<b>Course ID</b>	M+I259n and M+I260n
<b>Level</b>	Bachelor
<b>Course Type</b>	Hands-on Seminar with Team Work in Studios and Labs
<b>Hours per Week</b>	4
<b>Credits</b>	8
<b>Host Semester</b>	N/A
<b>Examination</b>	Project Work
<b>Module</b>	Mgp-22
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Heiner Behring

**Requirements:**

Basic design - oriented courses

**Objectives and Competences:**

Ability to develop and produce a media production, in this case a short movie

**Contents:**

- Production of a short movie (in team of max 4 students)
- Development and writing of a screenplay
- Arranging and preparation of a media production
- Shooting and post production

**Literature and Downloads:**

Provided in class

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Security of Web Applications and Lab	
Course ID	M+I274 and M+I280
Level	Bachelor
Course Type	Lecture and Lab
Hours per Week	2.5 and 2.5
Credits	2.5 and 2.5
Host Semester	UNITS 4
Examination	Written Exam and Lab Work
Module	UNITS-30
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Dirk Westhoff

**Requirements:**

Familiarity with a procedural programming language and to understand Internet and World Wide Web technologies.

**Objectives and Competences:**

- To understand fundamental web-application attacks and to apply recommended countermeasures against such web-application attacks
- To be familiar with generic configuration means to harden a Web-Server

**Contents:**

- Client-Server architectures e.g. three tier architecture
- Fundamental attacks on Web-applications and Defacements
- Mobile code and security concepts of ActiveX, Java and PHP
- DoS resp. DDoS-attacks, Websecurity-Scanner
- Countermeasures against Webapplication attacks
- Basic security requirements for cloud security

**Literature and Downloads:**

Provided in class

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Software Engineering and Lab	
Course ID	M+I122 and M+I123
Level	Bachelor
Course Type	Lecture and Lab
Hours per Week	2 and 1
Credits	3 and 2
Host Semester	UNITS 2
Examination	Written Exam and Lab Work
Module	UNITS-30
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Dirk Westhoff

**Requirements:**

Familiarity with a procedural programming language and to understand Internet and World Wide Web technologies

**Objectives and Competences:**

TBD

**Contents:**

- Lecture 1: Basic History of the Software Engineering Discipline
- Lecture 2: Requirements Engineering
- Lecture 3/4: UML-based Design
- Lecture 5: Coding – Best Practices
- Lecture 6: Testing Software
- Lecture 7: Different Development Approaches
- Lecture 8: Motivating a secure Development Lifecycle
- Lecture 9: Secure Programming
- Lecture 10: Static Code Analysis
- Lecture 11: CVSS-based Vulnerability Analysis
- Lecture 12: Selected reading of very recent (and very old „test of time“) papers

**Literature and Downloads:**

- Sommerville, I. „Software Engineering (10th Edition)“
- Martin, R. „Clean Code“
- Martin, R. „Clean Architecture“
- Brooks, F. „The Mythical Man-Month: Essays on Software Engineering“
- Fowler, M. „UML Distilled“
- <https://mi-learning.mi.hs-offenburg.de/SWE/> (in German)
- Any material mentioned in the lecture (e.g. Online Secure Coding Guidelines for C/C++)

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## 2.4 Department of Mechanical and Process Engineering

### 2.4.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x	x	<a href="#">Basics CAD</a>	Lab	3	Lab Work
x		<a href="#">Chemistry Lab</a>	Lab	1	Lab Work
	x	<a href="#">Fluid Mechanics</a>	Lecture	5	Written Exam
	x	<a href="#">Innovative Design and Inventive Problem-Solving</a>	Seminar		
x		<a href="#">Materials Engineering Lab</a>	Lab	3	Lab Work
x		<a href="#">Mechanical Process Engineering Lab</a>	Lab	2	Lab Work
	x	<a href="#">Thermodynamics II - Engines and Machines with Lab</a>	Lecture + Lab	5	Written Exam + Lab Work



## 2.4.2 Course Descriptions

Basic Computer Aided Design (CAD)	
Course ID	M+V823
Level	Bachelor
Course Type	Lab
Hours per Week	2
Credits	3
Host Semester	MA2
Examination	Lab Work
Module	MA-06: Dokumentation (Technical Documentation)
Location	Campus Offenburg

### Lecturer(s):

Prof. Dr. Christian Wetzel

### Requirements:

- Interest in interdisciplinary work
- Basic knowledge in designing and dimensioning simple machine elements in accordance with stress, production and material requirements

### Objectives and Competences:

- Ability to use a common CAD program, have an overview of the areas of use of CAD systems, and to understand the importance of CAD systems for product design and the flow of business information
- Acquisition of basic knowledge of general methods and working techniques for 3D modelling and design of components, assemblies, definition of standard parts and the derivation of production drawings with 3D CAD systems
- Capability to independently model and visualize simple components and assemblies with a CAD system and to generate technical drawings from them

### Contents:

- Introduction to working with 3D-CAD systems and system basics: function structure and structure of CAD systems, user interface, view manager, model information
- Basic construction elements and model references: coordinate systems, reference planes and axes
- Sketching and sketching methodology: creation, dimensioning and conditions of sketches
- Modelling and machining of components: profile and rotating bodies, drawn parts, composite bodies, rounding and chamfers, bores and threads, ribs, pattern creation, copying, mirroring and moving of construction elements, surface modelling, model adjustments, use of standard part libraries
- Assembly modelling: installation, replacement and adaptation of components, design of assembly structure, skeleton models, assembly information
- Drawing derivation from the 3D model: drawing settings, derivation of assembly drawings and individual part drawings in accordance with standards, generation of model views, dimensioning, deviations in shape and position, surface details, fits, creation of parts lists

### Literature and Downloads:

- Sham Tickoo: PTC Creo Parametric 4.0 for Designers, CADCIM Technologies; e-book, 4<sup>th</sup> ed. 2017.
- Köhler P (ed.): Pro/ENGINEER Praktikum. Einführende und fortgeschrittene Arbeitstechniken der parametrischen 3D-Konstruktion mit Wildfire 5.0. 5. Auflage, Wiesbaden: Vieweg + Teubner Verlag, 2010.
- Wyndorps P.: 3D-Konstruktion mit Pro/ENGINEER Wildfire 5.0. 5. Auflage, Europa-Lehrmittel Verlag, 2010.
- Hoischen H.: Technisches Zeichnen. 32. Auflage, Berlin: Cornelsen-Verlag, 2009

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<b>Chemistry Lab</b>	
<b>Course ID:</b>	M+V681
<b>Level:</b>	Bachelor
<b>Course Type:</b>	Lab
<b>Semester Hours per Week:</b>	1
<b>Credits:</b>	1
<b>Host Semester:</b>	N/A
<b>Examination:</b>	Lab Work
<b>Module:</b>	ES-02: Werkstoffe
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. habil Wolfgang Bessler

**Requirements:**

None

**Objectives and Competencies:**

The participants have knowledge in the basics of general chemistry. They are familiar with the structure and properties of substances, as well as with the properties of chemical reactions. In particular, they have knowledge of the chemical fundamentals of energy system technology, i. e. chemical energy conversion and chemical energy storage.

**Contents:**

Basic chemical operations handling of typical laboratory equipment:

- Chemical balance
- Solubility product
- Redox reactions
- Reaction speed and homogeneous catalysis
- Preparation of a defined solution by weighing and dilution
- Flame dyeing

**Literature and Downloads:**

- Chemie; Mortimer, C., Müller, U.; Thieme Verlag, 2007, ISBN 9783134843088.
- Chemie verstehen; Wawra, E., Dolznig, H., Müllner, E.; UTB, 2005, ISBN 9783825282059.

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Fluid Mechanics	
Course ID	M+V819
Level	Bachelor
Course Type	Lecture
Hours per Week	4
Credits	5
Host Semester	BT4
Examination	Written Exam
Module	BT-15 Anwendungsorientiertes Englisch
Location	Campus Offenburg

#### Lecturer(s):

Prof. Dr.-Ing. Andreas Schneider

#### Requirements:

Physics, technical mechanics I (statics)

#### Objectives and Competences:

Flowing gases and liquids constitute the basis of countless processes in energy technology, chemical and biotechnological processes, in the raw material, food, pharmaceutical and many other industries. Fluid mechanics deals with the states and motion of fluids, i.e. compressible gases and (almost) incompressible liquids, due to the forces acting on them, e.g. weight, centrifugal, pressure and frictional forces.

Understanding the principles of fluid mechanics is therefore essential for many engineers. The students are enabled to use this knowledge in the design of apparatuses and the planning of processes. In addition, there are general approaches in the engineering sciences, illustrated by special fluid mechanics tasks, such as the importance of and working with dimensionless key figures, and responsible working in groups.

#### Contents:

- Basics: Density and viscosity of fluids, definition of fluids vs solids, fluid statics, capillary effects
- Fluid kinematics: streamlines, continuity equation, flow potential
- Flow of ideal liquids: Navier-Stokes-, Euler-, and Bernoulli equations, vortices, momentum balance
- Fluid kinetics: Similarity laws, Reynolds number, laminar and turbulent flow, boundary layer theory
- Real liquid flow, hydraulic losses
- Introduction to gas dynamics: conservation of mass, Euler equation, Laval nozzle, sonic speed

#### Literature and Downloads:

- Course handout and exercises, downloads from Moodle.
- Çengel, Y.A. and Cimbala, J.M.: Fluid mechanics - Fundamentals and Applications, McGraw Hill, 4th ed. 2018, ISBN 978-1-259-69653-4 (university library)
- Kundu, P.K., Cohen, I.M., Dowling, D.R.: Fluid Mechanics, 5th ed. 2012, Elsevier, ISBN 978-0-12-382100-3, (university library)
- Elger, D.F, Williams, B.C., Crowe, C.T. and Roberson J.A.: Engineering Fluid Mechanics (international student version), 10th ed. 2014, John Wiley, (university library)
- Schobeiri, M.T.: Applied Fluid Mechanics for Engineers, 1st ed. 2014, MacGraw Hill, ISBN 978-0071800044, (university library)
- Song, H.: Engineering Fluid Mechanics, Springer 2018, ISBN 978-981-13-0173-5 (e-book, access via university network)
- Darby, R and Chhabra, R.P.: Chemical engineering fluid mechanics, CRC Press 2017 (e-book, access via university network)

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<b>Innovative Design and Inventive Problem Solving</b>	
<b>Course ID</b>	M+V712
<b>Level</b>	Bachelor
<b>Course Type</b>	Seminar, exercises, semester thesis in teamwork
<b>Hours per Week</b>	2
<b>Credits</b>	2
<b>Host Semester</b>	Spring
<b>Examination</b>	Presentation of the semester thesis / with individual grading
<b>Module</b>	MA-29
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Pavel Livotov

**Contents:**

Learning method: seminar, exercises, semester thesis in teamwork

Examination: presentation of the semester thesis / with individual grading

**Summary**

The universal Advanced Innovation Design Approach (AIDA) taught in the course, is based on the Theory of Inventive Problem Solving (TRIZ) and allows to enhance the productivity and efficiency of idea generation.

Through numerous examples and exercises, the course participants will learn to solve inventive problems systematically. In a semester thesis, the students are given an opportunity to apply the gained skills for a problem of their choice in a teamwork.

**Course content:**

1. Introduction to the Advanced Innovation Design Approach: identification of business opportunities and market needs, formulation and ranking of inventive problems, idea generation, new concept development and optimization.
2. Introduction to the TRIZ methodology of inventive problem solving: basic principles and main inventive methods.
3. Enhancement of personal creativity. Systematic contradiction-oriented way of thinking. Talented thinking with the System Operator (Multi-Screen Analysis). Rapid CrossIndustry Innovation tool.
4. New product development and problem solving with help of contradiction analysis and TRIZ inventive principles and technological effects.
5. Solving of difficult problems. Short form of inventive algorithm ARIZ, identification of physical contradictions and their resolving with separation principles.
6. Anticipatory failure identification: analysis of failures which happen for no apparent reason; prediction of potential failure scenarios for new products or processes.
7. Prediction of future technical product features with evolution patterns of technical systems.

**Literature and Downloads:**

Livotov, P., TRIZ Innovation Technology. Product Development and Inventive Problem Solving. Handbook, TriS Europe, Berlin, 2013

VDI Standard 4521 (2016), Inventive problem Solving with TRIZ. Fundamentals, terms and definitions, Beuth publishers, Duesseldorf, Germany, 2016-2019

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Materials Engineering Lab	
<b>Course ID:</b>	M+V703
<b>Level:</b>	Bachelor
<b>Course Type:</b>	Lab
<b>Semester Hours per Week:</b>	3
<b>Credits:</b>	3
<b>Host Semester:</b>	MA 3
<b>Examination:</b>	Lab Work
<b>Module:</b>	MA-16: Schweißtechnik
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Dipl.-Ing. Dietmar Kohler

**Requirements:**

Theoretical knowledge in materials science and in welding techniques.

**Objectives of the course:**

The students are capable of critically assessing and applying the individual welding and thermal cutting processes, taking into account the design and material specifications.

**Contents:**

Possible topics in seminar:

- Comparison of plastic and metal materials
- Classification of polymers
- Assembly of polymers: structure and behavior
- Manufacturing polymers: Methods and properties
- Plastic materials: Influence of intermolecular physical bondings; effect of additives
- Mechanical and thermal behavior, heat resistant polymers
- Properties and special processing methods of selected plastic materials

Laboratory tests:

- Identification of thermoplastic materials
- Measurement of tensile strength
- Measurement of melting flow Index
- Measurement of impact resistance

**Literature and Downloads:**

Lab test instructions

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Measurement and Control Engineering with Lab	
Course ID	M+V828
Level	Bachelor
Course Type	Lecture and Lab
Hours per Week	5
Credits	7
Host Semester	MA6
Examination	Written Exam and Lab Work
Module	MA-24: Mess- und Regelungstechnik
Location	Campus Offenburg

#### Lecturer(s):

Prof. Dr.-Ing. Rainer Gasper

#### Requirements:

Mathematics, electrical engineering, physics, mechanics, fluid dynamics, thermodynamics, machine elements & design

#### Objectives of the course:

The students are able to analyse complex systems in mechanical engineering and split them into subsystems exchanging signals. They understand the signal as a physical quantity e.g. displacement, force or temperature. They are able to describe simple linear systems mathematically and analyse simple systems. The students have the abstraction capability to estimate the behaviour of non-linear systems and to simulate and analyse them numerically.

They know simple controls and are able to adjust the parameters of those. They recognize critical systems regarding stability and can apply measures to improve stability. The students can familiarise with common measurement methods and can determine their usability.

#### Contents:

- System / signal / transfer function
- Complex numbers, Bode plot, root locus
- Laplace transformation
- Frequency response / illustration of combined systems
- Principal transfer functions
- Symbols in EMSR technology
- Synthesis of control circles
- Analytic and empirical design rules
- Stability of systems

#### Literature and Downloads:

- Palm, W.: "System Dynamics" (textbook), 3rd ed., Mc Graw Hill, 2014, ISBN-13: 978-0073398068.
- Ogata, K.: "System Dynamics", 4th ed., Prentice-Hall Publishing, 2004, ISBN-13: 978-0131424623 (hard cover), 978-8131709344 (paperback).
- Ogata, K.: Modern Control Engineering, 5th ed., Prentice Hall, 2009 (hardcopy) and Pearson, 2010 (paperback).
- Beckwith, T.G., Marangoni, R.D., Lienhard, J.H.: Mechanical Measurements, 6th ed., Pearson Prentice Hall, 2007, ISBN-13: 978-0201847659.
- Aström, K.J, Murray, R.M.: Feedback Systems - An Introduction for Scientists and Engineers, Princeton University Press, 2008ff free downloads: [www.cds.caltech.edu/~murray/books/AM05/pdf/am08-complete\\_22Feb09.pdf](http://www.cds.caltech.edu/~murray/books/AM05/pdf/am08-complete_22Feb09.pdf), [www.cds.caltech.edu/~murray/books/AM08/pdf/am08-complete\\_28Sep12.pdf](http://www.cds.caltech.edu/~murray/books/AM08/pdf/am08-complete_28Sep12.pdf), additional material: [www.cds.caltech.edu/~murray/wiki/index.php?title=CDS\\_101/110,\\_Fall\\_2015Lab](http://www.cds.caltech.edu/~murray/wiki/index.php?title=CDS_101/110,_Fall_2015Lab) Instructions.

