

# ENGLISH LANGUAGE MODULE HANDBOOK



# Courses taught in English

## TABLE OF CONTENTS

1 General Information and Provider of Courses .....	3
2 Bachelor Courses.....	4
2.1 Department of Business and Industrial Engineering.....	4
Course List.....	4
Course Descriptions .....	5
2.2 Department of Electrical Engineering, Medical Engineering and Computer Science .....	20
Course List.....	20
Course Descriptions .....	21
2.3 Department of Media .....	23
Course List.....	23
Course Descriptions .....	24
2.4 Department of Mechanical and Process Engineering.....	26
Course List.....	26
Course Descriptions .....	27
3 Master Courses.....	37
3.1 Faculty Business and Industrial Engineering.....	37
Course List.....	37
Course Descriptions .....	38
3.2 Department of Electrical Engineering, Medical Engineering and Computer Science .....	53
Course List.....	53
Course Descriptions .....	54
3.3 Department of Media .....	76
Course List.....	76
Course Descriptions .....	77
3.4 Department of Mechanical and Process Engineering.....	111
Course List.....	111
Course Descriptions .....	112
4 Language Courses.....	129

# 1 General Information and Provider of Courses

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<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>SPZ</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. CME/RED/MPE and others) have limited spaces for students.** Please check beforehand to see if a space is available for you.

The modules **Intercultural Leadership** and **Analytics Coaching** have limited spaces and we try to reserve spaces for incoming students, subject to availability. We cannot promise that we can accommodate all registrations and advise you to check beforehand to see if a space is available for you.

When filling out a **learning agreement**, please enter the module ID, for example “BW-21/ B+W0159”. If the space is not sufficient for the entire ID, please enter the first part (“BW-21”) The second part is optional. Some modules list more than one of these IDs, in which case you can use any of them (indicated by the word “any” underneath the module ID. This happens if different degree courses share the same module, for example General Business Administration is a core module for several degree courses. BW-01/ B+W0101, LH-01/ B+W0101 and WI-01/ B+W0101 are three codes for the same module and can be used interchangeably.

Some modules are split into part 1 and 2 or have a separate lab. In this case, you should either use the module offered in the respective term (e.g. Animation 1 in the spring term) or put both codes on separate lines of the learning agreement (e.g. Operating Systems and lab, AI-07/ EMI110 and AI-07/EMI111).

For all courses offered by the language center please use “SPZ” as module ID.

## 2 Bachelor Courses

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### 2.1 Department of Business and Industrial Engineering

#### Course List

4

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
x		<a href="#">Analytics Coaching</a>	Seminar	3	Project Work
from WS 24/25	x	Artificial Intelligence	Lecture	3	Paper + Presentation
x		<a href="#">Behavioral Economics</a>	Seminar	3	Paper + Presentation
x		<a href="#">Cross-Border Business Issues</a>	Seminar	3	Project Work
x	x	<a href="#">Economics</a>	Seminar	3	Term Paper
x	x	<a href="#">General Business Administration</a>	Lecture	5	Written Exam
x <sup>1</sup>	x	<a href="#">Human Resource Management and Organization</a>	Lecture	5	Written Exam and Project Work
x	x	<a href="#">Intercultural Leadership</a>	Seminar	3	Project Work
x	x	<a href="#">International Business Project</a> <sup>2</sup>	Seminar	5	Project Work
x		<a href="#">Sleep and Health</a>	Seminar	3	Paper + Presentation
x	x	<a href="#">Social and Intercultural Competences</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

<sup>1</sup> This module is only 2 hours per week and 3 ECTS in the Autumn Term 2023/2024.

<sup>2</sup> This module has been renamed from Interdisciplinary Project Seminar.

## Course Descriptions

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

5

### Lecturer(s):

Prof. Dr. Mathias Bärtl

### Prerequisites:

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>.

[Back to table of contents.](#)

<b>Behavioral Economics</b>	
<b>Module ID:</b>	WP-32 / B+W0082w
<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>	Seminar paper and presentation
<b>Location:</b>	Campus Gengenbach

**Lecturer(s):**

Dr. Grégory Bartel, MBA

**Prerequisites:**

Basic knowledge of General Psychology and interest in Economics and Neuroscience. Basics of neuroscience will be provided in class and are not a prerequisite.

**Objectives and Competences:**

By the end of the seminar, students should be able to:

- Explain how decisions ought to be made (i.e. rational decision making) and the systematic flaws observed in actual decisions
- Identify factors that influence (or should influence) decisions, including value, probability, uncertainty, delay, mood, and physiological state
- Understand the neurobiological basis of judgment and decision-making
- Apply methods designed at improving human decision-making.

**Contents:**

This course provides an overview of current models and empirical research on cognitive processes involved in human decision-making and judgments under risk and uncertainty.

- Normative theories of decision-making
- Heuristics and biases
- Affective mechanisms of decision-making:
- Value, uncertainty and risk
- Neurobiology of judgement and decision-making
- Behavioral economics and neuroeconomics
- Decision-making and society: “nudging” as public policy
- Decision-making and society: climate (in)action and the attitude-behavior gap

**Literature and Downloads:**

- Kahneman D. (2011). Two Systems. In Farrar, Straus & Giroux (Eds.), *Thinking, Fast and Slow* (pp.19-97). Penguin Books.
- Thaler, R. H., & Sunstein, C. R. (2008). Money, Health. In Yale University Press (Eds.), *Nudge: Improving decisions about health, wealth, and happiness* (pp.105-185). Penguin Books.

[Back to table of contents.](#)

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

**Lecturer(s):**

Dr Michael Stopfkuchen / 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

[Back to table of contents.](#)

<b>Economics</b>	
<b>Module ID</b>	BW-21/ 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>Location</b>	Campus Gengenbach

**Lecturer(s):**

Prof. Dr. Philipp Eudelle

**Prerequisites:**

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

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof. Dr. Andreas Klasen

**Prerequisites:**

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.

[Back to table of contents.](#)

<b>Human Resource Management and Organization</b>	
<b>Module ID</b>	WP-18/ B+W0387
<b>Level</b>	Bachelor
<b>Course Type</b>	Lecture/Exercise
<b>Hours per Week</b>	4
<b>Credits</b>	5
<b>Host Semester</b>	WP4
<b>Examination</b>	Written Exam (90 minutes) + ungraded PA
<b>Location</b>	Campus Gengenbach

**Lecturer(s):**

Prof. Dr. Julia Röderer

**Prerequisites:**

General Business Knowledge

**Objectives and Competences:**

Students are familiar with the human resources and organizational tasks in the company. They understand the relevance of these two areas of responsibility for achieving corporate goals and can apply business management design considerations to human resources and organizational issues. In doing so, they take into account, that the selected organization also has implications for personnel management decisions or that the organization must be adapted in the event of a personnel-related bottleneck (in particular at the job level). Against this background, they are able to assess the success of alternative personnel management and organizational measures and to make appropriate decisions.