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<b>Mechanical Process Engineering Lab</b>	
<b>Course ID</b>	M+V472
<b>Level</b>	Bachelor
<b>Course Type</b>	Lab
<b>Semester Hours per Week</b>	2
<b>Credits</b>	2
<b>Host Semester</b>	N/A
<b>Examination</b>	Lab Work
<b>Module</b>	BT-24 Mechanische Verfahrenstechnik
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Schneider

**Requirements:**

Good theoretical knowledge in mechanical process engineering, documented for example by a successful exam

**Objectives of the course:**

The students' theoretical knowledge is consolidated by means of laboratory tests.

**Contents:**

Choice of experiments:

- Viscosity measurement
- Particle size reduction and particle size distribution measurement
- Piping technology
- Free fall velocities and settling velocities of particles
- Mixing time measurement in stirred tanks
- Mass transfer rate measurement in stirred tanks
- Scale-up in liquid mixing
- Cake-forming filtration
- Fluidized bed technology



Particle Falling Velocity Column



Stirred Tanks (3 and 30 Litres)

**Literature and Downloads:**

- Lab test instructions, downloads from university "moodle" course
- EKATO Rühr- und Mischtechnik GmbH; Handbook of Mixing Technology; Schopfheim, 1991
- Mota, M. et al; Effect of real particles packing with large size ratio on porosity and tortuosity of filter bed; Proceedings of 9<sup>th</sup> World Filtration Congress, New Orleans, USA, 2004
- DIN 1342, Viscosity. Part 1: Rheological Terms, Part 2: Newtonian Liquids; Beuth 1983/86 (in German)
- DIN 53 018, parts 1 and 2; Measurement of the dynamic viscosity of Newtonian Liquids with Rotational Viscometers; Beuth-Verlag, Berlin, 1976 (in German)
- DIN 53 019, part 1; Measurement of Viscosity and Flow Curves with Rotational Viscometers with Standardized Geometry; Beuth-Verlag, Berlin, 1980 (in German)

- DIN ISO 9276-1:2004-09: Representation of results of particle size analysis - Part 1: Graphical representation, Beuth-Verlag (until 2002: DIN 66141) (available in German and English)
- DIN 66145 Graphical representation of particle size distributions; Beuth 2004 (available in German and English)

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Thermodynamics 2 – Engines and Machines with Lab	
Course ID	M+V826
Level	Bachelor
Course Type	Lecture and Lab
Hours per Week	4
Credits	5
Host Semester	MA6
Examination	Written Exam and Lab Work
Module	MA-23: Kraft- und Arbeitsmaschinen mit Labor
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Treffinger

**Requirements:**

- Higher mathematics and physics
- It is recommended to also attend the associated course “Thermodynamics I - Technical Thermodynamics”

**Objectives of the Course:**

The students know the classification of engines and machines and are able to choose a machine suitable for a specific task with emphasis on energy efficiency.

**Contents:**

- Classification of Engines and Machines
- Energy Balances
- Basics of Fluid Machines: Classification and structure, Euler hydrostatical law, scaling of fluid machines
- Hydraulic Fluid Machines: System / plant integration, types of impellers of e.g. a water turbine, design and control of Kaplan, Francis, and Pelton turbine, dimensionless identifiers and Cordier diagram, centrifugal pumps
- Thermal Turbomachinery: Classification, steam turbine as an example for a multistage turbine, gas turbine
- Displacement Machines: Basics, example of a reciprocating piston compressor
- Combustion Engines: Thermodynamics of combustion engines, selected aspects

**Literature and Downloads:**

- Carravetta, A., Derakhshan Horeh, S., Ramos, H.M.: Pumps as Turbines - Fundamentals and Applications, Springer, 2018, ISBN 978-3-319-67507-7 (e-book, access via university network).
- Brennen, C.E.: Hydrodynamics of pumps, Cambridge University Press, 2011, (e-book, access via university network).

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### 3 Master Courses

#### 3.1 Faculty Business and Industrial Engineering

##### 3.1.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
	x	<a href="#">Business Analytics</a>	Seminar	3	Project Work
x		<a href="#">Decision Making</a>	Lecture	3	Written Exam
	x	<a href="#">Digital Pricing Strategies</a>	Seminar	3	Project Work
x	x	<a href="#">Economic Policy</a>	Seminar	6	Term Paper
	x	<a href="#">Global Business Project</a>	Seminar	3	Project Work
x		<a href="#">International Economic Law – Turnaround Management</a>	Lecture	2,5	Written Exam
	x	<a href="#">International Finance Management</a>	Lecture	3	Written Exam
	x	<a href="#">Leadership - Leading People and Organizations</a>	Seminar	3	Project Work
x		<a href="#">Strategic Information Management and Decision Making</a>	Seminar	3	Written Exam
	x	<a href="#">Strategic International Marketing</a>	Seminar	3	Project Work
	x	<a href="#">Technical Logistics Seminar</a>	Seminar	6	Project Work

### 3.1.2 Course Descriptions

Business Analytics	
Course ID	IBC-08-02
Level	Master
Course Type	Seminar
Hours per Week	3
Credits	3
Host Semester	IBC
Examination	Project Work
Module	IBC-08 Business Information Systems
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Hagen

**Requirements:**

None

**Objectives of the Course:**

Students will understand the value of Business Analytics and data related techniques. Students can make practical use of business intelligence tools in their professional life as a consultant.

**Contents:**

The course covers theory and practice of business analytics:

- Chapter I:  
Introduction to Data Warehouse Systems and Business Intelligence, Architecture and components of DW-systems, data modelling in DW-systems, Online Analytical processing, dashboards.
- Chapter II:  
Implementation of a case study in the DW- system SAP BWä. Students use BI tools to analyse sales data, they create analytical reports and implement a dashboard for sales analytics.
- Chapter III:  
Introduction to Big Data, Data Science and Data Mining.

**Literature and Downloads:**

- Instructor provides case study material.
- Sabherwal, R., Becerra-Fernandez I. Business Intelligence: Practices, Technologies, & Management, 2011.
- Provost, F., Fawcett, T.: Data Science for Business, O'Reilly 2013.

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Decision Making	
Course ID	B+W1153
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	BWM
Examination	Written Exam
Module	BWM-02 Decision Making
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Graumann

**Requirements:**

Basic knowledge of business administration

**Objectives of the Course:**

By the end of the course, the students will have understood the concept of procedural rationality. They should be able to pass consciously through the phases of a decision making process while making use of the methodological recommendations of decision analysis.

**Contents:**

Everybody makes numerous decisions each and every day. Many of them are of minor importance, but some decisions require serious consideration. The course will teach students how to tackle these decisions. The concept is called Rational Decision Making. It is based on a model of a decision making process with seven phases. The course will highlight each and every phase and will then proceed with case studies. Thus, students will have the opportunity to apply their new knowledge to cases of practical decision making.

**Literature and Downloads:**

- Eisenführ, F. / Weber, M. / Langer, Th.: Rational Decision Making, Berlin et al. 2010.
- Edwards, W. / Miles Jr., R.F. / von Winterfeld, D. (Edts.): Advances in Decision Analysis. Cambridge et al. 2007.
- Keeney, R.L.: Value-Focused Thinking. Cambridge et al. 1996.

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Digital Pricing Strategies	
Course ID	B+W1148W
Level	Master
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BWM
Examination	Project Work
Module	BWM-05 Electives
Location	Gengenbach

**Lecturer(s):**

Mr. Max Bonn (Guest Lecturer)

**Requirements:**

Marketing, General Business Administration

**Objectives of the Course:**

- Understanding the importance of pricing and how it effects sales and profitability?
- Understanding the components of a pricing framework and how it can be applied to real business situations.
- Understanding the impact of digitalization on pricing and what additional considerations are needed when pricing in a digital context (digital products and digitalsales channels)
- Being able to design a digital pricing concept for a given case.

**Contents:**

Pricing Essentials:

- Why is Pricing such an important component in the marketing mix and how does it affect sales and profitability
- What are the main components of a comprehensive pricing framework?
- Price Strategy: How to design a pricing strategy that helps to achieve the strategic objectives of the overarching business strategy?
- Price Setting: How can we align the price to the value of the product?
- Price Differentiation & Dynamic Pricing: How can we optimize our yield by charging different prices for the same product?
- Price Getting: How can we consider the value of the customer?
- Pricing Psychology: How can we utilize psychological effects to optimize profit and sales?
- Pricing Enablers: What are the technical and organizational requirements to anchor and execute a pricing strategy?

Pricing in the digital world:

- The effects of digitalization on pricing?
- Pricing strategies for digital sales channels
- Pricing strategies for digital products
- The Revenue Models as a part of a digital business Model

**Literature and Downloads:**

- Tien Tzudo: Subscribed.
- Hermann Simon & Martin Fassnacht: Price Management.

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Economic Policy	
Course ID	B+W1007W
Level	Master
Course Type	Seminar
Hours per Week	4
Credits	6
Host Semester	BWM
Examination	Term Paper
Module	BWM-05 Electives
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Eudelle

**Requirements:**

None

**Objectives of the Course:**

The students will gain an understanding about the impact of governmental economic protection.

**Contents:**

Exemplarily some current topics:

- Definition of economic policies, Interventions of the state in economic affairs
- Objectives of economic affairs: stability objective, growth objective, structural objective, allocation objective
- Current issues of economic policies: good balance of governmental intervention, benefit and limits of growth

**Literature and Downloads:**

Provided in class

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Global Business Project	
Course ID	B+W1157
Level	Master
Course Type	Seminar
Hours per Week	2.0
Credits	3 Credits
Host Semester	BWM
Examination	Project Work
Module	BWM-04 Global Business
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Klasen

**Requirements:**

None

**Objectives of the Course:**

As part of a project work, students demonstrate their abilities to analyse challenges for companies in the global economy. This includes an understanding of the importance of globalisation as well as differences between industrialised and developing countries. Students learn to analyse competitors and to position companies in a competitive environment. They also develop international marketing entry strategies, e.g. by means of export or foreign direct investment. They are familiar with structures and organisation of international companies, as well as methods for the implementation of decision-making processes regarding R&D, production and marketing. Students have mastered basic models for solving problems in human resource development and leadership in an international context. In addition to methodical skills, the project work also strengthens students' social skills.

**Contents:**

Exemplarily some current topics:

- Definition of economic policies, Interventions of the state in economic affairs
- Objectives of economic affairs: stability objective, growth objective, structural objective, allocation objective
- Current issues of economic policies: good balance of governmental intervention, benefit and limits of growth

**Literature and Downloads:**

- Cavusgil, S.T., Ghauri, P.N. and Akcal, A.A.(2012) Doing Business in Emerging Markets. London: Sage.
- Hill, C.W.L. (2014) International Business. Maidenhead: McGraw.
- Holtbrügge, D. and Welge, M. (2010) Internationales Management. Stuttgart: Schäffer-Poeschel.
- Klasen, A. and Bannert, F. (2015) The Future of Foreign Trade Support. Durham: Global Policy and Wiley.

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Global Business Project	
Course ID	B+W1157
Level	Master
Course Type	Seminar
Hours per Week	2.0
Credits	3 Credits
Host Semester	BWM
Examination	Project Work
Module	BWM-04 Global Business
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Klasen

**Requirements:**

None

**Objectives of the Course:**

As part of a project work, students demonstrate their abilities to analyse challenges for companies in the global economy. This includes an understanding of the importance of globalisation as well as differences between industrialised and developing countries. Students learn to analyse competitors and to position companies in a competitive environment. They also develop international marketing entry strategies, e.g. by means of export or foreign direct investment. They are familiar with structures and organisation of international companies, as well as methods for the implementation of decision-making processes regarding R&D, production and marketing. Students have mastered basic models for solving problems in human resource development and leadership in an international context. In addition to methodical skills, the project work also strengthens students' social skills.

**Contents:**

Exemplarily some current topics:

- Definition of economic policies, Interventions of the state in economic affairs
- Objectives of economic affairs: stability objective, growth objective, structural objective, allocation objective
- Current issues of economic policies: good balance of governmental intervention, benefit and limits of growth

**Literature and Downloads:**

- Cavusgil, S.T., Ghauri, P.N. and Akcal, A.A.(2012) Doing Business in Emerging Markets. London: Sage.
- Hill, C.W.L. (2014) International Business. Maidenhead: McGraw.
- Holtbrügge, D. and Welge, M. (2010) Internationales Management. Stuttgart: Schäffer-Poeschel.
- Klasen, A. and Bannert, F. (2015) The Future of Foreign Trade Support. Durham: Global Policy and Wiley.

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International Economic Law – Turnaround Management	
Course ID	IBC-07-01
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	2,5
Host Semester	
Examination	Written Exam
Module	IBC-07
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Klasen

**Requirements:**

None

**Objectives of the Course:**

**Contents:**

**Literature and Downloads:**

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Leadership – Leading People and Organizations	
Course ID	B+W1147W
Level	Master
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BWM
Examination	Project Work
Module	BWM-05 Electives
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Adrian Bekman (Guest Lecturer)

**Requirements:**

Basics of General Business Administration / Business Organizations

**Objectives of the Course:**

- The students will have a clear insight in leadership concepts and key qualities
- The students will be better able to lead themselves and their processes
- The students experienced the key leadership competences in organizational context
- The students developed a personal vision on leadership

**Contents:**

- Key qualities of leadership
- Methodology of the social evidential: dealing with questions
- Process, dialogue, biography: man and organization
- Judgement-building and decision-making
- 7 leadership exercises to experience the methodology
- The art of conscious creation
- Self-leadership
- Key leadership concepts
- The process organization

**Literature and Downloads:**

- Adriaan Bekman: Horizontal Leadership. Alert Verlag Berlin
- Adriaan Bekman: The mystery of leadership Alert Verlag Berlin
- Adriaan Bekman: The art of conscious living Alert verlag Berlin

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Strategic Information Management and Decision Making	
Course ID	B+W1315
Level	Master
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BWM
Examination	Written Exam
Module	BWM-01 Unternehmensführung
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Klasen

**Requirements:**

None

**Objectives of the Course:**

This module aims to develop student skills to apply strategic information management concepts in support of business objectives. It enables participants to understand the principles of data, information and knowledge and their lifecycle necessary to drive and support business capability. It also helps to critically assess the strategic use of information, systems and tools, as well as techniques necessary to optimise information use in business processes. In addition, the module aims to develop students' understanding of the roles, strengths and weaknesses of different types of analytical models to support management decision-making. Participants will be able to produce solutions to practical decision-making, planning, control and performance evaluation scenarios by applying management concepts and techniques.

**Contents:**

- Foundations
- The strategic role and nature of information
- Strategic information management projects
- Implementing information management strategy
- Decision-making strategies and objectives
- Analytical models and problem-structuring for decision-making

**Literature and Downloads:**

- Brocke, J. vom and Rosemann, M. (ed.) (2015). Handbook on Business Process Management 2. Heidelberg: Springer.
- Eisenführ, F., Weber, M. and Langer, T. (2010). Rational Decision Making. Heidelberg: Springer.
- Galliers, R.D. (2009). Strategic Information Management. New York: Routledge.
- Obermaier, R. and Saliger, E. (2013). Betriebswirtschaftliche Entscheidungstheorie. München: Oldenbourg.

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Strategic International Marketing	
Course ID	B+W1033W
Level	Master
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	BWM
Examination	Project Work
Module	BWM-05 Electives
Location	Gengenbach

**Lecturer(s):**

Mr. Daniel Otte (Guest Lecturer)

**Requirements:**

Marketing lecture

**Objectives of the Course:**

By the end of the lecture students are able to

- Analyze and evaluate the attractiveness and structure of international markets
- Prioritize and choose markets to be entered
- Determine a market-entry strategy
- Design a suitable marketing mix for a foreign market

**Contents:**

The lecture sets the topic of entering foreign markets into perspective and then follows a 3-step approach starting with market analysis, followed by strategies in international marketing und then leading to go-to-market considerations (international marketing mix). It is designed to provide an understanding of what role international markets play for a corporation and how to better understand markets as well as their respective consumers in an international context. The lecture builds on existing knowledge of the marketing mix and puts the elements in an international context. It provides students with a holistic understanding of how to better understand and evaluate markets for a corporation, how to prioritize and choose foreign markets to be entered and how to design a suitable market-entry strategy.