**Contents:**

Selection and evaluation of personnel

- Preparation of personnel deployment
- Leadership and cooperation
- Motivation of employees
- Forms of personnel development
- Management in case of crisis
- Introduction based on a practical example
- Basic organizational terms
- Organizational levers
- Design of the organization

**Literature and Downloads:**

- Burkhardt, A., GRoomann, M., & Becker, R., (2018), Commitmentsenkt die Burnoutgefahr. In: Personalführung, 51. Jg., S. 56-60. (Paper)
- Berthel, J., & Becker, F.G. (2017), Personal-Management, München, Schäffer-Poeschel.
- GRoomann, M., et al., (2017), Entscheidung über Maßnahmen zur Senkung des Krankenstands. In: Zeitschrift Führung + Organisation, 86. Jg., S. 298-305. (Paper)
- GRoomann, M., Burkhardt, A., & Venohr, D. (2016), So unterstützen Maßnahmen zur Arbeitszufriedenheit die Kundenzufriedenheit. In: Personal Quarterly, 68. Jg., S. 26-31. (Paper)
- Frese, E., GRoomann, M., & Theuvsen, L. (2019), Grundlagen der Organisation. Wiesbaden, Springer Gabler.
- GRoomann, M., Grundei, J., (2016), Lohnt sich eine Hierarchieabflachung?, In: Board - Zeitschrift für Aufsichtsräte in Deutschland, 2. Jg., S. 161-164. (Paper)

- Galbraith, J.R., (2013), Designing Organizations, San Francisco, Jossey-Bass.
- Ebers, M., Maurer, I., & GRoomann, M., (2011), Organisation. In: W. Busse von Colbe u.a. (Hrsg.), Betriebswirtschaft für Führungskräfte. Stuttgart, S. 170-205, Schäffer-Poeschel.
- Ringlstetter, M., (2008), Humanressourcen-Management, München, Oldenbourg.

[Back to table of contents.](#)

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

**Lecturer(s):**

Mr. Siefert (Guest Lecturer)

**Prerequisites:**

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 behavior on different corporate situations. The course establishes an understanding of how leadership behavior 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

[Back to table of contents.](#)

<b>International Business Project</b>	
<b>Module ID</b>	BW-23/ B+W0162
<b>Level</b>	Bachelor
<b>Course Type</b>	Seminar
<b>Hours per Week</b>	4
<b>Credits</b>	5
<b>Host Semester</b>	BW6
<b>Examination</b>	Project Work
<b>Location</b>	Campus Gengenbach

**Lecturer(s):** Prof Dr Klasen

**Prerequisites:**

**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.

[Back to table of contents.](#)

<b>Sleep and Health</b>	
<b>Module ID:</b>	WP-32 / B+W0081w
<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>	Seminar paper and presentation
<b>Location:</b>	Campus Gengenbach

**Lecturer(s):**

Dr. Grégory Bartel

**Prerequisites:**

No requirements. Basics of neuroscience will be provided in class, and are not a prerequisite.

**Objectives and Competences:**

By the end of the seminar, students should be able to:

- Understand the physiological and neurobiological basis of sleep and wakefulness
- Explore the relationship between sleep and circadian rhythms
- Investigate causes, consequences and treatments of major sleep disorders
- Recognize the importance of good sleep hygiene and the societal relevance of inadequate sleep

**Contents:**

Humans spend roughly one-third of their lives sleeping, but despite how much time is spent in this offline state, why we sleep remains a fascinating mystery.

This course will explore candidate answers and focuses on the daily sleep/wake cycle, the developmental aspects and general functions of sleep, and on its physiological and neural bases:

- Phylogeny of sleep
- Homeostatic and circadian drives
- Neurobiology of sleep and wakefulness
- Sleep deprivation, sleep disorders and treatments
- Dreams and dreaming
- Sleep and health
- Sleep as productivity factor at the workplace

**Literature and Downloads:**

- Moorcroft, W. H., & Belcher, P. (2003). *Understanding sleep and dreaming*. Springer Verlag.
- McNamara, P. (2019). *The Neuroscience of Sleep and Dreams* (Cambridge Fundamentals of Neuroscience in Psychology). Cambridge: Cambridge University Press.

[Back to table of contents.](#)

<b>Social and Intercultural Competences</b>	
<b>Module ID:</b>	WP-06/ B+W0106
<b>Level:</b>	Bachelor
<b>Course Type:</b>	Seminar
<b>Semester Hours per Week:</b>	2
<b>Credits:</b>	3
<b>Host Semester:</b>	WP1
<b>Examination:</b>	Project Work
<b>Location:</b>	Campus Gengenbach

**Lecturer(s):** Dr. Stephanie Simon

**Prerequisites:**

**Objectives and Competences:**

The purpose of this seminar is to develop and improve students' social competence and to sensitize them to diversity in general and to cultural differences in particular. This enables them to reflect their own cultural identities and to interact respectfully and successfully with persons of different cultural backgrounds. Teaching methods include lecture-style presentations, group exercises, and self-reflection in order to encourage personal, in-depth dealing with the concepts of the seminar.

**Contents:**

- What's in the term "competence"?
- Social, emotional and behavioral skills
- Diversity (categories of diversity, theoretical models)
- Culture (possible meanings of the term, cultural dimensions and values, theoretical models)
- Intercultural competence
- Diversity-conscious communication
- Practical considerations, e.g. preparation for potential travels and stays abroad

**Literature and Downloads:**

Provided in class

[Back to table of contents.](#)

<b>Social Psychology</b>	
<b>Module ID</b>	WP-04/ B+W0377
<b>Level</b>	Bachelor
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	4
<b>Credits</b>	5
<b>Host Semester</b>	WP1
<b>Examination</b>	Written Exam
<b>Location</b>	Campus Gengenbach

**Lecturer(s):**

Dr. Stephanie Simon

**Prerequisites:****Objectives and Competences:****Contents:**

- Basic understanding of social psychology and research methods
- Social identity, social groups, and group dynamics
- Group performance and leadership
- Social perception and attribution
- Intergroup relations, stereotypes, and prejudice
- Social influence
- Attitudes and attitude change
- Aggression and violence
- Prosocial behavior and fairness

**Literature and Downloads:**

- Fischer, P., Jander, K. & Krueger, J. (2018) Sozialpsychologie für Bachelor, Heidelberg, Springer.
- Jonas, K., Stroebe, W. et al. (2014), Sozialpsychologie, Heidelberg, Springer.
- Kessler, T. & Fritsche, I. (2017), Sozialpsychologie, Heidelberg, Springer.
- Garms-Homolova, V., (2020), Sozialpsychologie der Einstellungen und Urteilsbildung, Wiesbaden, Springer.

[Back to table of contents.](#)



Software Implementation Project	
Module ID	WIN-26/ B+W0617
Level	Bachelor
Course Type	Lecture
Hours per Week	4
Credits	6
Host Semester	WIN6
Examination	Project presentation and project documentation
Location	Campus Gengenbach

**Lecturer(s):** Prof. Dr. Tobias Hagen

**Prerequisites:** IT affinity, basic understanding in either software development, web development or databases

**Objectives and Competences:**

- Gain experience with software development in a team
- Apply project management techniques
- Further improve various technical skills (depending on the type of project)

**Contents:**

The students implement (parts of) a software system in small teams of 3-5. The topics vary from year to year. Tasks may include modelling, design, programming, and configuration of software components. A special focus is put on the integration of different components like ERP system, web application, and mobile devices. The students work in teams where they use and apply typical project management concepts. All phases of a project are covered.

**Literature and Downloads:**

Depends on the project

[Back to table of contents.](#)

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

**Lecturer(s):** Mrs. Annebeth Demaeght

**Prerequisites:**

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.

[Back to table of contents.](#)

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

### Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
	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	Lab Work

## Course Descriptions

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

21

### Lecturer(s):

Prof. Dr. Tobias Lauer

### Prerequisites:

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

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Pfletschinger

**Prerequisites:**

- Basic knowledge of mathematics for engineers, in particular complex numbers
- Basic knowledge of communications engineering and signal theory

**Objectives and Competences:**

Upon successful completion of this module, the student will be able to:

- understand the functions and the relationship of the main building blocks of a modern receiver including RF processing, modulation, demodulation and digital baseband processing
- implement a basic simulation chain of a digital communication system
- implement a software defined receiver in Matlab

**Contents:**

In this course, students will implement a working digital communication system. The project includes the following steps:

- ▶ Basics of analog and digital communication
- ▶ Simulation of communication systems
- ▶ Software installation and operation of SDR module
- ▶ Spectral analysis of received signals
- ▶ Modulation and demodulation
- ▶ Synchronization at receiver side
- ▶ Data transmission and detection

**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.

[Back to table of contents.](#)

## 2.3 Department of Media

### Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
	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

## Course Descriptions

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

24

### Lecturer(s):

Prof. Dr. Dirk Westhoff

### Prerequisites:

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

[Back to table of contents.](#)



Software Engineering and Lab	
Module ID	UNITS-30/ 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
Location	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Andreas Schaad

**Prerequisites:**

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++)

[Back to table of contents.](#)

## 2.4 Department of Mechanical and Process Engineering

### Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
	x	<a href="#">Basics CAD</a>	Lab	3	Lab Work
	x	<a href="#">Fluid Mechanics</a>	Lecture	5	Written Exam
	x	<a href="#">Innovative Design and Inventive Problem-Solving</a>	Seminar	2	Presentation
x		<a href="#">Materials Engineering Lab</a>	Lab	3	Lab Work
	x	<a href="#">Thermodynamics II - Engines and Machines with Lab</a>	Lecture + Lab	5	Written Exam + Lab Work
	x	<a href="#">Heat Transfer and Lab</a>	Lecture + Lab	6	Oral Exam
	x	<a href="#">System Dynamics and Control</a>	Lecture + Lab	7	Written Exam

## Course Descriptions

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

27

**Lecturer(s):** Prof. Dr. Christian Wetzel

### **Prerequisites:**

- 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, CAD/CIM 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

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr.-Ing. Andreas Schneider

**Prerequisites:**

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)

[Back to table of contents.](#)

<b>Innovative Design and Inventive Problem Solving</b>	
<b>Module ID</b>	MA-29/ 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>	
<b>Examination</b>	Presentation of the semester thesis / with individual grading
<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

<b>Materials Engineering Lab</b>	
<b>Module ID:</b>	MA-16/ 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>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Dipl.-Ing. Dietmar Kohler

**Prerequisites:**

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

[Back to table of contents.](#)

<b>Thermodynamics 2 – Engines and Machines with Lab</b>	
<b>Module ID</b>	MA-23/ M+V826
<b>Level</b>	Bachelor
<b>Course Type</b>	Lecture and Lab
<b>Hours per Week</b>	4
<b>Credits</b>	5
<b>Host Semester</b>	MA6
<b>Examination</b>	Written Exam and Lab Work
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Treffinger

**Prerequisites:**

- 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 reprocating piston compressor
- Combustion Engines: Thermodynamics of combustion engines, selected aspects

**Literature and Downloads:**

- Carravetta, A., Derakhshan Houreh, 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).

[Back to table of contents.](#)



<b>Heat Transfer with lab</b>	
<b>Module and Course ID:</b>	ALABAMA/ M+V437 English class in the context of cooperation with Alabama; exchange students from other universities are welcome to join!
<b>Level:</b>	Bachelor
<b>Course Type:</b>	Lecture and lab
<b>Semester Hours per Week:</b>	4 SWS (If only a very few students enroll in this course, it will be offered as a self-study course with a contact time of 2 SWS)!
<b>Credits:</b>	6 ECTS
<b>Host Semester:</b>	Summer term
<b>Examination:</b>	Oral exam
<b>Location:</b>	Campus Offenburg

**Lecturer(s):** Peter Treffinger/Jörg Ettrich/Andreas Schneider

**Requirements:** Basics of Fluid Dynamics and Thermodynamics

**Objectives and Competences:**

- The students know the heat transfer mechanisms heat conduction, convective heat transport and heat transfer by radiation.
- They can estimate heat transfer coefficients for heat transfer problems with simple boundary conditions.
- They know concepts of similarity relations and the associated dimensionless numbers in the context of heat transfer.
- They are familiar with the design and operation of heat exchangers.
- They are able to calculate and design heat exchangers for simple problems.