The central focus is set upon:

- How to evaluate a foreign market
- Market choice and market entry strategy
- Go-to-market (marketing mix in the international context)

**Literature and Downloads:**

Slides of the course “Strategic International Marketing” are available in moodle. Additional Literature Recommendations:

- Becker, J. (2019): Marketing-Konzeption, 11. Auflage, München.
- Kotler, P. /Armstrong, G. (2015): Principles of Marketing, 16thedition.
- Homburg, C. (2016): Marketingmanagement, 6. Auflage, Wiesbaden.
- Bruhn, M. (2019): Marketing, 14. Auflage, Wiesbaden.
- Meffert et al (2015): Marketing, 12. Auflage, Wiesbaden.
- Simon, H. / Fassnacht, M. (2019): Price Management, 1stedition, Berlin.

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Technical Logistics Seminar	
Course ID	B+W1170
Level	Master
Course Type	Seminar
Hours per Week	4
Credits	6
Host Semester	BWM
Examination	Project Work
Module	BWM-15 Operations Executions
Location	Gengenbach

**Lecturer(s):**

Prof. Dr. Dittrich

**Requirements:**

None

**Objectives of the Course:**

TBD

**Contents:**

Project work (over both teaching terms) in teams to strengthen the ability to work in a team and to achieve a span over previously practised individual sequences on a more comprehensive topic; presentation and defence of the results at the end of the semester.

**Literature and Downloads:**

The literature is largely case- and exercise-related and will be mentioned in the course of the seminar or researched by the students themselves as an exercise.

Exercise script on the intranet of the Offenburg University of Applied Sciences (Moodle).

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## 3.2 Department of Electrical Engineering, Medical Engineering and Computer Science

### 3.2.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
	x	<a href="#">Advanced Digital Signal Processing</a>	Lecture	4	Written Exam
	x	<a href="#">Advanced Channel Coding</a>	Lecture	3	Written Exam
x		<a href="#">Automotive Radar</a>			
x		<a href="#">Computer Networks</a>	Lecture	3	Written Exam
	x	<a href="#">Computer Vision</a>	Lecture + Lab	4	Written Exam + Lab Work
x		<a href="#">Digital Communications with Lab</a>	Lecture	3	Written Exam
x		<a href="#">Digital Signal Processing (DSP) Lab</a>	Lab	1	Lab Work
x		<a href="#">Digital Signals and Systems</a>	Lecture	3	Written Exam
	x	<a href="#">Embedded and Industrial Networks</a>	Lecture	2	Written Exam
	x	<a href="#">Embedded and Industrial Networks Lab</a>	Lab	3	Lab Work
	x	<a href="#">Guided Wave Theory</a>	Lecture	5	Written Exam
x		<a href="#">Information Theory and Coding</a>	Lecture	3	Written Exam
x		<a href="#">Microwave Lab</a>	Lab	2	Lab Work
x		<a href="#">Internet of Things</a>	Lecture	2	Presentation
	x	<a href="#">Power Electronics</a>	Lecture	4	Written Exam
	x	<a href="#">Renewable Energy Systems</a>	Lecture	3	Written Exam
	x	<a href="#">Renewable Energy Systems Lab</a>	Lab	2	Lab Work
x		<a href="#">Statistical Signal Processing and Information Theory</a>	Lecture	2	Written Exam
	x	<a href="#">Telecommunication Networks</a>	Lecture	3	Written Exam

### 3.2.2 Course Descriptions

Advanced Digital Signal Processing	
Course ID	EMI414
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	4
Host Semester	CME
Examination	Written Exam
Module	CME-07 Advanced Digital Signal Processing
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Werner Reich

**Requirements:**

- Basics of continuous-time and discrete-time signals and systems (impulse response, step response, frequency response)
- Fourier Series, Fourier Transformation, Laplace Transformation, z-Transformation
- Lecture "Digital Signals and Systems"

**Objectives of the Course:**

- Profound knowledge of digital signal processing systems
- Ability to implement modern signal processing concepts

**Contents:**

- Transform Analysis of Linear Time-Invariant Systems: Frequency Response Components, All-Pass Filters, Minimum-Phase Systems.
- IIR Filter Design: Approximation of Differential Equation, Impulse and Step Invariance Design, Bilinear Transformation.
- IIR Filter Structures: Noncanonical and Canonical Direct Form, Transposed Direct Form, Parallel Form, Cascade Form. Finite Precision Numerical Effects.
- FIR Filter Design Techniques: Fourier Approximation, Windowing, Optimum Equiripple Approximation.
- Discrete Fourier Transform (DFT): Linear and Circular Convolution, Fast Fourier Transform (FFT) Algorithms.
- Multirate Processing: Downsampling, Decimation Filter, Upsampling, Interpolation Filter.
- Adaptive Signal Processing: Configuration in different Applications, Optimum Filter, Least-Mean-Squares Algorithm.

**Literature and Downloads:**

- Oppenheim, Alan V.; Schaffer, Ronald W.: Discrete-Time Signal Processing. Pearson, 2013.

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Advanced Channel Coding	
Course ID	EMI406
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	CME
Examination	Written Exam
Module	CME-04 Digital Communications
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Tobias Felhauer

**Requirements:**

**Objectives of the Course:**

**Contents:**

Introduction:

- Coding; Types of Coding; Modelling of noisy Digital Communication Channels; Coding Gain
- Information Theoretical Analysis of a Communication Link
- Digital Communication System Model; Information Measures; Entropy and Redundancy, Equivocation, Irrelevance and Transinformation of a Communication Link; Channel Capacity; Examples

Error Protection Coding (FEC)

- General error protection strategies, Types and Capabilities of Linear Codes; Boundaries of Linear Codes
- Mechanisation of Coding and Decoding of linear Block Codes
- Special linear block codes: Hamming Codes, Simplex Codes, Reed-Muller Codes, cyclic block codes, Reed-Solomon (RS)

Codes; Bose-Chaudhuri-Hocquenghem (BCH) Codes

- Error Protection Coding for burst error channels: CRC-Codes, Fire-Codes, Interleaving
- Convolutional Coding: Description of convolutional Codes (Tree-, State- and Trellis-Diagram);
- Characteristics of convolutional Codes (minimum free distance, catastrophic error propagation etc.); ML-Decoding Principle (hard/soft decision Viterbi decoding); puncturing

Advanced Error Protection Coding

- Concatenated Coding:
  - serial concatenated coding (Product Codes)
  - parallel concatenated Coding (Turbo Codes)
- Low-density parity-check codes (LDPC - Gallager-Codes)

**Literature and Downloads:**

- J. G. Proakis: Digital Communications. McGraw-Hill, New York, 2007.
- D. Declercq et al.: Channel Coding: Theory, Algorithms, and Applications: Academic Press, 2014.

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Automotive Radar	
Course ID:	MK 8078, EI 7985, EP 7460, EPplus 7500
Level:	Bachelor + Master
Course Type:	Lecture
Semester Hours per Week:	2
Credits:	2
Host Semester:	EIM
Examination:	Written Exam
Module:	Electives
Location:	Campus Offenburg

#### Lecturer(s):

Prof. Dr.-Ing. Marlene Harter

#### Requirements:

- Basic knowledge in signal processing
- Basic knowledge in high-frequency but not strictly required

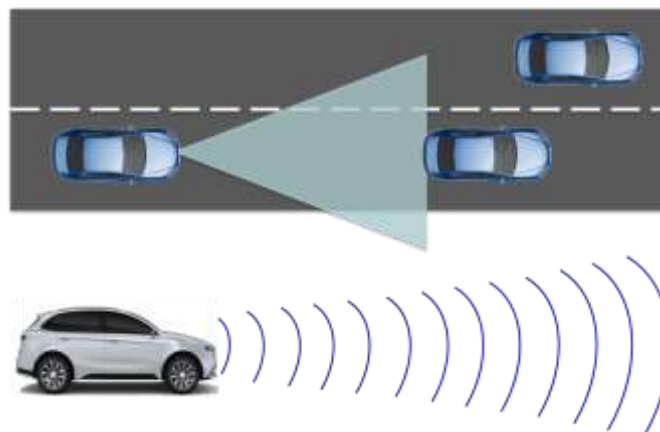
#### Objectives and Competences:

- Understanding the principle and types of automotive radars
- Being capable to understand the advantages of radar compared to other technologies
- Being capable to know the applications and functions of current and future automotive radar systems

#### Contents:

Advanced Driver Assistance Systems (ADAS), employing available camera, lidar and radar technology, are in worldwide deployment these days. Up to now about 180 million radar units are worldwide circulating on our roads. Today ADAS are no longer comfort devices anymore, but they have become a safety feature for various AEB-Systems (Automatic Emergency Braking) in cars and trucks worldwide.

- History of automotive radar
- Radar basics: Wave propagation, automotive radar frequencies and regulations, comparison to other technologies
- Radar techniques: Radar principles and components, radar signal modulation, basic radar signal processing, radar system specifications and characteristics
- Principles for angle measurement
- Automotive radar in praxis: Applications and examples of automotive radars, radar sensor vehicle installation, mutual interference of radar sensors
- Future trends in automotive radar



#### Literature and Downloads:

- Winner, H., Hakuli, S., Lotz, F., Singer, C. (eds.), Handbook of Driver Assistance Systems, Basic Information, Components and Systems for Active Safety and Comfort, Springer, 2016.
- Skolnik, M., Radar Handbook, 3<sup>rd</sup> edition, McGraw-Hill Education, 2008.
- Pozar, D. M., Microwave Engineering, 2<sup>nd</sup> edition, Wiley, 2011.

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Computer Networks	
Course ID:	E+I407
Level:	Master
Course Type:	Lecture
Semester Hours per Week:	2
Credits:	3
Host Semester:	CME1
Examination:	Written Exam
Module:	CME-03 Communication Networks
Location:	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Erwin Mayer

**Requirements:**

- Background knowledge in communication and networks
- General background in computer science

**Objectives and Competences:**

- Understanding general communication concepts and their practical application
- Understanding role and implications of a layered communication architecture
- Obtaining the capability to analyze, organize and maintain IP networks
- Learning the terminology and methodology to be able to analyze and tune communication systems
- Identifying typical requirements and problems in network environments and devise adequate solutions (e.g. addressing, error recovery, flow control, routing)
- Capability to select and adequately use standard network equipment (repeater, hubs, switches, routers,..) for given tasks
- Being capable to interpret data traffic visualized over a network sniffing tool and understand the rationale of the exchanged messages
- Understanding advanced modulation and coding schemes being used in modern computer networks
- Competence to understand, design, implement and analyze medium access control (MAC) mechanisms being used in modern computer networks
- Competence to understand the basics of traffic engineering for the use in modern computer networks
- Understanding performance issues in network environments and how to avoid performance bottlenecks

**Contents:**

- General Communication Concepts
- OSI and TCP/IP Reference Model
- Physical Layer
- Data Link Layer
- Network Layer
- Transport Layer
- Application Layer
- Performance Analysis

**Literature and Downloads:**

- A.S. Tanenbaum, Computer Networks, 5<sup>th</sup> ed., Prentice Hall, 2010.
- J. F. Kurose, K. W. Ross, Computer Networking (A Top-Down Approach Featuring the Internet), 6<sup>th</sup> ed., Prentice Hall, 2012.
- Comer, Droms, Computer Networks and Internets, 6<sup>th</sup> ed., Addison-Wesley, 2014.

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<b>Computer Vision</b>	
<b>Course ID</b>	EMI407
<b>Level</b>	Master
<b>Course Type</b>	Lecture and Lab
<b>Hours per Week</b>	4
<b>Credits</b>	4
<b>Host Semester</b>	EIM
<b>Examination</b>	Written Exam and Lab Work
<b>Module</b>	EIM-15 Bildverarbeitung
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Hensel

**Requirements:**

**Objectives of the Course:**

After successful completion of this module

- the students have become acquainted with feature-based methods of machine vision.
- are able to name and implement different algorithms of the optical motion field.
- have a mental map of selected machine learning methods in the field of computer vision
- have the ability to select and use deep neural networks in image processing tasks

**Lecture contents:**

Feature-based methods:

- Feature detectors and feature descriptors
- Image pyramids
- SIFT detector and descriptor

Image Transformations:

- Affine and Projective Transformations
- Robust transformation estimation (RANSAC)

Image Motion and Tracking

- Optical flow (local and global methods)

Machine learning in image processing

- Clustering/Segmentation: k-means, SLIC Superpixel
- Classification: Bayes, Support Vector Machines, Perceptron
- Neural Networks: Base and Backpropagation learning

Deep learning in machine vision

- Fundamentals of deep neural networks in image processing (convolutional neural networks, CNNs)
- Training and training data collection
- Object classification with neural networks
- Object detection and segmentation with neural networks

**Laboratory contents:**

- Image mosaicing: image transformations and scale-invariant feature detectors
- Optical Flow: Motion estimation in image sequences with Lucas-Kanade-Method
- Machine learning methods for segmentation: K-Means in image compression
- Neural Networks: Training with Backpropagation and Classification
- Deep Learning: Keras and Tensorflow in Python. Image classification and transfer learning with deep architectures

**Literature and Downloads:**

- Szeliski, R., Computer Vision: Algorithms and Applications; Springer, 2020, online pdf version:  
<http://szeliski.org/Book/>

- Burger, Burge, Digital Image Processing - An algorithmic introduction, 3rd ed. Springer, 2015
- Gonzalez, Digital Image Processing, 4th ed., Pearson, 2017
- Goodfellow, Bengio, Courville, Deep Learning, MIT Press 2016, onlineversion:  
<http://www.deeplearningbook.org/>

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Digital Communications with Lab	
Course ID:	EMI404
Level:	Master
Course Type:	Lecture
Semester Hours per Week:	3
Credits:	3
Host Semester:	CME1
Examination:	Written Exam
Module:	CME-04 Digital Communications
Location:	Campus Offenburg

#### Lecturer(s):

Prof. Dr. Tobias Felhauer

#### Requirements:

- Basic knowledge about signal and linear system theory
- Basic knowledge about digital communications
- Experience with MATLAB/Simulink is helpful but not strictly required

#### Objectives and Competences:

- Understanding the structure and basic mechanisms in digital communication systems
- Having the capability to design, implement and optimize digital communication systems for different applications
- Understanding basic digital modulation schemes for baseband and passband transmission
- Being capable to evaluate the performance of digital communication systems
- Having the capability to model and simulate digital communication systems by using MATLAB/Simulink in combination with the communication blocksets.

#### Contents:

- Introduction - Review:  
General block diagram of a digital communication system, characterisation of signals and systems (periodic signals, transient signals, random signals and noise), linear - system characterisation
- Basics of Digital Communications:  
Pulse code modulation (sampling theorems for lowpass and bandpass signals, quantization, coding and SNR calculations), pulse shaping for optimum transmission (inter - symbol - interference (ISI), Nyquist criteria, raised cosine rolloff filtering), filtering for optimum detection (matched filter, correlation)
- Baseband Transmission and Line Coding:  
Binary and multilevel signaling, line codes and spectra (NRZ, RZ, Manchester, CMI, AMI, HDBn, 4B3T etc., general requirements, line codes and applications, power spectra and spectral efficiency of binary line codes)
- Bandpass modulation of Carrier Signals:  
Digital bandpass modulations overview, phase constellation diagram, digital quadrature modulator and demodulator implementation structures, analysis of exemplary digital carrier modulation schemes
- Digital Communication System Analysis and Simulation:  
Eye pattern diagram, bit-error-rate calculation, simulation and optimization of digital communication systems using MATLAB/SIMULINK/communication toolbox (lab course)

#### Literature and Downloads:

- Glover, P.M. Grant: Digital Communications. Prentice Hall, London, 1997.
- L. W. Couch II: Digital and Analog Communication Systems. Prentice Hall, London, 2012.
- J. G. Proakis: Digital Communications. McGraw-Hill, New York, 2007.

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Digital Signal Processing (DSP) Lab	
Course ID:	EMI415
Level:	Master
Course Type:	Lab
Semester Hours per Week:	2
Credits:	1
Host Semester:	CME
Examination:	Lab Work
Module:	CME-07 Advanced Digital Signal Processing
Location:	Campus Offenburg

**Lecturer(s):**

Prof Dr Werner Reich

**Requirements:**

**Objectives of the Course:**

**Contents:**

Experiment 1: A-to-D and D-to-A-Conversion

- Aliasing Effect
- Mirror Components
- $(\sin x)/x$ -Distortion
- Quantization Effects: Estimation of Signal-to-Noise-Ratio
- Nonlinearity of D-to-A-Converter
- Subjective Listening Tests

Experiment 2: Finite Impulse Response (FIR-) Filters

- Filter Design Using the Fourier Approximation
- Modification by Using Window Functions
- Optimum Design (Parks-McClellan-Algorithm)
- Finite Precision Effects
- Design of Hilbert Filters (Wideband Phase Shifters)

Experiment 3: Fast Fourier Transformation

- Speed Measurements
- Spectral Analysis, Windows to reduce Leakage Effects
- Comparison of direct and fast Implementation of Correlation
- Comparison of direct and fast Convolution

**Literature and Downloads:**

"User's Guides" for the Experiments

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Digital Signals and Systems	
Course ID:	EMI403
Level:	Master
Course Type:	Lecture
Semester Hours per Week:	2
Credits:	3
Host Semester:	CME
Examination:	Written Exam
Module:	CME-02 Signal and System Theory
Location:	Campus Offenburg

**Lecturer(s):**

Prof Dr Stephan Pfletschinger

**Requirements:**

**Objectives of the Course:**

TBD

**Contents:**

- Elementary signals: sine, rectangle, complex exponential, Dirac impulse
- Properties of Signals and Systems: periodicity, orthogonality, signal power and signal energy
- Description of linear time-invariant systems in time and frequency domain: Impulse response, step response and transfer function
- Fourier series, Fourier transform, discrete-time Fourier transform, z-transform
- The Sampling Theorem
- Digital Filters: FIR and IIR, Pole-zero-plot, canonical structures

**Literature and Downloads:**

- Alan V. Oppenheim, Alan S. Willsky: *Signals & Systems*. Pearson, 2013.
- Alan V. Oppenheim, George V. Verghese: *Signals, Systems and Inference*. Pearson, 2017.
- John G. Proakis, Dimitros K. Manolakis: *Digital Signal Processing*. Pearson, 2014.
- Stephan Boyd, Lieven Vandenberghe: *Introduction to Applied Linear Algebra*. Cambridge University Press, 2018.
- Mark Wickert: *Signals & Systems for Dummies*. Wiley, 2013.

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Embedded and Industrial Networks and Lab	
<b>Course ID:</b>	EMI2205 and EMI2206
<b>Level:</b>	Master
<b>Course Type:</b>	Lecture and Lab
<b>Semester Hours per Week:</b>	2.0 and 2.0
<b>Credits:</b>	2 and 3
<b>Host Semester:</b>	CME2/EIM2
<b>Examination:</b>	Written Exam and Lab Work
<b>Module:</b>	CME-12 Embedded & Industrial Networks
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Axel Sikora

**Requirements:**

Basics in embedded and industrial networks

**Objectives and Competences:**

- The students gain a deeper insight into the internal structure of Communication protocols.
- In this way, they also learn about the most important design paradigms and are thus able to select and implement not only the communication protocol that is optimal for the application, but also to design appropriate adaptations and extensions themselves.

**Contents:**

- Lab 1: Diodes for signal limitation
- Lab 2: Amplifier with transistors
- Lab 3: Power amplifier
- Lab 4: Oscillators
- Lab 5: Amplitude modulation
- Lab 6: Frequency modulation

**Literature and Downloads:**

Provided in class

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Guided Wave Theory	
Course ID	EMI411
Level	Master
Course Type	Lecture
Hours per Week	4
Credits	5
Host Semester	CME
Examination	Written Exam
Module	CME-06 Guided Waves
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Andreas Christ

**Requirements:**

**Objectives of the Course:**

TBD

**Contents:**

Maxwell's equations: general forms, cause-effect-relations, continuity relation, time harmonic fields

Wave concept: uniform plane waves, propagation and energy flux, skin effect

Boundary conditions

Transmission lines:

- Modes: concept and classification, orthogonality
- Properties of rectangular waveguides, other waveguide types and coaxial lines

Circuit theory for waveguide systems:

- Scattering matrix formulation
- Equivalent circuits
- Examples of passive devices

**Literature and Downloads:**

1. Balanis, C. A., *Advanced Engineering Electromagnetics*, John Wiley&Sons, New York, 2012.
2. Ulaby, F. T., *Fundamentals of Applied Electromagnetics*, Pearson, 2014.
3. Fleisch, D., *A Student's Guide to Maxwell's Equations*, Cambridge University Press, 2008.

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Information Theory and Coding	
Course ID	EMI405
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	CME
Examination	Written Exam
Module	CME-02 Signal and System Theory
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Stephan Pfletschinger

**Requirements:**

**Objectives of the Course:**

**Contents:**

- Channel coding
  - Error detection and correction
  - Binary linear block codes
  - Hard decoding and soft decoding
- Information, Entropy and Redundancy
  - Information content
  - Entropy of random variables and random vectors
- Source Coding
  - The source coding theorem
  - Shannon-Fano coding
  - Huffman coding
- Discrete memoryless channels
  - Conditional and joint entropy
  - Mutual information
  - The channel coding theorem
- Continuous channel models
  - The AWGN channel
  - Fading channels

**Literature and Downloads:**

- Stefan. M. Moser, Po-Ning Chen, *A Student's Guide to Coding and Information Theory*, Cambridge University Press, 2012.
- Benedetto, S., Biglieri, E., *Principles of Digital Transmission*, Kluwer Academic, Plenum Publishers, 1999.
- Robert McEliece: *The Theory of Information and Coding*, Student Edition, Cambridge University Press, 2004.
- David MacKay: *Information Theory, Inference, and Learning Algorithms*, Cambridge University Press, 2003.
- Thomas M. Cover, Joy A. Thomas, *Elements of Information Theory*, Wiley, 2006.

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Internet of Things	
Course ID	EMI419
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	2
Host Semester	
Examination	Presentation
Module	CME-10
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr.-Ing. Axel Sikora

**Requirements:**

- knowledge of communication and networking technologies
- basic understanding of system architectures and distributed programming
- basic understanding of wireless communication

**Objectives of the Course:**

- understand IoT architectures, technologies and solutions
- get an insight into IoT platform solutions
- achieve a good understanding of practical aspects of wireless technologies
- discuss cellular communication & LPWAN as fundamental stepping stones towards IoT networks
- see and understand some hands-on examples

**Contents:**

ch.1 IoT Introduction  
ch.2 Reference Models and Protocols  
ch.3 IoT Architectures  
ch.4 Industrial Wireless Communication  
ch.5 Cellular Communication  
ch.6 LPWAN Technologies

**Literature and Downloads:**

A. Holtschulte, "Praxisleitfaden IoT und Industrie 4.0: Methoden, Tools und Use Cases für Logistik und Produktion", Mai 2021, : Carl Hanser Verlag GmbH & Co. KG, ISBN 978-3446466838  
A. Tamboli, "Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24 Hours", April 2019, Apress, ISBN 978-1484244975  
D. Serpanos, M.C. Wolf, "Internet-of-Things (IoT) Systems", 2018, Springer, ISBN 978-3-319-69715-4.  
L. Peterson, O. Sunay, "5g Mobile Networks: A Systems Approach", Morgan & Claypool Publishers, July 2020, ISBN 978-1681738901, online available at <https://5g.systemsapproach.org/>  
H. Fattah, "5G LTE Narrowband Internet of Things (NB-IoT)", September 2018, Taylor & Francis Ltd, ISBN 978-1138317604.  
many (actual) online ressources

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<b>Microwave Lab</b>	
<b>Course ID</b>	EMI412
<b>Level</b>	Master
<b>Course Type</b>	Lab
<b>Hours per Week</b>	1
<b>Credits</b>	2
<b>Host Semester</b>	CME
<b>Examination</b>	Lab Work
<b>Module</b>	CME-06 Guided Waves
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Marlene Harter

**Requirements:**

**Objectives of the Course:**

**Contents:**

- Network Analysis of passive microwave elements
- Rectangular Waveguide in microwave communications
- Circuit Simulations with Microwave Office

**Literature and Downloads:**

1. Pozar, David: Microwave Engineering, John Wiley & Sons, 2011.
2. Wandell, Brian C.: Transmission Line Handbook, Artech House, 1991.

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Power Electronics and Grid Control	
Course ID	EMI2601
Level	Master
Course Type	Lecture
Hours per Week	4
Credits	4
Host Semester	PDE
Examination	Written Exam
Module	PDE-10 Power Electronics and Grid Control
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Uwe Nuß

**Requirements:**

**Objectives of the Course:**

The students are familiar with the functionality of power electronic devices for affecting energy flow in power grids.

The students are able to create and implement concepts for the integration of power electronic devices into power grids in order to optimize power flow.

The students can weigh up which form of energy transmission (three-phase current or high voltage direct current) is the most appropriate from a technical and economic point of view under given auxiliary conditions.

The students are familiar with the current concepts for power grid control and can apply them.

**Contents:**

1. Active and reactive power in power grids
2. Reactive power compensation
  - 2.1 passive reactive power compensation
  - 2.2 active reactive power compensation
    - 2.2.1 reactive power compensation using three-phase AC power controllers
    - 2.2.2 reactive power compensation using voltage source inverters
    - 2.2.3 flexible AC Transmission Systems
3. Line-commutated and self-commutated converters for HVDC transmission)
4. Grid control

**Literature and Downloads:**

1. Schröder, D.: Leistungselektronische Schaltungen, 3. Auflage, Springer-Verlag, Berlin, Heidelberg, 2012
2. Specovius, J.: Grundkurs Leistungselektronik, 8. Auflage, Springer Vieweg, Wiesbaden, 2017
3. Zhang, X., Rehtanz, C.: Flexible AC Transmission Systems: Modelling and Control, Springer-Verlag, Berlin, Heidelberg, 2012

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Renewable Energy Systems	
Course ID	EMI2238
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	2
Host Semester	PDE
Examination	Written Exam
Module	PDE-08 Renewable Energy Systems
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Michael Schmidt

**Requirements:**

**Objectives of the Course:**

The students have a general knowledge on the manifold technologies of generating electricity from renewable energy sources and understand their basic principles as well as their technical and economic potentials.

The students understand the basics of energy meteorology, in particular the spatial and temporal variability of solar and wind resources and the resulting challenges for grid integration, and can conduct basic site assessments.

The students have a detailed knowledge on the technology of photovoltaic (PV) and wind power plants. They know the manifold technical realization concepts and evaluate their utility for concrete sites and applications. The students are able to model the physical and economic behavior of PV and wind power plants in operation within a power grid or microgrid. They can apply industry-relevant simulation software. They know how to measure and evaluate the performance of these plants under normal conditions and to identify different failure modes.

Students learn to analyze data, to deduce conclusions and to evaluate them critically. They learn to present the methods and findings of their work in a scientific manner (scientific working and writing). They learn to work in teams.

**Contents:**

1. Overview of renewable energy conversion technologies, their physical principles and techno-economic potentials
2. Solar resource: properties, measurement, variability, forecasting
3. Solar cells: Basic principle and different technologies
4. Solar plants: Main concepts, Planning & grid integration, modeling and evaluation of plant performance, site assessments
5. Wind resource: properties, measurement, variability, forecasting
6. Wind power: Basic principle
7. Wind power plants: Planning & grid integration, modeling and evaluation of plant performance, site assessments
8. Basic grid integration aspects of solar and wind power (microgrids and power grids)
9. Lab work on operation of solar plants and wind power plants and their simulation via software

**Literature and Downloads:**

- Kleissl, Jan (2013): Solar energy forecasting and resource assessments. Oxford, Waltham: Academic Press, Elsevier.
- Manwell, J. F.; McGowan, J. G.; Rogers, Anthony L. (2009): Wind energy explained. Theory, design and application. 2nd ed. Chichester, U.K.: Wiley.
- Planning and installing photovoltaic systems. A guide for installers, architects and engineers (2012). 3rd ed. London: Earthscan.

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Renewable Energy Systems Lab	
Course ID	EMI2239
Level	Master
Course Type	Lab
Hours per Week	2
Credits	2
Host Semester	PDE
Examination	Lab Work
Module	PDE-08
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr M. Schmidt

**Requirements:**

**Objectives of the Course:**

See [Renewable Energy Systems](#)

**Contents:**

1. Lab work on the operation of solar power plants
2. Lab work on the operation of wind power plants
3. Simulation of wind power plants, solar power plants, and microgrids on the basis of industry-relevant software
4. Presentation of practical work in form of written scientific reports

**Literature and Downloads:**

- Mermoud, A. "Pvsyst: Software for the study and simulation of photovoltaic systems." ISE, University of Geneva, [www.pvsyst.com](http://www.pvsyst.com) (2012).

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Statistical Signal Processing and Information Theory	
Course ID	EMI2252
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	2
Host Semester	
Examination	Written Exam
Module	EIM-16 Signalverarbeitung
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Stephan Pfletschinger

**Requirements:**

**Objectives and Competences:**

**Contents:**

- **Random Variables and Random Processes**
  - discrete and continuous random variables
  - pdf, cdf, pmf, expectation, moments, variance
  - transformations of random variables
- **Parameter and Spectrum Estimation**
  - power spectral density and periodogram
  - parameter estimation
- **Probability and Information**
  - Entropy, conditional and joint entropy
  - mutual information
- **Source Coding**
  - Shannon-Fano, Huffman
  - Source coding theorem
- **Channel Capacity and Channel Coding**
  - Discrete memoryless channels
  - AWGN channel
  - Fading channels
- **Decision Theory**
  - MAP, ML, hypothesis testing
- **Factor Graphs and Belief Propagation**
- **Applications**
  - Frame synchronization
  - MIMO
  - Analog-Digital-Conversion

**Literature and Downloads:**

- Stefan. M. Moser, Po-Ning Chen, A Student's Guide to Coding and Information Theory, Cambridge University Press, 2012.
- Martin Bossert, Einführung in die Nachrichtentechnik, Oldenbourg Verlag, 2012.
- David MacKay: Information Theory, Inference, and Learning Algorithms, Cambridge University Press, 2003Alan V. Oppenheim, Alan S. Willsky: Signals & Systems. Pearson, 2013.
- Alan V. Oppenheim, George V. Verghese: Signals, Systems and Inference. Pearson, 2017.