**Contents:**

- Introduction
- Heat transfer by conduction
- Convective heat transfer
- Heat exchanger
- Heat transfer by radiation

**Literature and Downloads:**

- von Boeckh, P. & Wetzel, T. Heat Transfer: Basics and Practice Springer, 2012 (available as e-book via the library of HS Offenburg)
- The German standard to heat transfer in English: Gesellschaft, VDI: VDI Heat Atlas. Berlin Heidelberg: Springer Science & Business Media, 2010. (available as e-book via the library of HS Offenburg)
- Thermal Energy Storages: Bauer, T.; Steinmann, W.-D.; Laing, D. & Tamme, R.: Thermal Energy Storage and Systems. Annual Review of Heat Transfer, Begell House, 2012, 15, 131-177  
[https://www.researchgate.net/publication/328032045\\_Review\\_on\\_heat\\_transfer\\_analysis\\_in\\_thermal\\_energy\\_storage\\_using\\_latent\\_heat\\_storage\\_systems\\_and\\_phase\\_change\\_materials](https://www.researchgate.net/publication/328032045_Review_on_heat_transfer_analysis_in_thermal_energy_storage_using_latent_heat_storage_systems_and_phase_change_materials)

Module Description VT (Verfahrenstechnik) Process Engineering  
Department of Mechanical and Process Engineering

Module Heat Transfer

Responsible	<i>tbd</i>		
Program:	Process Engineering	Degree:	Bachelor
ECTS:	6	Workload (h):	180
Recommended Semester:	4	Contact Time (h):	<b>60</b>
Module Duration (Semester):	1	Self-study Time/ Teamwork (h):	<b>120</b>
Teaching Method:	Lecture / Lab	Hours per Week (45 min):	4
Availability:	<b>Summer</b>		
Usability:	Bachelor Process/Mechanical Engineering, Second Study Section		
Recommended Qualifications	<b>Basics of Fluid Dynamics and Thermodynamics</b>		
Competences	<i>Heat and Mass Transfer is an important basis to describe and to dimension processes. The students have to deal with similarity relations and non-dimensional properties in many ways. They know the basics of heat conduction and are able to describe the temperature distribution and to dimension a simple heat exchanger. An application-oriented laboratory experiment illustrates the theory. They also deal with the basics of Radiation and Convection. The students know the basics of mass transfer, phase changes and phase equilibrium. They can deal with drying processes and Adsorption and are able to discuss energetic optimization of those.</i>		

Records and Scores *Written Test, 90 min.*

Course Description

M+V437 Heat and Mass Transport (Lecture/Lab) , 4.0  
Literature:

- *Skript zur Vorlesung*
- *H.D. Baehr und K. Stephan, Wärme- und Stoffübertragung, Springer Verlag Berlin-Heidelberg (2008)*
- *Verein deutscher Ingenieure (Hrsg.), VDI Wärmeatlas, 10. Auflage (2006)*

List of Contents:

- A. Introduction and Basics:  
Heat and Mass Transport in energy technology  
Conservation Equations

Mathematical Tools

Non-dimensional Properties

- B. Heat Transfer:  
Conservation Equations for Energy and Temperature  
Heat Conduction  
Convection  
Radiation  
Heat Sources
- C: Mass Transfer  
Diffusion  
Convection
- D. Heat and Mass Transfer:  
Convective Heat Transport  
Heat Transition
- E. Single Phase Heat Exchanger  
Flow Types  
Operating Characteristics  
Heat Exchanger Efficiency  
Number of Transfer Units  
Log-Mean Temperature Difference  
Experimental Setup / Hands-On
- F. Heat Exchanger with Phase Transition  
Characteristics of Phase Transition  
Melting and Solidification  
Condensation and Evaporation  
Boiling  
Experimental Setup / Hands-On
- G. Examples and Outlook

<b>System Dynamics and Control</b>	
<b>Module and Course ID:</b>	ALABAMA/ M+V828 English class in context of cooperation with Alabama; exchange students from other universities are welcome to join!
<b>Level:</b>	Bachelor
<b>Course Type:</b>	Lecture and lab
<b>Semester Hours per Week:</b>	5 SWS (If only a very few students enroll in this course, it will be offered as a self-study course with a contact time of 2 SWS)!
<b>Credits:</b>	7 ECTS
<b>Host Semester:</b>	Summer term
<b>Examination:</b>	K90 (written exam of 90 minutes duration)
<b>Location:</b>	Campus Offenburg

**Lecturer(s):** Rainer Gasper

**Requirements:** Basics of Mathematics, Electrical Engineering, Physics, Mechanics, Fluid Dynamics, Thermodynamics and Machine Elements/Design

**Objectives and Competences:**

- The students are able to analyse complex systems in Mechanical Engineering and split them into subsystems exchanging signals. They understand a signal as a physical quantity e.g. displacement, force or temperature.
- They are able to describe simple linear systems mathematically and analyse simple systems analytically.
- 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:**

- Definition and Typical Tasks
- System / Signal / Transfer Function
- Complex Numbers / Bode Plot / Root Locus
- Laplace Transformation
- Frequency Response / Illustration of combined Systems
- Important Transfer Functions
- Symbols in EMSR Technology
- Synthesis of Control Circles
- Analytic and Empirical Design Rules
- Stability of Systems

**Literature and Downloads:**

- Regelungstechnik für Ingenieure, M. Reuter (Vieweg, 2000)
- der Vorlesung verteilte Umdrucke, (2000)

**Module Description** MA (Maschinenbau) Mechanical Engineering  
Department of Mechanical and Process Engineering  
Module **System Dynamics and Control**

Responsible	<b>Prof. Dr.-Ing. Ulrich Hochberg</b>		
Program:	Mechanical Engineering	Degree:	Bachelor
ECTS:	7	Workload (h):	210
Recommended Semester:	6	Contact Time (h):	<b>75</b>
Module Duration (Semester):	1	Self-study Time/ Teamwork (h):	<b>135</b>
Teaching Method:	Lecture / Lab	Hours per Week (45 min):	5
Availability:	<b>Winter and Summer</b>	Group Size:	-
Usability:	Bachelor Mechanical Engineering, Second Study Section		
Recommended Qualifications	<b>Basics of Mathematics, Electrical Engineering, Physics, Mechanics, Fluid Dynamics, Thermodynamics and Machine Elements/Design</b>		
Competences	<i>The students are able to analyse complex systems in Mechanical Engineering and split them into subsystems exchanging signals. They understand a signal as a physical quantity e.g. displacement, force or temperature. They are able to describe simple linear systems mathematically and analyse simple systems analytically. 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.</i>		

Records and Scores **Written Test, 90 min.**

**Course Description**  
M+V828 Measurement and Control with Lab (Lecture/Lab) , 5.0  
Literature:

- *Regelungstechnik für Ingenieure, M. Reuter (Vieweg, 2000)*
- *In der Vorlesung verteilte Umdrucke, (2000)*

**List of Contents:**

- *Definition and Typical Tasks*
- *System / Signal / Transfer Function*
  
- *Laplace Transformation*
- *Frequency Response / Illustration of combined Systems*
- *Important Transfer Functions*
- *Symbols in EMSR Technology*
- *Synthesis of Control Circles*
- *Analytic and Empirical Design Rules*
- *Stability of Systems*

## 3 Master Courses

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### 3.1 Faculty Business and Industrial Engineering

#### 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 Analysis</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</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

## Course Descriptions

Business Analytics	
Module 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

38

+++ Please do not confuse this module, Business Analytics, with the module “Business Intelligence”, which is also held by Prof. Dr. Hagen, but in German language.+++

### Lecturer(s):

Prof. Dr. Hagen

### Prerequisites:

Basic knowledge in MS Excel

### 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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Graumann

**Prerequisites:**

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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Mr. Max Bonn (Guest Lecturer)

**Prerequisites:**

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.

[Back to table of contents.](#)





<b>Economic Policy</b>	
<b>Module ID</b>	BWM-06/ B+W1007W
<b>Level</b>	Master
<b>Course Type</b>	Seminar
<b>Hours per Week</b>	4
<b>Credits</b>	6
<b>Host Semester</b>	BWM
<b>Examination</b>	Term Paper
<b>Location</b>	Gengenbach

**Lecturer(s):**

Prof. Dr. Eudelle

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Klasen

**Prerequisites:**

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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Klasen

**Prerequisites:**

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.

[Back to table of contents.](#)

<b>International Economic Law</b>	
<b>Module ID</b>	IBC-07-01
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	2
<b>Credits</b>	3
<b>Host Semester</b>	IBC 1
<b>Examination</b>	Written Exam
<b>Location</b>	Gengenbach

**Lecturer(s):** Prof. Dr. Andreas Klasen

**Prerequisites:**

Basics in Business Administration

**Objectives of the Course:**

At the end of the course, participants will be able to apply selected concepts and basic techniques used in international transactions and/or consulting projects; therefore students will build up expertise to

- understand basic concepts of commercial law, international trade law, international investment law and competition law,
- assess transactional requirements and the problems that threaten the success of trade,
- understand tools in international trade processes and legal structure to further global development, and
- analyse selected issues in international trade and competition policy, the transactional conditions conducive to its development and the specific and general problems which threaten the success and integrity of individual transactions.

**Contents:**

International economic law is related to significant bodies of rules and institutions involved in shaping the 21<sup>st</sup> century international economic order. The subject is not only relevant due to its central role facilitating the integration of global markets, but also because of the opportunity to gain specialist expertise in a very important area of international law and global commerce. The lecture includes, in particular:

- Understanding fundamental principles of the law of the World Trade Organization (WTO). Key topics include sources of WTO law, the relationship between WTO law and international and domestic law, the WTO dispute settlement system, and substantive rules on market access.
- Assessing international law governing foreign investments. Important topics include sources, scope and content of the substantive international law rules that determine investor-state relationships, and discusses their application in practice.
- Analysing crucial elements of competition law and policy. This covers, for example, the role of international organisations and multinational enterprises, competition rules of the EU and the UK, as well as the relationship between competition policy and trade policy.

**Literature and Downloads:**

- Agarwal, A.A. (2017) Business Leadership and Law. New Delhi, Springer.

- Chaisse, J., Choukroune, L. & Jusoh, S. (eds.) (2020) Handbook of International Investment Law and Policy. Singapore, Springer.
- Fatehi, K. & Choi, J. (2019) International Business Management. Cham, Springer.
- Hüscherlath, K. & Schweitzer, H. (eds.) (2014) Public and Private Enforcement of Competition Law in Europe. Heidelberg, Springer.
- Jenny, F. & Katsoulacos, Y. (2016) Competition Law and Enforcement in the BRICS and in Developing Countries. Cham, Springer.
- Klasen, A. (ed.) (2020) The Handbook of Global Trade Policy. Oxford, Wiley.
- Morschett, D., Schramm-Klein, H. & Zentes, J. (2015) Strategic International Management. Wiesbaden, Springer Gabler.
- OECD (2022) Arrangement on officially supported export credits. Paris, OECD

<b>International Financial Management</b>	
<b>Module and Course ID:</b>	BWM-02/ B+W1154
<b>Level:</b>	Master
<b>Course Type:</b>	Lecture
<b>Semester Hours per Week:</b>	2
<b>Credits:</b>	3
<b>Examination:</b>	Written exam
<b>Location:</b>	Gengenbach

**Lecturer(s):** Prof. Dr. Andreas Klasen

47

**Requirements:**

Basics in finance

**Objectives and Competences:**

At the end of the course, participants will be able to apply concepts of international financial management; students will build up expertise to

- develop a critical understanding of key theories, approaches and issues in the field of global financial management,
- apply knowledge and understanding of complex issues to improve business and management practice, and
- understand tools in international financing processes and related legal structures.

**Contents:**

In times of poly-crises and challenging economic conditions, financial management is one of the most dynamic disciplines in the world. This lecture addresses key issues and developments in the sector and aims to provide students with a solid understanding of the changing global context in which firms operate. The lecture includes, in particular:

- Understanding fundamental principles of corporate finance in an international environment.
- Assessing international financial institutions and understand key concepts of public development banks and export credit agencies.
- Analysing crucial elements of financing transactions in an international environment such as trade finance, export finance, development finance, structured finance and project finance.

**Literature and Downloads:**

- Corelli, A. (2018) Analytical Corporate Finance. Cham, Springer.
- Fatehi, K. & Choi, J. (2019) International Business Management. Cham, Springer.
- García, F.J.P. (2017) Financial Risk Management. Cham, Palgrave Macmillan.
- Götze, U., Northcott, D. & Schuster, P. (2015) Investment Appraisal. Berlin Heidelberg, Springer.
- Klasen, A. (ed.) (2020) The Handbook of Global Trade Policy. Oxford, Wiley.
- Morschett, D., Schramm-Klein, H. & Zentes, J. (2015) Strategic International Management. Wiesbaden, Springer Gabler.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Adrian Bekman (Guest Lecturer)

**Prerequisites:**

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

[Back to table of contents.](#)



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

**Lecturer(s):**

Mr A. Gehringer

**Prerequisites:**

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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Mr. Daniel Otte (Guest Lecturer)

**Prerequisites:**

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
- Develop 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 and 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, 16th edition.
- 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, 1st edition, Berlin.