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### 3.3 Department of Media

#### 3.3.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x		<a href="#">Anonymity and Surveillance</a>	Lecture	4	Written Exam
x		<a href="#">Anonymity and Surveillance Seminar</a>	Seminar	2	Term Paper
x		<a href="#">Applied Cryptanalysis</a>	Lecture	4	Written Exam
x		<a href="#">Applied Cryptanalysis Lab</a>	Lab	2	Report
x		<a href="#">Database Systems</a>	Lecture	3	Written Exam
x		<a href="#">Database Systems Lab</a>	Lab	1	Lab Work
	x	<a href="#">Data Analysis for Risk and Security Management</a>	Lecture	3	Written Exam
x		<a href="#">Data Mining</a>	Lecture	3	Written Exam
x		<a href="#">Data Mining Lab</a>	Lab	3	Report
x		<a href="#">Ethics and EU Law</a>	Lecture + Seminar	3	Presentation + Written Exam
	x	<a href="#">Global Risk and Security Management</a>	Seminar	3	Term Paper + Oral Exam
x		<a href="#">Interactive Distributed Applications</a>	Lecture	5	Written Exam
x		<a href="#">Interactive Media</a>	Lecture	3	Written Exam
x		<a href="#">Intercultural Media Design</a>	Seminar	3	Project Work
x		<a href="#">Intercultural Media Design Lab (IMD Lab)</a>	Lab	3	Lab Work
	x	<a href="#">Lab Work</a>	Lab	12	Term Paper
	x	<a href="#">Marketing</a>	Lecture	3	Term Paper
	x	<a href="#">Media Integration</a>	Seminar	2	Term Paper
	x	<a href="#">Media Integration Lab</a>	Lab	2	Lab Work
	x	<a href="#">Mobile Security</a>	Lecture	3	Written Exam
	x	<a href="#">Mobile Security Lab</a>	Lab	3	Report
x		<a href="#">Multimedia Web Technologies:</a> <ul style="list-style-type: none"> <li><a href="#">Multimedia Databases</a></li> <li><a href="#">Network Security in Multimedia Systems</a></li> <li><a href="#">Next Generation Internet</a></li> </ul>		7	Written Exam
			Lecture		
			Lab		
			Lab		
	x	<a href="#">Security in Ubiquitous Computing</a>	Lecture	3	Written Exam
	x	<a href="#">Security in Ubiquitous Computing Lab</a>	Lab	3	Report
x		<a href="#">Software Security</a>	Lecture	3	Written Exam
x		<a href="#">Software Security Lab</a>	Lab	3	Report
	x	<a href="#">Ubiquitous Applications</a>	Lecture	5	Written Exam and Report

### 3.3.2 Course Descriptions

Anonymity and Surveillance	
Course ID	M+I807
Level	Master
Course Type	Lecture
Hours per Week	3
Credits	4
Host Semester	ENITS
Examination	Written Exam
Module	ENITS-04 Anonymity and Surveillance
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Daniel Hammer

**Requirements:**

Computer networks and network security, Applied Crypt- Analysis

**Objectives of the Course:**

After successful participation in the course students shall be able to:

- have knowledge of basic terms and concepts of anonymity and privacy protection in computer networks
- to describe attacks on anonymous network communication and the exchange of sensitive data and explain defense mechanisms
- explain selected anonymization technologies (such as anonymizers, digital mixers, remailer systems and TOR) and their functionality as well as OTR technologies

**Contents:**

- Communication in networks when internal and external attackers are present
- Definition and usage of the terms anonymity, non-linkability and unobservability
- Concepts of distinguishability, concatenation and pseudonymity
- Privacy with different protection levels of communication data
- legal framework of anonymity and data protection in the Internet
- Anonymization technologies, overlay networks
- Anonymizer, digital mixing according to Chaum, Java Anon Proxy (JAP) / JonDo
- TOR networks and hidden services
- Threat models, mechanisms for protecting private network communication
- Self-protection in social networks, Deep Web und crime
- Remailer-systems and OTR-technologies
- Techniques for identifying users on the web
- Impact of anonymous Internet usage

**Literature and Downloads:**

- TOR-Projekt (<https://www.torproject.org>)
- Jens Kubieziel: Anonym im Netz; Open Source Press; 2007
- Bäumlerv.v. Mutius (Hrsg.): Anonymität im Internet; Vieweg; 2003
- Electronic Frontier Foundation: Surveillance Self-Defense; (<https://ssd EFF.org/>)
- Bruce Schneier: Applied cryptography. protocols, algorithms, and source code in C; John Wiley & Sons; 2015

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Anonymity and Surveillance Seminar	
Course ID	M+I808
Level	Master
Course Type	Seminar
Hours per Week	1
Credits	2
Host Semester	ENITS
Examination	Term Paper
Module	ENITS-04 Anonymity and Surveillance
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Daniel Hammer

**Requirements:**

See VL M+I807 Anonymity and Surveillance

**Objectives of the Course:**

See VL M+I807 Anonymity and Surveillance

**Contents:**

See VL M+I807 Anonymity and Surveillance

**Literature and Downloads:**

See VL M+I807 Anonymity and Surveillance

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Applied Cryptanalysis	
Course ID	M+I801
Level	Master
Course Type	Lecture
Hours per Week	3
Credits	4
Host Semester	ENITS
Examination	Written Exam
Module	ENITS-01 Applied Cryptanalysis
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Erik Zenner

**Requirements:**

- Module Algorithms and Data Structures (“Algorithmen und Datenstrukturen”) or similar
- Module Mathematics and Cryptography (“Mathematik und Kryptografie”) or similar: basic knowledge in symmetric and asymmetric cryptography and related basic principles of number theory

**Objectives of the Course:**

After successful participation in the course students shall be able to:

- understand methods of applied cryptanalysis
- apply them to concrete cryptographic systems

create implementations on their own or use third-party tools.

**Contents:**

Specific methods of modern cryptanalysis, e.g.

- differential cryptanalysis and its variants
- time-memory tradeoffs
- number-theoretical analysis methods
- practical attacks of the recent past (e.g. against TLS, random number generators etc.)

**Literature and Downloads:**

Provided for download at the beginning of the lecture.

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Applied Cryptanalysis Lab	
Course ID	M+I802
Level	Master
Course Type	Lab
Hours per Week	1
Credits	2
Host Semester	ENITS
Examination	Report
Module	ENITS-01 Applied Cryptanalysis
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Erik Zenner

**Requirements:**

See M+I801 Applied Cryptanalysis

**Objectives of the Course:**

See M+I801 Applied Cryptanalysis

**Contents:**

See M+I801 Applied Cryptanalysis

**Literature and Downloads:**

See M+I801 Applied Cryptanalysis

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Database Systems	
Course ID	M+I401
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	CME
Examination	Written Exam
Module	CME-21 Internet and Media Technologies
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Volker Sänger

**Requirements:**

**Objectives of the Course:**

**Contents:**

- Introduction: Database System, Data Model, Database Applications
- The Relational Model: Relations and Attributes, Selection, Join, Projection
- SQL: Schema Definition, Queries, Changing the Data, Views, Consistency, ACID-Principle, SQL-Transactions,
- Databank Design: Design Phases, Semantic Data Models, Dependencies, Normalisation, Transferring the Entity-Relationship Model into Relations
- Database-Programming: JSP, Object-relational Mapping, JDBC, Stored-Procedures, Trigger
- Beyond Relations: SQL3, No-SQL-Datenbanken, CAP und BASE, MongoDB, Main Memory Databases

**Literature and Downloads:**

- R. Elmasri, S.B. Navathe: Fundamentals of Database Systems, 7th Edition, Addison-Wesley, 2016.
- M. Keith, M. Schincariol: Pro JPA 2 - A Definitive Guide to Mastering the Java Persistence API, Apress Media, 2013.
- Hector Garcia-Molina, Jeff Ullman and Jennifer Widom: Database Systems, Prentice-Hall, 2009.

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Database Systems Lab	
Course ID	M+I411
Level	Master
Course Type	Lab
Hours per Week	1
Credits	1
Host Semester	CME
Examination	Lab Work
Module	CME-21 Internet and Media Technologies
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Volker Sanger

**Requirements:**

**Objectives of the Course:**

**Contents:**

1. Introduction to a standard relational database and its SQL-dialects
2. Mapping a relational model to a physical model
3. Implementing the physical model with SQL-commands
4. Inserting, deleting and updating of data with SQL
5. Various forms of Queries with SQL

**Literature and Downloads:**

- R. Elmasri, S.B. Navathe: Fundamentals of Database Systems, Addison-Wesley, 2013
- Hector Garcia-Molina, Jeff Ullman and Jennifer Widom: Database Systems, Prentice-Hall, 2008

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Data Analysis for Risk and Security Management	
Course ID	M+I812
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Written Exam
Module	ENITS-07 Data Analysis for Risk and Security Management
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Dirk Drechsler

**Requirements:**

- Statistics and Mathematics (Statistik und Mathematik)
- Risk Management (Risikomanagement)
- BCDR, Excel
- Business Economics (Betriebswirtschaftslehre)

**Objectives of the Course:**

After successful participation in the course students shall be able to:

- work out and apply autonomously selected issues of international risk and security management
- work out and apply chosen methods of quantitative risk management under guidance
- develop an independent risk and security awareness and its application in current problem areas of enterprise security

**Contents:**

1. Digital Business Ecosystems, Threat Landscape and Anomaly Detection
2. A Refresher in Statistics
3. Regression Analysis and Time Series Regression
4. Markov Processes
5. Time Series Forecasting (without Regression)

**Literature and Downloads:**

1. Anderson, David R. et al.: An Introduction to Management Science; Cengage; most recent edition.
2. Anderson, David R. et al.: Quantitative Methods for Business; Cengage; most recent edition.
3. Camm, Jeffrey D. et al.: Essentials of Business Analytics; Cengage; most recent edition.
4. Evans, James: Business Analytics; Pearson; most recent edition.
5. Selected scientific papers.

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<b>Data Mining</b>	
<b>Course ID</b>	M+I803
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	2
<b>Credits</b>	3
<b>Host Semester</b>	ENITS
<b>Examination</b>	Written Exam
<b>Module</b>	ENITS-02 Data Mining
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Janis Keuper

**Requirements:**

Requires basic knowledge of data bases, statistics and experience with a modern programming language.

**Objectives of the Course:**

**Contents:**

- Introduction to data mining: overview, CRISP, data pre-processing, concepts of supervised and unsupervised learning, visual analytics
- Association rules
- Linear regression: simple linear regression, introduction to multiple linear regression
- Classification: logistic regression, decision trees, SVM
- Ensemble methods: bagging, random forests, boosting
- Clustering: K-means, K-medoids, Hierarchical clustering
- Evaluation and validation: cross-validation, assessing the statistical significance of data mining results
- Ethics and privacy
- Selection of advanced topics such as neural networks, outlier detection, relation to big data analysis
- In the lab, students apply data mining methods and algorithms to problem sets and develop data mining applications, using tools such as R and RapidMiner.

**Literature and Downloads:**

1. Aggarwal, C. C. (2015). Data Mining: The Textbook. SpringerLink : Bücher. Cham: Springer International Publishing.
2. Han, J., Kamber, M., & Pei, J. (2011). Data Mining: Concepts and Techniques (3rd ed.). Burlington: Elsevier Science.
3. James, G., Witten, D., Hastie, T., & Tibshirani, R. (2014). An introduction to statistical learning: With applications in R (Corrected at 4th print). Springer texts in statistics. New York: Springer.
4. Witten, I. H., & Hall, M. A. (2011). Data mining: Practical machine learning tools and techniques (3rd ed.). Burlington, MA: Morgan Kaufmann.

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Data Mining Lab	
Course ID	M+I804
Level	Master
Course Type	Lab
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Report
Module	ENITS-02 Data Mining
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Janis Keuper

**Requirements:**

See M+I803 Data Mining

**Objectives of the Course:**

TBD

**Contents:**

See M+I803 Data Mining

**Literature and Downloads:**

See M+I803 Data Mining

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Ethics and EU Law	
Course ID	M+I805 and M+I806
Level	Master
Course Type	Seminar
Hours per Week	4
Credits	6
Host Semester	ENITS
Examination	Presentation (1/2) in Ethics and written exam (1/2) in Law
Module	ENITS-03 Ethics and EU-Law
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Westhoff, Prof Dr Erik Zenner

**Requirements:**

Ability to work scientifically (Literature study, presentation).

**Objectives of the Course:**

After successful participation in the course students shall be able to:

M+I805 Ethics:

- understand and analyse ethical dilemmas in computer science.
- derive a qualified judgement on the matter.
- defending said judgement in discussions.

M+I806 Law:

- understand the respective legal provisions and evaluate the consequences therefrom for companies.
- understand what kind of legal measures exist to check the security of IT systems.

Participants shall understand the legal requirements in other areas of law that pertain to IT security, especially data protection laws, labor laws and contract laws.

**Contents:**

M+I805 Ethics:

- theoretical foundations of ethics
- current topics in computer ethics: Facts and ethical evaluation

M+I806 Law:

- legal and organizational consequences of the NIS Directive
- explanation of the legal situation in certain other countries in and beyond the EU
- related topics from the data protection
- related topics from other areas of law

**Literature and Downloads:**

Recent case studies and papers will be announced at the beginning of the course.

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Global Risk and Security Management	
Course ID	M+I812
Level	Master
Course Type	Seminar
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Term Paper and Oral Exam
Module	ENITS-07 Data Analysis for Risk and Security Management
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Janis Keuper

**Requirements:**

Requires basic knowledge of data bases, statistics and experience with a modern programming language.

**Objectives of the Course:**

TBD

**Contents:**

1. Digital Business Ecosystems, Threat Landscape and Anomaly Detection
2. A Refresher in Statistics
3. Regression Analysis and Time Series Regression
4. Markov Processes
5. Time Series Forecasting (without Regression)

**Literature and Downloads:**

1. Anderson, David R. et al.: An Introduction to Management Science; Cengage; most recent edition.
2. Anderson. David R. et al.: Quantitative Methods for Business; Cengage; most recent edition.
3. Camm, Jeffrey D. et al.: Essentials of Business Analytics; Cengage; most recent edition.
4. Evans, James: Business Analytics; Pearson; most recent edition.
5. Selected scientific papers.

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Interactive Distributed Applications	
Course ID:	M+I400
Level:	Master
Course Type:	Lecture
Semester Hours per Week:	4
Credits:	5
Host Semester:	CME3
Examination:	Written Exam
Module:	CME-20 Interactive Distributed Applications
Location:	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Tom Rüdebusch

**Requirements:**

Familiarity with a procedural programming language/good programming skills in C or Java

**Objectives and Competences:**

Upon successful completion of the module students are able to understand Internet and Web technologies and are able to implement basic Web applications.

**Contents:**

- User Interfaces
- Internet Services
- The World Wide Web
  - Protocol (WWW System Architecture)
  - Page Description (HTML)
  - Server (Static vs. Dynamic Web Pages, CGI/C, PHP)
  - Client (JavaScript, CSS, DOM)
  - Structuring Information (Extensible Markup Language XML)
- Applications

**Literature and Downloads:**

- Shneiderman et al.: Designing the User Interface. Pearson, 2017.
- Freeman: The Definitive Guide to HTML5. Apress, 2011.
- Flanagan: JavaScript. O'Reilly, 2011.
- Tatroe, MacIntyre, Lerdorf: Programming PHP. O'Reilly, 2013.
- Harold, Means: XML in a Nutshell. O'Reilly, 2004.

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<b>Interactive Media</b>	
<b>Course ID:</b>	M+I409
<b>Level:</b>	Master
<b>Course Type:</b>	Lecture
<b>Semester Hours per Week:</b>	2
<b>Credits:</b>	3
<b>Host Semester:</b>	CME1
<b>Examination:</b>	Written Exam
<b>Module:</b>	CME-21 Internet and Media Technologies
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Roland Riempp

**Requirements:**

None

**Objectives and Competences:**

- To be capable of planning and implementing multimedia projects

**Contents:**

1. Introduction, Basics
1. Web technology: HTML, CSS, CMS
2. Media types and formats for static and dynamic media
3. Data compression for static and dynamic media, container and codec formats
4. Transmission technologies, streaming
5. Basic workflow of media integration and multimedia production

**Literature and Downloads:**

- Istvan Novak (2014): Unraveling HTML5, CSS3, and JavaScript
- Julie C. Meloni (2014): HTML, CSS and JavaScript All in One
- Jennifer Niederst Robbins (2012): Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics
- Tay Vaughan (2011): Multimedia - Making it Work
- T. M. Savage, K.E. Vogel (2008): An Introduction to Digital Multimedia
- Dr. Nigel Chapman, Jenny Chapman (2009): Digital Multimedia

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Intercultural Media Design + IMD Lab	
<b>Course ID:</b>	M+I403 and M+I404
<b>Level:</b>	Master
<b>Course Type:</b>	Seminar and Lab
<b>Semester Hours per Week:</b>	2 and 2
<b>Credits:</b>	3 and 3
<b>Host Semester:</b>	CME1
<b>Examination:</b>	Project Work and Lab Work
<b>Module:</b>	CME-22 Media Design
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Daniel Fetzner / Prof. Dr. Robert Gücker

**Requirements:**

Interest in Intercultural Design and Audiovisual Communication

**Objectives and Competences:**

- Participants extend their ability for the audiovisual language of color, form, typography, sound, interactive and audiovisual media with emphasis on intercultural communication
- Commercial, scientific and artistic forms of media communication will be applied to analyse design projects
- Sensibility for interdisciplinary fields of visualisation and sonification will be augmented seminar and laboratory are part of an intercultural team learning process

**Contents:**

- The students start with a self-portrait and a reflection about their personal belongings. They document their daily observations in groups out of five people via different media like text, sound and video

**Literature and Downloads:**

- Chen, Ling (2018): Intercultural Communication. Boston/Berlin: De Gruyter
- Heidkamp, Philipp (2010): Learning from Nairobi. Köln: kisdedition
- Ware, Colin (2008): Visual Thinking. Burlington: Penros

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<b>Lab Work</b>	
<b>Course ID</b>	M+I811
<b>Level</b>	Master
<b>Course Type</b>	Lab
<b>Hours per Week</b>	8
<b>Credits</b>	12
<b>Host Semester</b>	ENITS
<b>Examination</b>	Term Paper
<b>Module</b>	ENITS-06 IT-Sec-Laborarbeit
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Daniel Hammer

**Requirements:**

This module has several requirements. Please contact us to clarify if you are eligible to join this module.

**Objectives of the Course:**

Implementation of theoretical knowledge in a challenging project (practical, research-oriented and in a team)

**Contents:**

Practical security management in the context of real tasks in an enterprise environment.