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof. Dr. Dittrich

**Prerequisites:**

Previously acquired knowledge of Logistics is required.

**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).

[Back to table of contents.](#)

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

### 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	5	Written Exam + Lab Work
x		<a href="#">Digital Communications with Lab</a>	Lecture + Lab	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="#">Statistical Signal Processing and Information Theory</a>	Lecture	2	Written Exam
	x	<a href="#">Telecommunication Networks</a>	Lecture	3	Written Exam

## Course Descriptions

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

54

### Lecturer(s):

Prof. Dr. Christian Reich

### Prerequisites:

- 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.

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof Dr Tobias Felhauer

**Prerequisites:****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.

[Back to table of contents.](#)

<b>Automotive Radar</b>	
<b>Module ID:</b>	CME-05/ EMI442
<b>Level:</b>	Bachelor + Master
<b>Course Type:</b>	Lecture
<b>Semester Hours per Week:</b>	2
<b>Credits:</b>	2
<b>Host Semester:</b>	CME
<b>Examination:</b>	Oral Exam
<b>Module:</b>	Electives
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr.-Ing. Marlene Harter

**Prerequisites:**

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

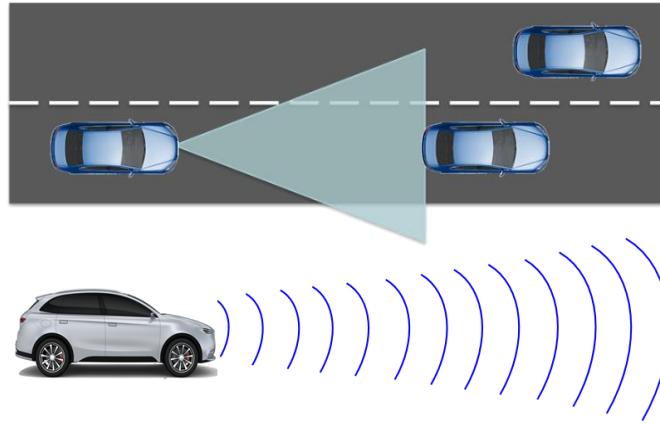
**Objectives and Competences:**

- 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.

[Back to table of contents.](#)

<b>Computer Networks</b>	
<b>Module ID:</b>	CME-03/ E+I407
<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>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Erwin Mayer

**Prerequisites:**

- 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 Dateology 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.

<b>Computer Vision</b>	
<b>Module ID</b>	EIM-15/ EMI407
<b>Level</b>	Master
<b>Course Type</b>	Lecture and Lab
<b>Hours per Week</b>	4
<b>Credits</b>	5
<b>Host Semester</b>	EIM
<b>Examination</b>	Written Exam and Lab Work
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Hensel

**Prerequisites:**

**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/>

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Tobias Felhauer

**Prerequisites:**

- 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.

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof. Dr. Christian Reich

**Prerequisites:****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

[Back to table of contents.](#)

<b>Digital Signals and Systems</b>	
<b>Module ID:</b>	CME-02/ EMI403
<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>	Written Exam
<b>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Stephan Pfletschinger

**Prerequisites:****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 Vandenbergh: *Introduction to Applied Linear Algebra*. Cambridge University Press, 2018.
- Mark Wickert: *Signals & Systems for Dummies*. Wiley, 2013.

[Back to table of contents.](#)

<b>Embedded and Industrial Networks and Lab</b>	
<b>Module ID:</b>	CME-12/ EMI2205 (Lecture) CME-12/ EMI2206 (Lab)
<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>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Axel Sikora

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Andreas Christ

**Prerequisites:****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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Stephan Pfletschinger

**Prerequisites:**

**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.

[Back to table of contents.](#)

<b>Internet of Things</b>	
<b>Module ID</b>	CME-10/ EMI419
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	2
<b>Credits</b>	2
<b>Host Semester</b>	CME
<b>Examination</b>	Written Exam
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr.-Ing. Axel Sikora

**Prerequisites:**

- 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

[Back to table of contents.](#)



<b>Microwave Lab</b>	
<b>Module ID</b>	CME-06/ 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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Marlene Harter

**Prerequisites:****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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Stephan Pfletschinger

**Prerequisites:****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, 2003
- Alan V. Oppenheim, Alan S. Willsky: Signals & Systems. Pearson, 2013.
- Alan V. Oppenheim, George V. Verghese: Signals, Systems and Inference. Pearson, 2017.

## 3.3 Department of Media

### 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="#">IT SEC Lab Work</a>	Lab	12	Term Paper
	x	<a href="#">Marketing<sup>3</sup></a>	Lecture	3	Term Paper
	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>	Lecture Lab Lab	7	Written Exam
	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

<sup>3</sup> The module Marketing will run for the last time in the spring term of 2023.

## Course Descriptions

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

77

**Lecturer(s):** Prof Dr Daniel Hammer

**Prerequisites:**

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
- Bäumler/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

[Back to table of contents.](#)

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

78

**Lecturer(s):**

Prof Dr Daniel Hammer

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Erik Zenner

**Prerequisites:**

- 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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Erik Zenner

**Prerequisites:**

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

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof Dr Volker Sanger

**Prerequisites:****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.

[Back to table of contents.](#)

<b>Database Systems Lab</b>	
<b>Module ID</b>	CME-21/ M+I411
<b>Level</b>	Master
<b>Course Type</b>	Lab
<b>Hours per Week</b>	1
<b>Credits</b>	1
<b>Host Semester</b>	CME
<b>Examination</b>	Lab Work
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Volker Sänger

**Prerequisites:****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

[Back to table of contents.](#)

<b>Data Analysis for Risk and Security Management</b>	
<b>Module ID</b>	ENITS-07/ M+I812
<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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Dirk Drechsler

**Prerequisites:**

- 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.

[Back to table of contents.](#)

<b>Data Mining</b>	
<b>Module ID</b>	ENITS-02/ 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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Janis Keuper

**Prerequisites:**

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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Janis Keuper

**Prerequisites:**

See M+I803 Data Mining

**Objectives of the Course:**

TBD

**Contents:**

See M+I803 Data Mining

**Literature and Downloads:**

See M+I803 Data Mining

[Back to table of contents.](#)

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

**Lecturer(s):** Prof Dr Westhoff, Prof Dr Erik Zenner

**Prerequisites:**

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.

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof Dr Janis Keuper

**Prerequisites:**

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.

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof. Dr. Tom Rüdebusch

**Prerequisites:**

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.

[Back to table of contents.](#)

Interactive Media	
<b>Module ID:</b>	CME-21/ 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>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Roland Riempp

**Prerequisites:**

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

[Back to table of contents.](#)

<b>Intercultural Media Design + IMD Lab</b>	
<b>Module ID:</b>	CME-22/ M+I403 (Seminar) CME-22/ M+I404 (Lab)
<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>Location:</b>	Campus Offenburg

**Lecturer(s):**

Prof. Daniel Fetzner / Prof. Dr. Robert Gücker

**Prerequisites:**

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: kisdediton
- Ware, Colin (2008): Visual Thinking. Burlington: Penros

[Back to table of contents.](#)

<b>IT SEC Lab Work</b>	
<b>Module ID</b>	ENITS-06/ 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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Daniel Hammer

**Prerequisites:**

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:**

[Back to table of contents.](#)

<b>Marketing</b>	
<b>Module ID</b>	CME-42/ 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>Location</b>	Campus Offenburg

+++ This seminar takes place on Saturdays. +++

++++ This module will run for the last time in Spring term 2023. ++++

**Lecturer(s):**

Ms. Christine Miclau

**Prerequisites:**

**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.

[Back to table of contents.](#)



<b>Mobile Security</b>	
<b>Module ID</b>	ENITS-08/ 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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Dirk Westhoff

**Prerequisites:**

- 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

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof Dr Dirk Westhoff

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

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

**Prerequisites:**

- 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:**

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Sanger

**Prerequisites:**

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. Geron: 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

[Back to table of contents.](#)

<b>Network Security in Multimedia Systems</b>	
<b>Module ID</b>	CME-24
<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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Hammer

**Prerequisites:****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>

[Back to table of contents.](#)

<b>Next Generation Internet</b>	
<b>Module ID</b>	CME-24
<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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Schmidt

**Prerequisites:****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

[Back to table of contents.](#)

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

**Lecturer(s):** Prof Dr Andreas Schaad

**Prerequisites:**

- 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>

[Back to table of contents.](#)



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

**Lecturer(s):**

Prof Dr Andreas Schaad

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Andreas Schaad

**Prerequisites:**

- 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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof Dr Andreas Schaad

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

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

109

**Prerequisites:**

- 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>)

[Back to table of contents.](#)



## 3.4 Department of Mechanical and Process Engineering

### Course List

Autumn Term	Spring Term	Course Name	Course Type	Credits	Exam Type
	x	<a href="#">Dynamic Modelling of Energy Systems</a>		4	Written Exam
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="#">Operations Research in Energy Economics</a>	Lecture	4	Written Exam
	x	<a href="#">Power Electronics and Grid Control</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 Lecture + Seminar	8	Written Exam
x		<a href="#">Process Control Engineering</a>	Lecture	2	Written Exam
	x	<a href="#">Renewable Energy Systems</a>	Lecture + Lab	5	
x		<a href="#">Solar Technologies</a>	Lecture	4	Written Exam
x		<a href="#">Tools to Manage Environmental Affairs</a>	Lecture + Lab	2	Term Paper

## Course Descriptions

Dynamic Modelling of Energy Systems	
Module ID	RED
Level	Master
Course Type	
Hours per Week	4
Credits	4
Host Semester	ECM-S-2, ECM-W-3; Required Elective
Examination	Written exam 120 minutes
Location	

112

### Lecturer(s):

Prof. Dr. Peter Treffinger

### Prerequisites:

Knowledge of thermal and electrical engineering would be helpful, but is not a prerequisite.

### Objectives of the Course:

The students learn how to represent mathematical models in the form of differential-algebraic equations (DAE). Thereby energy conversion systems and their components serve as examples for modeling.

The students get an overview of the selection of numerical solvers for DAE; they know the Modelica modelling language and master the principles of physical modelling in Modelica.

The students learn how to apply libraries, namely the Modelica standard library (MSL) and to organize and structure large models.

Finally, the students are able to develop their own models according to the respective requirements.

### Contents:

1. From physical plants to differential-algebraic equations
2. Mathematical representation of differential-algebraic equations – signal-oriented (causal) vs. equation-based causal approaches
3. Characteristics of modern modelling and simulation languages (objects, inheritance, multi-domain approach)
4. Modelica language (Types, classes, equations, algorithms, etc.)
5. Modelica libraries (Structure, Modelica Standard Library, etc.)
6. Solving problems with Dymola (GUI, building models by means of libraries, building own models, initialization, modelling of discontinuities)

### Literature and Downloads:

Lecture Notes

TILLER, M. D.: Introduction to physical modeling with Modelica. Norwell (MA): Kluwer Academica Publishers, 2004.

Lecture and exercises: For each student is a student license available that can be installed on your own computer!)

[Back to table of contents.](#)



<b>Energy Economics</b>	
<b>Module ID</b>	RED-01/M+V3037
<b>Level</b>	Master
<b>Course Type</b>	Lecture and Practical Work
<b>Hours per Week</b>	4
<b>Credits</b>	4
<b>Host Semester</b>	RED
<b>Examination</b>	Written exam 90 minutes
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Niklas Hartmann

**Prerequisites:****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.

[Back to table of contents.](#)

<b>Energy Storage, Conversion and Transport</b>	
<b>Module ID</b>	RED-03/ M+V3047
<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>	RED
<b>Examination</b>	Written Exam 90 minutes
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Wolfgang Bessler/Prof. Dr. Daniel Kray

**Prerequisites:**

**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.

[Back to table of contents.](#)

<b>Energy Systems Engineering</b>	
<b>Module ID</b>	RED-07/ M+V735
<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>	RED
<b>Examination</b>	Written Exam
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Niklas Hartmann

**Prerequisites:****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.

[Back to table of contents.](#)

<b>Energy Usage in Industrial Processes</b>	
<b>Module ID</b>	RED-04/ M+V3048
<b>Level</b>	Master
<b>Course Type</b>	Lecture and Seminar
<b>Hours per Week</b>	4
<b>Credits</b>	4
<b>Host Semester</b>	RED
<b>Examination</b>	Written Exam 90 minutes
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Peter Treffinger

**Prerequisites:**

**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

[Back to table of contents.](#)

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

**Lecturer(s):**

Ms. Zumholz (Guest Lecturer)

**Prerequisites:**

- 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)

[Back to table of contents.](#)

<b>Grid Control, Analysis, Planning and Coordination</b>	
<b>Module ID</b>	RED-11/ M+V3052
<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>	RED
<b>Examination</b>	Written Exam
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof Dr Grit Köhler

**Prerequisites:****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.

[Back to table of contents.](#)

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

**Lecturer(s):**

Prof. Dr. Niklas Hartmann

**Prerequisites:****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 RED-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.