**Literature and Downloads:**

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<b>Marketing</b>	
<b>Course ID</b>	M+I428
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Semester Hours per Week</b>	2
<b>Credits</b>	3
<b>Host Semester</b>	CME
<b>Examination</b>	Term Paper
<b>Module</b>	CME-42 Management Skills
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Christopher Zerres

**Requirements:**

**Objectives and Competences:**

- Awareness of the (marketing) challenges for companies operating internationally
- Understanding of major concepts, methods and instruments used in marketing

**Contents:**

- Marketing
- Marketing management, strategic planning and marketing process.
- Planning, execution and control of marketing programs.
- Development of marketing-mix: product development, product-life-cycle strategies, price strategies, product placement, distribution, communication, sales, promotion strategies.
- International Marketing
- The Scope and Challenge of International Marketing.
- Selection of target markets: consumer markets, business to business.
- Market segmentation.
- Researching International Markets.
- The International Political and Legal Environment.
- Marketing Strategies
- Business Customs and Practices in International Marketing.

**Literature and Downloads:**

- Hollensen, S. (2020): Global Marketing, 8th Edition, Pearson Education Limited.
- Green, M.C., Keegan, W.J. (2020): Global Marketing, 10th Edition, Pearson Education Limited.
- Kotabe, M., Helsen, K. (2020): Global Marketing Management, 8th Edition, Wiley.

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<b>Media Integration + Lab</b>	
<b>Course ID</b>	M+I409 and M+I410
<b>Level</b>	Master
<b>Course Type</b>	Seminar and Lab
<b>Hours per Week</b>	2 and 2
<b>Credits</b>	2 and 2
<b>Host Semester</b>	CME
<b>Examination</b>	Term Paper and Lab Work
<b>Module</b>	CME-26 Media Integration
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Roland Riempp

**Requirements:**

- Basic knowledge of planning and implementing multimedia projects one
- Lecture "Interactive Media"

**Objectives and Competences:**

- getting overview over different web and media technologies and their application
- insight into different topics in the frame of interactive media
- understanding multimedia conception and production
- conception of an interactive multimedia application for WWW and mobile web
- realization on an interactive multimedia application for the WWW and mobile web

**Contents:**

**Seminar:**

- Introduction, Assignment of topics and dates for individual seminar presentations
- Different categories of interactive multimedia applications
- Screen design for interactive multimedia applications
- Several topics in the context of interactive media. Individual presentations of the participants
- Creating and editing multimedia assets
- Introduction to HTML5 and CSS 3
- Creating an interactive multimedia-applications based on HTML5 and CSS 3

**Lab:**

- Introduction to HTML5, CSS 3 and JavaScript
- Creating and editing multimedia assets
- Creating an interactive multimedia-applications based on the software "Quick'N Easy Web-Builder 7" by Pablo Software.

**Literature and Downloads:**

**Seminar:**

- Tay Vaughan: Multimedia (2007): Making it Work, ISBN: 978-0072264517
- Lisa Lopuck: Designing Multimedia: A Visual Guide to Multimedia and Online Graphic Design, ISBN: 978-0201883985
- T. M. Savage, K.E. Vogel (2008): An Introduction to Digital Multimedia, ISBN: 978-0763750527
- Dr. Nigel Chapman, Jenny Chapman (2009): Digital Multimedia, ISBN: 978-0470512166

**Lab:**

- HTML5 foundations. Matt West. Chichester, West Sussex, U.K. : John Wiley & Sons (2013) - Available online for students here (only from inside the intranet of the university Offenburg): <http://proquest.tech.safaribooksonline.de/9781118432693>
- HTML5: your visual blueprint for designing rich web pages and applications. Adam McDaniel. Hoboken, NJ: J. Wiley & Sons (2012) - Available online for students here (only from inside the intranet of the university Offenburg): <http://proquest.tech.safaribooksonline.de/9780470952221>
- Beginning HTML5 and CSS3. Richard Clark ... [et al.]. Apress (2012) - Available online for students here (only from inside the intranet of the university Offenburg): <http://proquest.tech.safaribooksonline.de/9781430228745>
- Beginning CSS3. David Powers. Apress (2012) - Available online for students here (only from inside the intranet of the university Offenburg): <http://proquest.tech.safaribooksonline.de/9781430244738>
- PABLO Tutorials for "Quick'N Easy Web-Builder 7" [https://www.quickandeasywebbuilder.com/getting\\_started.html](https://www.quickandeasywebbuilder.com/getting_started.html)

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<b>Mobile Security</b>	
<b>Course ID</b>	M+I814
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	2
<b>Credits</b>	3
<b>Host Semester</b>	ENITS
<b>Examination</b>	Written Exam
<b>Module</b>	ENITS-08 Mobile Security
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Dirk Westhoff

**Requirements:**

- Computer Networks (Computernetze)
- Network Security (Netzwerksicherheit)
- Applied cryptanalysis

**Objectives of the Course:**

After successful participation in the course students shall be able to:

- understand and assess basic mobile and wireless security aspects
- understand selected security protocols and connection to infrastructure services of wireless networks as well as assess the security level provided
- understand selected system security aspects, and vulnerability of mobile devices as well as assess the security level provided

**Contents:**

- introduction
- overview of threats and attack techniques in the context of mobile devices and wireless networks
- system security of mobile devices
- Android OS: covert channels over IPC
- approaches to limitation of horizontal privilege escalation and control flow integrity on restricted devices
- trust anchors: MTM, T-time signatures
- mobility aspects
- security and mobility: safety concepts for MIPv4 and MIPv6
- pseudonymity architectures for car-to-car communication
- security protocols and wireless networks, such as
- security considerations of cellular networks (GSM, UMTS), wireless local networks (WLAN 802.11, ZigBee WSN), PANs (Bluetooth), WIDS and L2 PiP injections (802.15.4)
- approaches in coding techniques for selective jamming and robustness
- connection to infrastructure services
- remote codes attestation
- robust and secure OTA programming
- key exchange between low-power (RFD) and high-performance devices (FFD)
- non-repudiational charging in multi-hop AdHoc networks

**Literature and Downloads:**

1. Selected publications of IEEE & ACM DLs
2. Levente Buttyan, Jean-Pierre Hubaux Security and Cooperation in Wireless Networks, 2007

3. Dirk Westhoff, Mobile Security - Schwachstellen verstehen und Angriffsszenarien nachvollziehen, Springer Vieweg, 264 Seiten, ISBN 978-3-662-60855-5, 2020

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Mobile Security Lab	
Course ID	M+I815
Level	Master
Course Type	Lab
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Report
Module	ENITS-08 Mobile Security
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Dirk Westhoff

**Requirements:**

See M+I814 Mobile Security

**Objectives of the Course:**

See M+I814 Mobile Security

**Contents:**

See M+I814 Mobile Security

**Literature and Downloads:**

See M+I814 Mobile Security

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Multimedia Web Technologies	
Course ID	M+I405
Level	Master
Course Type	Lab
Hours per Week	6
Credits	7
Host Semester	CME
Examination	Written Examination
Module	CME-24
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Sanger, Prof Dr Hammer, Prof Dr Schmidt

**Requirements:**

- Relational and object-relational databases
- SQL
- At least one programming language, e.g. Java
- UML, Entity-Relationship modelling
- Principles of computer networks
- Internet protocols
- Authentication in computer networks
- Computer technology, computer networks and cryptography

**Objectives of the Course:**

The students will learn to understand how to design and implement multimedia web applications. They will know the concepts for a secure data transmission and storage and to be able to apply them.

Please note: This module consists of three components: [Multimedia Databases](#), [Network Security in Multimedia Systems](#) and [Next Generation Internet](#). The three components must be taken together and share one written exam.

**Contents:**

**Literature and Downloads:**

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Multimedia Databases	
Course ID	M+I405
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	
Host Semester	CME3
Examination	Written Examination
Module	CME-24
Location	Campus Offenburg

#### Lecturer(s):

Prof Dr Sanger

#### Requirements:

SQL, Data Modeling

#### Objectives of the Course:

In this course students learn the handling of multimedia data (image, audio, video and free text) in databases. The lecture provides insights into the storage of images, sounds, and videos together with corresponding meta data in different types of databases. Furthermore it explains the query process of multimedia data in combination with innovative user interfaces. On completion of the course students will know how to model, store and query multimedia databases and they understand how well known multimedia systems like e.g. Google image search, Shazam or Pinterest work.

Please note: This module must be taken together with the other components of CME-24 [Multimedia Web Technologies](#).

#### Contents:

- Introduction to Multimedia Databases: Meta Data, Features, Segmentation, Similarity, Data Models
- Technological Foundations: Information Retrieval, Neural Networks, Deep Learning, Architecture of Multimedia Databases
- Image Databases: Meta Data for Images, Semantic Gap, Deep Learning for Images, Image Retrieval, Case Studies
- Audio Databases: Meta Data for Audio, Audio Retrieval, Case Study Shazam
- Video Databases: Meta Data for Video, Deep Learning for Videos, Video Retrieval, Case Studies
- Text Databases

#### Literature and Downloads:

- Blanken, H.M.; de Vries, A.P.; Blok, H.E.; Feng, L. (Eds.): Multimedia Retrieval, Springer-Verlag, 2007 (ebook: <http://www.springer.com/computer/database+management+&+information+retrieval/book/978-3-540-72894-8>)
- S. Ruger: Multimedia Information Retrieval. Morgan & Claypool, 2010
- R. Baeza-Yates and B. Ribeiro-Neto: Modern Information Retrieval - the concepts and technology behind search. ACM Press, 2. Edition, 2011
- A. Geron: Neural Networks and Deep Learning, O'Reilly, 2018. ebook
- A. Krizhevsky, I. Sutskever, G.E. Hinton: ImageNet Classification with Deep Convolutional Neural Networks. In Advances in Neural Information Processing Systems 25, NIPS 2012
- A. Wang: An Industrial-Strength Audio Search Algorithm. In ISMIR Proceedings, Baltimore 2003
- A. Basiri et.al.: Chaos Engineering. IEEE Software May/June 2016, pp 35-41
- Y. Jing, D. Liu, D. Kislyuk, A. Zhai, J. Xu, J. Donahue, S. Tavel: Visual Search at Pinterest. In KDD Proceedings, Sydney, 2015
- P. Covington, J. Adams, E. Sargin: Deep Neural Networks for YouTube Recommendations, Proceedings of the 10th ACM Conference on Recommender Systems, New York, 2016
- J. Redmon, S. Divvala, R. Girshick and A. Farhadi, "You Only Look Once: Unified, Real-Time Object Detection," 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016, pp. 779-788

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Network Security in Multimedia Systems	
Course ID	
Level	Master
Course Type	Lab
Hours per Week	
Credits	
Host Semester	
Examination	
Module	CME-24
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Hammer

**Requirements:**

**Objectives of the Course:**

Please note: This module must be taken together with the other components of CME-24 [Multimedia Web Technologies](#).

**Contents:**

- IT-Security
- Internet Forensics
- Anonymity and Pseudonymity
- Linkability, Unobservability, Privacy
- Anonymizer, Digital Mixing, Remailer
- Darknet, Overlay Networks
- TOR, Affiliate Systems

**Literature and Downloads:**

- <https://www.torproject.org>
- <https://geti2p.net>
- <https://www.privacy-handbuch.de/>
- <https://www.anonym-surfen.de>
- AN.ON: Technischer Hintergrund von JAP. <http://anon.inf.tu-dresden.de/JAPTechBgPaper.pdf>
- Reporters Without Borders (Organisation): Internet access barred as wave of new legislation threatens freedom of Information. <http://en.rsf.org/russia-internet-access-barred-as-wave-of-01-11-2012,43627.html>.
- Clarke, Ian: The Philosophy behind Freenet. <https://freenetproject.org/philosophy.html>.
- Chaum, David: Untraceable Electronic Mail, Return Addresses, and Digital Pseudonyms. (1981). <https://mirror.robert-marquardt.com/anonbib/cache/chaum-mix.pdf>
- Clarke, Ian; Sandberg, Oskar; Toseland, Matthew; Verendel, Vilhelm: Private Communication Through a Network of Trusted - Connections: The Dark Freenet. PET 2010. <https://freenetproject.org/papers/freenet-0.7.5-paper.pdf>.
- Federrath, Hannes; Golembiewski, Claudia: Speicherung von Nutzungsdaten durch Anonymisierungsdienste im Internet. In: Datenschutz und Datensicherheit 28/8 (2004), 486-490. <http://epub.uni-regensburg.de/7349/1/FeGoDuD2004.pdf>
- I2P Technical Introduction. <http://www.i2p2.de/techintro.html>

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<b>Next Generation Internet</b>	
<b>Course ID</b>	
<b>Level</b>	Master
<b>Course Type</b>	Lab
<b>Hours per Week</b>	
<b>Credits</b>	
<b>Host Semester</b>	
<b>Examination</b>	
<b>Module</b>	CME-24
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Schmidt

**Requirements:**

**Objectives of the Course:**

Please note: This module must be taken together with the other components of CME-24 [Multimedia Web Technologies](#).

**Contents:**

- Internet Architecture (principles and critical discussion of changes)
- IPv6
- Content Distribution in the Internet (CDNs, P2P systems, Information Centric Networking)
- Multimedia communication (new transport protocols, congestion control, quality-of-service)

**Literature and Downloads:**

- J. F. Kurose, K. W. Ross: Computer Networking -- A Top-down Approach Featuring the Internet. Pearson, 2013.
- additional articles and books are presented in the lecture

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Security in Ubiquitous Computing	
Course ID	M+I816
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Written Exam
Module	ENITS-09 Security in Ubiquitous Computing
Location	Campus Offenburg

#### Lecturer(s):

Prof Dr Andreas Schaad

#### Requirements:

- Computer networks / Network security
- Cryptography
- Application Security
- Software Security

#### Objectives of the Course:

Students will be able to read recent scientific literature and assess currently emerging security technologies.

#### Contents:

In this lecture series we will look at different aspects of „ubiquitous“ security, i.e. security concerns and solutions in our daily life as consumers, application developers or software architects interacting with distributed systems and across different layers in a system stack. We will start with selected topics in the lifecycle of a mobile or IoT device, covering readily available security technologies as well as emerging R&D. We will realize that an important aspect is to identify what can be assumed to be available as a trusted computing base, i.e. the set of all hardware, firmware, and/or software components that are critical to the security of a computing device. For that reason, we will investigate trusted execution environments (TEEs) trusted platform modules (TPM) as well as the currently emerging software guard extensions (SGX). We will address different security concerns in cloud computing and cloud infrastructures, for example looking at identity management in distributed systems as well as selected emerging topics when interacting with encrypted cloud databases. As part of this lecture series we will also touch on blockchain technology as well as security in industrial control systems.

#### Literature and Downloads:

1. Pfleeger, C. et al.: „Security in Computing“, 5th Edition, Prentice Hall, 2015
2. Russell, B., van Duren, D.: „Practical Internet of Things Security“, 2016, Packt Publishing
3. Will, A. and Challener, D.: „A Practical Guide to TPM 2.0 Using the Trusted Platform Module in the New Age of Security“, Apress, 2015
4. Ginter, A.: „SCADA Security: Security: What's Broken and How To Fix It“, Abterra Technologies, 2016
5. [https://www.owasp.org/index.php/Application\\_Threat\\_Modeling](https://www.owasp.org/index.php/Application_Threat_Modeling)
6. <https://software.intel.com/en-us/articles/intel-software-guard-extensions-tutorial-part-1-foundation>

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Security in Ubiquitous Computing Lab	
Course ID	M+I817
Level	Master
Course Type	Lab
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Report
Module	ENITS-09 Security in Ubiquitous Computing
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Andreas Schaad

**Requirements:**

See M+ Security in Ubiquitous Computing I816

**Objectives of the Course:**

See M+ Security in Ubiquitous Computing I816

**Contents:**

We will do various exercises related to SGX & TPM programming.

**Literature and Downloads:**

See M+ Security in Ubiquitous Computing I816

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Software Security	
Course ID	M+I809
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Written Exam
Module	ENITS-05 Software Security
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Andreas Schaad

**Requirements:**

- Prior knowledge of Assembly and C is beneficial, but not required.
- Basic software development skills / Software Engineering Lecture.

**Objectives of the Course:**

After successful participation in the course students shall have

- ability to engineer security requirements
- knowledge and application skills with selected tools for "Threat Modelling"
- knowledge and application skills with selected tools for "Secure Development & Testing"
- familiarity with basic considerations of security for software components and ability to evaluate them

Students will understand the impact of security vulnerabilities within software components and achieve competence in mitigating them.

**Contents:**

Introduction

- Historical considerations of "reverse engineering" and software security assessment

Reverse engineering

- Overview of reverse engineering tools (system tools, disassemblers, debuggers, decompilers)
- Detailed introduction to different tools, such as gdb and radare2
- Introduction to Assembly and C, with practical examples of reverse engineering
- Architecture-specific differences of reverse engineering of software components
- Introduction of obfuscation methods for hardening

Software security assessment

- Overview of security-critical vulnerabilities in software components (e.g. memory-corruption vulnerability, format-string vulnerability)
- Impact of vulnerabilities with practical examples of "exploitation"
- Detection of vulnerabilities by means of reverse engineering
- Introduction to various security mechanisms for mitigation of such vulnerabilities (data execution prevention, address space layout randomization, stack canaries, etc.)

**Literature and Downloads:**

- Shostak, Threat Modeling: Designing for Security (Englisch) Taschenbuch - 7. Februar 2014, Wiley
- Selected academic papers (ACM, IEEE, Springer) and reading list as announced in lecture.

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Software Security Lab	
Course ID	M+I810
Level	Master
Course Type	Lab
Hours per Week	2
Credits	3
Host Semester	ENITS
Examination	Report
Module	ENITS-05 Software Security
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Andreas Schaad

**Requirements:**

See M+I809 Software Security

**Objectives of the Course:**

See M+I809 Software Security

**Contents:**

See M+I809 Software Security

**Literature and Downloads:**

See M+I809 Software Security

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Ubiquitous Applications	
Course ID	M+I412
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	5
Host Semester	CME
Examination	Written Exam and Report
Module	CME-23
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Katharina Mehner-Heindl, Mr Carlos Jérez-Vargas

**Requirements:**

- Object oriented programming in a programming language like Java or Objective C
- HTML programming with PHP scripting
- Database design and SQL basic knowledge

**Objectives of the Course:**

- To know and differentiate the Ubiquitous Applications particularities in comparison with Internet applications
- To know sensors, actuators, processors and operating systems of ubiquitous and mobile hardware as a means to develop context-sensitive user-centric applications
- To specify, design, realize and develop Ubiquitous Applications using contemporary hardware and APIs

**Contents:**

- Introduction and basic concepts
- Processors and OS
- Input and output
- Communication between processors
- Sensors and actuators
- Just-in-Time services and applications
- Introduction to smartphone APIs (e.g. Android, Phonegap, etc.), software architecture, frameworks, and installation
- Program examples for GPS, sensors, Web interfaces, databases, user interfaces
- Self-guided practical development of a prototype using e.g. a smartphone (100 hours)

**Literature and Downloads:**

- Weiser, Mark. The Computer for the 21st Century. In ACM SIGMOBILE Mobile Computing and Communications Review - Special issue dedicated to Mark Weiser. Volume 3 Issue 3, July 1999, pp 3-11. (<https://www.ics.uci.edu/~corps/phaseii/Weiser-Computer21stCentury-SciAm.pdf>)
- Varun Nagpal. Android Sensor Programming by Example: Take your Android applications to the next level of interactivity by exploring the wide variety of Android sensors. Packt Publishing. 2016. (<http://proquest.tech.safaribooksonline.de/9781785285509>)
- Ammar Rayes, Salam Samer. Internet of Things From Hype to Reality: The Road to Digitization. Springer Verlag. 2017. (<http://dx.doi.org/10.1007/978-3-319-44860-2>)

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### 3.4 Department of Mechanical and Process Engineering

#### 3.4.1 Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x		<a href="#">Energy Economics</a>	Lecture + Practical Work	4	Written Exam
x		<a href="#">Energy Storage, Conversion and Transport</a>	Lecture + Lab	4	Written Exam
x		<a href="#">Energy Systems Engineering</a>	Lecture + Lab	4	Written Exam
x		<a href="#">Energy Usage in Industrial Processes</a>	Lecture + Seminar	4	Written Exam
x	x	<a href="#">German Culture and Society</a>	Lecture	2	Term Paper
	x	<a href="#">Grid Control, Analysis, Planning and Coordination</a>	Lecture + Lab	4	Written Exam
x		<a href="#">Managing Complexity</a>	Lecture + Seminar	2	Term Paper
	x	<a href="#">Operations Research in Energy Economics</a>	Lecture	4	Written Exam
x		<a href="#">Power Plants and Power Systems</a> <ul style="list-style-type: none"> <li><a href="#">Power Plants</a></li> <li><a href="#">Power Systems</a></li> </ul>	Lecture + Seminar	8	Written Exam
			Lecture + Seminar		
x		<a href="#">Process Control Engineering</a>	Lecture	2	Written Exam
	x	<a href="#">Solar Technologies</a>	Lecture	4	Written Exam
x		<a href="#">Tools to Manage Environmental Affairs</a>	Lecture + Lab	2	Term Paper

### 3.4.2 Course Descriptions

Energy Economics	
Course ID	M+V3037
Level	Master
Course Type	Lecture and Practical Work
Hours per Week	4
Credits	4
Host Semester	PDE
Examination	Oral Exam
Module	PDE-01 Energy Economics
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Grit Köhler

**Requirements:**

**Objectives of the Course:**

The students know and apply the common terminology in the energy sector. They know and understand the structure of an energy sector by example of Germany and are able to access systematically the structures of other energy markets. The students know how to access data in the energy sector; they are acquainted to statistical methods allowing critical analysis of data.

The students got the background to judge the impact of actual developments in industry, politics, legacy etc. on the energy sector.

The students know how to gain information and data required for techno-economic analyses of energy projects. They are able to perform cost calculation and investment appraisal studies. By applying computer tools they are able to perform extensive sensitivity analyses.

**Contents:**

- Terminology in the energy sector
- Primary energy resources (conventional and renewable) and energy conversion chains
- Environment protection (impact of exploitation, transport and conversion on environment, environment protection and international law)
- Structure of the energy sector (government agencies, organisations, industry, etc. involved and their role; Regulations in the energy sector by example of Germany and Europe; Liberalisation in the energy market; regulation of grid-bound energy sector)
- Cost calculation; Learning Curves; Investment appraisal Methods
- Energy demand and energy systems (sectors; daily, weekly and seasonal load profiles; electricity market and heat market; district heating; cogeneration)
- Electrical supply (example Germany, Europe; power plant fleet; virtual power plants; base load, middle load, peak load; decentralised energy supply; grid topology; grid operation; quality and reliability of grid operation)

**Literature and Downloads:**

1. MÜLLER, L.: Handbuch der Elektrizitätswirtschaft - Technische, wirtschaftliche und rechtliche Grundlagen. 2. Auflage, Berlin : Springer, 2001.
2. KONSTANTIN, P.: Praxisbuch Energiewirtschaft - Energieumwandlung, -transport und -beschaffung im liberalisierten Markt. 2. Auflage, Berlin : Springer, 2009.

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Energy Storage, Conversion and Transport	
Course ID	M+V3047
Level	Master
Course Type	Lecture and Lab
Hours per Week	4
Credits	4
Host Semester	RED
Examination	Written Exam
Module	PDE-03 Energy Storage, Conversion and Transport
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Wolfgang Bessler

**Requirements:**

**Objectives of the Course:**

The students are familiar with various types of electrical energy conversion and storage technology, specifically, batteries, fuel cells, and electrolyzers. They are also familiar with chemical (e.g., hydrogen) and thermal energy transport technologies as well as interconversion between electrical, chemical and thermal storage (e.g., power-to-gas, power-to-heat). On the fundamental level, they know the thermodynamic and kinetic working principles of electrochemical cells. On the technology level, the students know the setup and design principles the systems, including their properties in terms of efficiency and durability. On the application level, the students are aware of applicability, requirements, and potential of different energy storage and transport systems. They have an insight into the economic status of energy storage, conversion and transport technologies and understand the future trends in research and development.

**Contents:**

1. Introduction, history, thermodynamic and kinetic fundamentals
2. Batteries, types (lithium-ion, lead-acid, redox-flow) and properties
3. Fuel cells, electrolyzers, gas storage
4. Thermal storage and transport
5. Stationary and mobile applications, grid connection and integration

**Literature and Downloads:**

- Bessler, Lecture notes
- Kurzweil and Dietlmeier, Elektrochemische Speicher, 2015
- Larminie and Dicks, Fuel Cell Systems Explained, 2003.

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Energy Systems Engineering	
Course ID	M+V735
Level	Master
Course Type	Lecture and Lab
Hours per Week	4
Credits	4
Host Semester	RED
Examination	Written Exam
Module	PDE-07 Required Electives
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Niklas Hartmann

**Requirements:**

**Objectives of the Course:**

The students are able to analyse energy systems and they can derive solutions to improve the whole energy system.  
The students know how to apply agile project management to organize themselves in teams.  
Furthermore, the students know how to do data acquisition, data analysis, and to evaluate measures with the data. They consolidated their knowledge in energy management systems and renewable energy systems.  
The students know how to connect the results from data engineering to the renewable energy systems and the energy management systems to find better solutions.  
The students apply their knowledge to real world problems with data from existing companies. They will present their results to the company.

**Contents:**

1. System analysis of energy systems
2. Application of data acquisition, data refinement, data representation, and regression techniques on real energy systems
3. Application of agile project management
4. Renewable energy systems

**Literature and Downloads:**

Literature recommendations will be given in the lectures.

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Energy Usage in Industrial Processes	
Course ID	M+V3048
Level	Master
Course Type	Lecture and Seminar
Hours per Week	4
Credits	4
Host Semester	RED
Examination	Written Exam
Module	PDE-04 Energy Usage in Industrial Processes
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Peter Treffinger

**Requirements:**

**Objectives of the Course:**

The students know the essential technologies for energy conversion and storage in industry. They know the boundary conditions for the collection of energy-related data industry. They are able to setup a monitoring platform and to perform a energy flow analysis. Based on the energy flow analysis, they can propose energy efficiency measures.

The students are able to implement an energy management system (e.g. according to DIN EN ISO 50001). The students learn the principles of project management.

**Contents:**

1. Energy conversion and energy storage in industry
2. Energy efficiency measures
3. Visualisation, monitoring, data acquisition and control of industrial processes
- 4.. Energy efficiency in the context of regulations and standards (DIN EN ISO 50001, EN 16001, EN 15232, ...)

Exercises: Data analysis of monitoring data, energy balances of industrial plants.

**Literature and Downloads:**

Neugebauer (ed.): Handbuch Ressourcenorientierte Produktion. München: Carl Hanser Verlag, 2014

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German Culture and Society	
Course ID	M+V910
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	2
Host Semester	MPE1
Examination	Oral Exam
Module	MPE-16 Non-Technical Competences
Location	Campus Offenburg

#### Lecturer(s):

Ms. Zumholz (Guest Lecturer)

#### Requirements:

- Only for non-Germans
- Interest and basic knowledge in history, politics, society, in particular with respect to Germany and the Germans

#### Objectives and Competences:

Improving knowledge about and understanding of Germany and the Upper Rhine region and its inhabitants

#### Contents:

Possible topics:

- Germany: East and West, federal structure, political parties, "social market economy", free democratic basic law, national anthem ("über Alles"?), public and private media (papers, radio, TV, films), education system, present challenges (EU, regional effects of climate change, terrorism, integration of refugees)
- The image of Germany and "the" Germans in the students' countries of origin
- The tri-national Upper Rhine region: Baden, Alsace, northwestern Switzerland
- Industrialization in Germany, medium-sized enterprises ("mittelständische Unternehmen"), region-based industries and global players ("Herrenknecht", "Tesa", "Daimler", "BASF"), mining in the Black Forest, tourism, winegrowing and beer brewing, media enterprises ("Burda")
- The revolution in Baden and the Offenburg freedom movement, German emigration to the second and third world, the synod of Konstanz, religion now and then, hierarchical structures
- German language and culture: regional dialects ("badisch", "schwäbisch", "alemannisch", "schwiizerdütsch", "plattdütsch"), humour and political satire as reflecting the *zeitgeist* ("Heinz Erhardt", "Dieter Hildebrandt", "Loriot"), contemporary music ("Stockhausen", "Udo Lindenberg", "Neue Deutsche Welle", "Guggemusik"), code of conduct ("Knigge")

#### Literature and Downloads:

- Watson, P.: The German Genius; Simon & Schuster UK, London 2010
- Fullbrook, M.: A Concise History of Germany; Cambridge University Press, 2<sup>nd</sup> edition 1991, 16<sup>th</sup> Printing 2015
- The Federal President - representing and integrating: [www.bundespraesident.de/EN/Role-and-Functions/WorkInGermany/RepresentingAndIntegrating/representing-and-integrating.html](http://www.bundespraesident.de/EN/Role-and-Functions/WorkInGermany/RepresentingAndIntegrating/representing-and-integrating.html)
- Basic Law of the Federal Republic of Germany: [www.bundestag.de/blob/284870/ce0d03414872b427e57fccb703634dcd/basic\\_law-data.pdf](http://www.bundestag.de/blob/284870/ce0d03414872b427e57fccb703634dcd/basic_law-data.pdf)
- The German revolution 1848 - Frankfurt Vorparlament - German National Assembly: [www.age-of-the-sage.org/history/1848/german\\_revolution.html](http://www.age-of-the-sage.org/history/1848/german_revolution.html)
- The Hecker uprising (Baden including Offenburg in 1848/49): [https://en.wikipedia.org/wiki/Hecker\\_uprising](https://en.wikipedia.org/wiki/Hecker_uprising)
- In the heart of Europe - The Upper Rhine Valley (2000): [www.regbas.ch/de/assets/File/downloads/Economy\\_-\\_Uppper\\_Rhine\\_Valley.pdf](http://www.regbas.ch/de/assets/File/downloads/Economy_-_Uppper_Rhine_Valley.pdf)
- The Baden Revolution of 1848/49: [https://en.wikipedia.org/wiki/Baden\\_Revolution](https://en.wikipedia.org/wiki/Baden_Revolution)
- Guide to German culture, customs and etiquette: [http://www.uni-frankfurt.de/46329991/Guide-to-German-culture\\_and-etiquette.pdf](http://www.uni-frankfurt.de/46329991/Guide-to-German-culture_and-etiquette.pdf)

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Grid Control, Analysis, Planning and Coordination	
Course ID	M+V3052
Level	Master
Course Type	Lecture and Lab
Hours per Week	4
Credits	4
Host Semester	RED
Examination	Written Exame
Module	PDE11 – Grid Control, Analysis, Planning and Coordination
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Grit Köhler

**Requirements:**

**Objectives of the Course:**

After completing the course the students have acquired a fundamental understanding of those methods and tools, which are needed for the planning of economic, reliable and technically secure operation of networks of electrical power supply.

**Contents:**

1. Selection/dimensioning of network structures including communication structures.
2. Methods of network analyses and network planning.
3. Software for load flow and short circuit calculation and for the analysis of power system faults.
4. Selective network protection, criteria for network protection, power system control.
5. Operations in electric power systems.
6. Grid stability and reliability.
7. Operational management of networks.

Lab Work: Experimental network analyses with test rig.

**Literature and Downloads:**

- Heuck, Klaus, Dettmann, Klaus-Dieter, Schulz, Detlef: Elektrische Energieversorgung. 8. Auflage, Wiesbaden: Vieweg+Teubner, 2010.
- Hiller, Thomas, Bodach, Mirko, Castor, Walter: Praxishandbuch Stromverteilungsnetze. Würzburg: Vogel Buchverlag, 2014.
- Ungrad, Helmut, Winkler, Willibald, Wiszniewski, Andrzej: Schutztechnik in Elektroenergiesystemen (Taschenbuch). 2. Auflage, Berlin, Heidelberg: Springer-Verlag, 2013.

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Managing Complexity	
Course ID	M+V3032
Level	Master
Course Type	Lecture and Seminar
Hours per Week	2
Credits	2
Host Semester	MPE1
Examination	Term Paper
Module	MPE-16 Non-Technical Competences
Location	Campus Offenburg

**Lecturer(s):**

**Requirements:**

**Objectives of the Course:**

**Contents:**

The course is designed to provide a fundamental basis for management and leadership in the information age. It will introduce a scientific and philosophical approach to management and explore the historical origins of an analytical methodology that allows profound insight into the behaviour of processes and systems. It will teach that management is prediction and provide an understanding of a methodology for transforming raw data into knowledge in order to secure a sound basis for future action. Case histories will demonstrate how the costly errors of inappropriate action and sub-optimisation can be avoided and how a scientific basis for continual improvement and sustainable competitiveness is achieved.

**Literature and Downloads:**

- Spare, N.C.: Managing Complexity - A Compendium of Papers for a System of Knowledge; collection of selected papers
- Deming, W. Edwards: Out of the Crisis; Massachusetts Institute of Technology 1982 and 1986
- Deming, W. Edwards: The New Economics; Massachusetts Institute of Technology 1994/95
- Scholtes, Peter R.: The Leaders Handbook; McGraw-Hill 1988
- Neave, Henry R.: The Deming Dimension; SPC Press Inc. 1990
- Wheeler, Donald J.; Chambers, David S.: Understanding Statistical Process Control; SPC Press Inc. 1992
- Wheeler, Donald J.: Understanding Variation - The Key to Managing Chaos; SPC Press Inc. 1993
- Wheeler, Donald J.: Advanced Topics in Statistical Process Control; SPC Press Inc. 1995
- Spare, Noel C.: The Four Pillars of Wisdom - A System for 21st Century Management; pp. 63-68; in
- Think Different - Collection of the English Papers in the December 2006 Revision of the Deming Homepage;
- <https://www.skgep.gov.ae/docs/default-source/Articles/article2.pdf>
- same series of articles in German: [http://public.fh-wolfenbuettel.de/~hamannm/umdrucke/demming\\_collect.pdf](http://public.fh-wolfenbuettel.de/~hamannm/umdrucke/demming_collect.pdf)

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Operations Research in Energy Economics	
Course ID	M+V3038
Level	Master
Course Type	Lecture
Hours per Week	4
Credits	4
Host Semester	RED
Examination	Term Paper
Module	PDE-09 Operations Research in Energy Economics
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Grit Köhler

**Requirements:**

**Objectives of the Course:**

Qualitative and quantitative methods of management science / Operational Research are gaining ever higher importance in the energy sector e. g. optimization problems play a prominent role in energy economics, considering for example development of power plant fleets, development of grids and the usage of power plants. Students learn about the background of forecasting methods and optimization as mathematical tool for analysing power systems. They are able to formulate mathematical models and to apply optimization methods, e. g. linear programming, and forecasting methods, e. g. time series analysis.

Within module PDE-02 the students also apply the knowledge and competencies in economics and business strategy gained so far. Within required elective courses the students deepen and expand their capabilities when implementing a revised business strategy and experience the impact on an enterprise as a whole or when analysing and further developing energy management solutions in industry.

**Contents:**

1. System analysis in Energy Economics (data acquisition and data refinement, data representation, regression techniques)
2. Optimization problems in Energy Economics (types of problems; e.g. development of power plant fleet; resource planning)
3. Approaches to develop models for optimization problems in energy sector
4. Application of selected computational optimization techniques

**Literature and Downloads:**

- KONSTANTIN, P.: Praxisbuch Energiewirtschaft - Energieumwandlung, -transport und -beschaffung im liberalisierten Markt. 2. Auflage, Berlin: Springer, 2009.
- RUDOLPH, M., WAGNER, U.: Energieanwendungstechnik. Wege und Techniken zur effizienteren Energienutzung. Berlin: Springer, 2008.
- SUHL, L., MELLOULI, T.: Optimierungssysteme : Modelle, Verfahren, Software, Anwendungen. 2. Auflage, Berlin : Springer, 2009.

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Power Plants and Power Systems	
Course ID	
Level	Master
Course Type	Lecture and Practical Work
Hours per Week	4 and 4
Credits	8
Host Semester	RED
Examination	Writte Exam
Module	PDE-02 Power Plants and Power Systems
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Peter Treffinger, Prof Dr Bernd Jatzlau

**Requirements:**

**Objectives of the Course:**

The students know in-depth fluid dynamics and mechanics of thermal and hydraulic turbo-machinery. They know about different types of steam generators and understand their requirements with respect to fluid mechanics and heat exchange in two-phase-flow. The students are aware of instabilities, which can occur when operating steam generators. The students are able to formulate a specification sheet for the main components of thermal power plants. Optimization strategies for the operating conditions of power plants can be judged and examined in a qualified way.

Please note: This module consists of two components: [Power Plants](#) and [Power Systems \(Energiesysteme\)](#). The two components must be taken together and share one written exam.

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<b>Power Plants</b>	
<b>Course ID</b>	M+V3046
<b>Level</b>	Master
<b>Course Type</b>	Lecture and Practical Work
<b>Hours per Week</b>	4 and 4
<b>Credits</b>	8
<b>Host Semester</b>	RED
<b>Examination</b>	Writte Exam
<b>Module</b>	PDE-02 Power Plants and Power Systems
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Peter Treffinger, Prof Dr Bernd Jatzlau

**Requirements:**

**Objectives of the Course:**

Please note: This module must be taken together with the other components of PDE-02 [Power Plants and Power Systems](#).

**Contents:**

1. Energie und Kraftwerk / energy and power plant
2. Wärmefreisetzung / heat release
3. Apparate im Kraftwerk / components in power plants
4. Verwendung von Wärme und Kraft / Use of heat and power
5. Massen- und Energietransport / mass and energy transport
6. Function of power stations
7. Basic idea of construction of power stations
8. Flexibility, transient operation, life cycle models in the context of flexible operation
9. Exercises: solving energy balances

**Literature and Downloads:**

1. Nag; Power Plant Engineering; McGrawHill, 2014
2. El-Wakil; Powerplant Technology; McGrawHill, 1995
3. Dolezal; Energetische Verfahrenstechnik; Teubner Stuttgart, 1983
4. VDI-Wärmeatlas

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<b>Power Systems (Energiesysteme)</b>	
<b>Course ID</b>	M+V3054
<b>Level</b>	Master
<b>Course Type</b>	Lecture and Practical Work
<b>Hours per Week</b>	4
<b>Credits</b>	
<b>Host Semester</b>	RED
<b>Examination</b>	Written Exam
<b>Module</b>	PDE-02 Power Plants and Power Systems
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Peter Treffinger, Prof Dr Bernd Jatzlau

**Requirements:**

**Objectives of the Course:**

Please note: This module must be taken together with the other components of PDE-02 [Power Plants and Power Systems](#).

**Contents:**

1. Introduction and Overview
  - 1.1. General
  - 1.2. Working Fluid Water
  - 1.3. Working Fluid Air
  - 1.4. Combined Cycles
  - 1.5. Possibilities / Major Components
  - 1.6. Sites
  - 1.7. Brief Economy
  - 1.8. Cost Discussion
  - 1.9. Optimization
  - 1.10. Energy Consumption in Germany
2. Thermodynamic Review
3. Power Boilers
  - 3.1 Furnaces
    - 3.1.1 Fuels
      - 3.1.1.1 Solid Fuels
      - 3.1.1.2 Liquid Fuels
      - 3.1.1.3 Gaseous Fuels
    - 3.1.2 Combustion Calculation
    - 3.1.3 Combustion Systems
      - 3.1.3.1 Grate Firing
      - 3.1.3.2 Fluidized Bed Combustion
      - 3.1.3.3 Dust Firing
      - 3.1.3.4 Combustion of Liquid and Gaseous Fuels
    - 3.1.4 Operation Problems
  - 3.2 Power Boilers
    - 3.2.1 Historical Look back
    - 3.2.2 Heat transport
    - 3.2.3 Basics of Twophase Flows
      - 3.2.3.1 Heattransfer with Twophase Flows
      - 3.2.3.2 Boiling Crises
      - 3.2.3.3 Pressure Loss with Twophase Flows

- 3.2.4 Boiler Systems and Types
  - 3.2.4.1 Shell-Type Power Boilers (Fluegas Tube SG)
  - 3.2.4.2 Water Tube Power Boilers
  - 3.2.4.3 Heat Recovery Power Boilers
- 3.2.5 Design of a Power Boiler
  - 3.2.5.1 Balance Power Plant (Heat Process Diagram)
  - 3.2.5.2 Total Balance Steam Generator
  - 3.2.5.3 Arrangement and Balance of Heating Areas
  - 3.2.5.4 Materials for Boilers
  - 3.2.5.5 Design of Heating Areas
- 3.2.6 Aspects of Construction
- 3.2.7 Starting, Shut-Down and Control of Boilers
- 3.3 Nuclear Boilers

- 4. Steamturbines
  - 4.1 Introduction
  - 4.2 Operating processes
  - 4.3 main equation of the theory of turbines
  - 4.4 working processes
    - 4.4.1 constant pressure (=simple impulse) turbine
    - 4.4.2 overpressure / reaction turbine
    - 4.4.3 radial turbines
    - 4.4.4. comparison between simple impulse and reaction turbines
  - 4.4.5 specific numbers of the machine
  - 4.4.6 performance / power and consumption
  - 4.5. Fundamentals of turbine control
  - 4.6. Miscellaneous
    - 4.6.1 Casing
    - 4.6.2 Rotor types
    - 4.6.3 Blade roots
    - 4.6.4 Cover Bands and Tie Wire
    - 4.6.5 Bearing

#### **Literature and Downloads:**

1. Dolezal; Energetische Verfahrenstechnik; Teubner Stuttgart, 1983
2. Thomas, Thermische Kraftanlagen, Springer Berlin, 1984
3. El-Wakil; Powerplant Technology; McGrawHill, 1995
4. VDI-Wärmeatlas, Springer, Berlin, 2006
5. Nag; Power Plant Engineering; McGrawHill, 2014
6. Strauss, Kraftwerkstechnik, SpringerVieweg, Berlin, 2016

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Process Control Engineering	
Course ID	M+V916
Level	Master
Course Type	Lecture
Hours per Week	2
Credits	2
Host Semester	MPE
Examination	Lab Work
Module	MPE-14 Advanced Process Engineering
Location	Campus Offenburg

**Lecturer(s):**

**Requirements:**

**Objectives of the Course:**

TBD

**Contents:**

- The automation pyramid
- Norms and regulations
- The most relevant DCS systems
- Sensors and actuators
- Fieldbus systems
- Controller Level
- DCS Level

**Literature and Downloads:**

1. Schildt, G.-H.; Kastner, W.: Prozeßautomatisierung; Springer, Berlin 1998
2. Polke, M. (ed.): Process Control Engineering; VCH, Weinheim 1994, ISBN-13: 978-3527286898
3. Urbas, L.: Process Control Systems Engineering; Oldenbourg Industrieverlag, 1st ed. 2012

**Downloads:**

Siemens: Manual of Siemens Simatic PCS 7 Getting Started, parts 1 and 2:

<http://www.pacontrol.com/siemens-manuals/Process-Control-System-PCS-7-Part1.pdf>

<http://www.pacontrol.com/siemens-manuals/Process-Control-System-PCS-7-Part2.pdf>

[http://www7.informatik.uni-wuerzburg.de/fileadmin/10030700/user\\_upload/vorlesungen/ss03/lit\\_reg\\_aut\\_tech.pdf](http://www7.informatik.uni-wuerzburg.de/fileadmin/10030700/user_upload/vorlesungen/ss03/lit_reg_aut_tech.pdf)

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Solar Technologies	
Course ID	M+V730
Level	Master
Course Type	Lecture
Hours per Week	4
Credits	4
Host Semester	RED
Examination	Written Exam
Module	PDE-7 Required Electives
Location	Campus Offenburg

**Lecturer(s):**

Prof Dr Michael Schmidt

**Requirements:**

Recommended: Thermodynamics, Fluid Dynamics, Optics, physics of semiconductors

**Objectives of the Course:**

TBD

**Contents:**

1. Introduction sustainable energy conversion
2. Solar radiation
3. Solar thermal energy conversion
4. Solar thermal systems
5. Solar cell design
6. PV process technology
7. PV process and cell characterization
8. PV systems

**Literature and Downloads:**

1. Bollin, Elmar: Solartechnik. In: Zahoransky, Richard, A.: Energietechnik. 4. Auflage, Wiesbaden : Vieweg+Teubner, 2009, 265-301.
2. Bollin, Elmar (Hrsg.): Automation regenerativer Wärme- und Kälteversorgung von Gebäuden. Wiesbaden : Vieweg+Teubner, 2009.
3. Mertens, Konrad: Photovoltaik, Hanser-Verlag, 2011
4. Würfel, Uli: Physics of solar cells : from basic principles to advanced concepts, Wiley-VCH
5. Goetzberger, Adolf: Photovoltaic solar energy generation, Springer

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Tools to manage Environmental Affairs	
Course ID	M+V911
Level	Master
Course Type	Lecture and Lab
Hours per Week	3
Credits	3
Host Semester	MPE
Examination	Lab Work
Module	MPE-16 Non-Technical Competences
Location	Campus Offenburg

**Lecturer(s):**

**Requirements:**

**Objectives of the Course:**

TBD

**Contents:**

TBD

**Literature and Downloads:**

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## 4 Language Courses

The Language Center ("Sprachenzentrum") at Offenburg University provides a wide range of language classes every semester, both for credits and as extracurricular classes. Our offer typically includes general and specialized English language classes (mostly B1, B2 level), a full range of German language classes (complete beginners (A1) to advanced (C1)), French, Spanish, Polish and Japanese.

The most current list of the classes, lectures and the class descriptions are on the webpage of the Language Centre: <https://www.hs-offenburg.de/en/international/language-center/>

Course Name	Hours per week	Audience	Lecturer	Credits	Exam Type
<b><u>English</u></b> <i>Campus Offenburg</i>					
Business English (B2)	2	any	David Potter	2	Written exam
Business English (B2)	2	any	Elena Stöcklin	2	Written exam
English for Engineers (B2)	2	any	Elena Stöcklin	2	Written exam
Englisch f. Medienschaffende (B2)	2	MI	David Potter	2	Presentation
Technisches Englisch (B2)	4	any	Kevin Parr	4	Written exam
Technisches Englisch nur BT3 (B2)	2	BT3 only	TBA	2	Presentation
Technisches Englisch nur UV3 (B2)	2	UV3 only	TBA	2	Presentation
<b><u>English</u></b> <i>Campus Gengenbach</i>					
Business English (B2)	2	B+W only	Robert Burrows	2	Written exam
Advanced Business English (B2)	2	BWM, DEC, WIM only	Kevin Parr	2	Written exam
<b><u>French</u></b> <i>Campus Offenburg</i>					
Französisch Auffrischung A2	2	any	Marie-Ch. Nicaud	2	Written exam

Course Name	Hours per week	Audience	Lecturer	Credits	Exam Type
<b><u>Spanish</u></b> <i>Campus Offenburg</i>					
Spanisch (A1.1)	2	any	Elena Stöcklin	2	Written exam
Spanisch Auffrischung (A2)	2	any	Elena Stöcklin	2	Written exam
<b><u>Spanish</u></b> <i>Campus Gengenbach</i>					
Wirtschaftsspanisch (B1)	2	any	Isabel Jerónimo Fornes	2	Written exam
<b><u>Other languages</u></b> <i>Campus Offenburg</i>					
Japanisch I	2	any	Kaori Müller-Shibayama	2	Written exam
Japanisch II	2	any	Kaori Müller-Shibayama	2	Written exam
Japanisch III	2	any	Kaori Müller-Shibayama	2	Written exam
Polnisch I (A1.1)	2	any	Roman Zukowsky	2	Written exam
<b><u>German</u></b> <i>Campus Offenburg</i>					
Deutsch A1.1	6	any	Regina Beller	6	Written exam
Deutsch A1.2	6	any	In Planung	6	Written exam
Deutsch A2.1	4	any	Anika Meckesheimer	4	Written exam
Deutsch A2.2	4	any	Aylin Akkaya	4	Written exam
Deutsch B1.1	4	any	Susanne Ramm-Weber	4	Written exam
Deutsch B2.1	4	any	Susanne Schmidt-Lossau	4	Written exam
Deutsch B2.2	4	any	Birgitta Fruttiger	4	Written exam

Course Name	Hours per week	Audience	Lecturer	Credits	Exam Type
Deutsch C1.2	4	any	Astrid Listner	4	Written exam
Technisches Deutsch B1	4	any	Birgitta Fruttiger	4	Presentation
<b><u>German</u></b> <i>Campus Gengenbach</i>					
German Language I (A1.1)	4	IBC only	in Planung	4	Written exam
German Language V (B1.1)	4	IBC only	in Planung	4	Written exam

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