[Back to table of contents.](#)

<b>Power Electronics and Grid Control</b>	
<b>Module ID</b>	RED-10
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	4
<b>Credits</b>	4
<b>Host Semester</b>	RED
<b>Examination</b>	Written Exam 120 minutes
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Mr. Wolfgang Diener

**Prerequisites:**

**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:**

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

[Back to table of contents.](#)



<b>Power Plants and Power Systems</b>	
<b>Module ID</b>	RED-02
<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>	Written Exam 180 minutes
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Andreas Schneider

**Prerequisites:****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.

[Back to table of contents.](#)

<b>Power Plants</b>	
<b>Module ID</b>	RED-02/ 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>	Written exam
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Andreas Schneider

**Prerequisites:**

**Objectives of the Course:**

Please note: This module must be taken together with the other components of RED-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

[Back to table of contents.](#)

<b>Power Systems (Energiesysteme)</b>	
<b>Module ID</b>	RED-02/ 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>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Andreas Schneider

**Prerequisites:**

**Objectives of the Course:**

Please note: This module must be taken together with the other components of RED-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

[Back to table of contents.](#)

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

**Lecturer(s):**

**Prerequisites:**

**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)

[Back to table of contents.](#)

<b>Renewable Energy Systems</b>	
<b>Module ID</b>	RED-08
<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>	RED
<b>Examination</b>	Written Exam 60 minutes Lab experiments and reports
<b>Location</b>	Campus Offenburg

**Lecturer(s):** Prof. Dr. Michael Schmidt

**Prerequisites:**

**Objectives of the Course:**

**Contents:**

Lecture:

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

Lab:

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:**

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

[Back to table of contents.](#)

<b>Solar Technologies</b>	
<b>Module ID</b>	RED-07/ M+V730
<b>Level</b>	Master
<b>Course Type</b>	Lecture
<b>Hours per Week</b>	4
<b>Credits</b>	4
<b>Host Semester</b>	RED
<b>Examination</b>	Written Exam
<b>Location</b>	Campus Offenburg

**Lecturer(s):**

Prof. Dr. Daniel Kray

**Prerequisites:**

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

[Back to table of contents.](#)

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

**Lecturer(s):**

**Prerequisites:**

**Objectives of the Course:**

TBD

**Contents:**

TBD

**Literature and Downloads:**

[Back to table of contents.](#)



## 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.

Some classes are put on for specific degree courses; interested exchange students should please enquire beforehand if there are still spaces available for them to join. The email of the Language Center is [sprachenzentrum@hs-offenburg.de](mailto:sprachenzentrum@hs-offenburg.de).

“**Blockkurs**” – This is a compact and intensive course that typically covers the same content as a semester-long course, but in a shorter time frame (one (3 ECTS) or two (5 ECTS) weeks). Due to the registration process and the application times, usually only exchange students who stay a complete academic year can join the courses in February and/or March. Classes in February are allocated to the autumn term and classes in March are allocated to the summer term.

The most current list of the classes, lectures and the class descriptions are on the webpage of the Language Centre: [Language Center: Hochschule Offenburg \(hs-offenburg.de\)](http://Language Center: Hochschule Offenburg (hs-offenburg.de))

### ECTS TABLE FOR LANGUAGE COURSES

All language classes – with one exception – follow the same format of either 2 hours per week and 3 ECTS or 4 hours per week and 5 ECTS.

Course	Hours per week (SWS)	Corresponding ECTS
Any language	2	3
Any language	4	5
German for CME	6	CME-Students: 2



### Language classes

WINTERSEMESTER/AUTUMN TERM 2023/2024

At the time of publication, the program is usually not complete and may still change. More current Information can be found on our [Website](#).

Seminar	Hours/Week	Audience	Lecturer	Dates
<b><u>English</u></b> <b>Campus Offenburg</b>				
<b>Business English (B2) (Blockkurs)</b>	2	all	Bianca Elliott	During Semester Break 25.09.-30.09.23

Advanced English (C1)	2	all	Julia Kölling	Tue or Wed
Englisch f. Medienschaffende (B2) (English for students of the M faculty)	2	M	David Potter	WED 14:00
Technisches Englisch (B2) (Technical English)	2	all	David Potter	WED 15:45
Technisches Englisch (B2) BT3 only	2	BT3	Kevin Parr	THU 08:00
Technisches Englisch (B2) UT3 only	2	UT3	Kevin Parr	THU 09:45
German Culture and Society	2	all	Dörte Zumholz	TUE 17:30
<i>Seminar</i>	<i>Hours/ Week</i>	<i>Audience</i>	<i>Lecturer</i>	<i>Date</i>
<b><u>English</u></b>				
<b><i>Campus Gengenbach</i></b>				
Wirtschaftsenglisch (B2) BW (Business English)	4	BW1/ Group A	Chuck Cashdollar	FRI 09:45 + 11:35
Wirtschaftsenglisch (B2) BW	4	BW1/ Group B	Philippa Dart- Cleiß	FRI 09:45 + 11:35
Wirtschaftsenglisch (B2) BW	4	BW1/ Group C	David Potter	FRI 09:45 + 11:35
Wirtschaftsenglisch (B2) LH	4	LH1 / Group A	Chuck Cashdollar	WED 09:45 + 11:35
Wirtschaftsenglisch (B2) LH	4	LH1 / Group B	Philippa Dart- Cleiß	WED 09:45 + 11:35
Wirtschaftsenglisch (B2) WI, WIN and WP	2	Bachelor WI,WIN,W P	Kiersta Halseth	Starting 3.11.22 THU 17:00
Wirtschaftsenglisch (B2) WI, WIN und WP *new*	2	Bachelor WI,WIN,W P	TBA	TBA
Advanced Business English (B2) Master	2	Master B+W	Kevin Parr	FRI 09:45
Technisches Englisch (B2) WI (Blockkurs)	2	WI	Kevin Parr	During Semester break 25.09.-30.9.23
<b><u>French</u></b>				
<b><i>Campus Gengenbach</i></b>				
Französisch A1.2 (French)	2	all	Marie-Ch. Nicaud	FRI 09:45
<b><u>French</u></b>				
<b><i>Campus Offenburg</i></b>				
Französisch B1.1 (French)	2	all	Marie- Ch.Nicaud	FRI 11:35

<b><u>Spanish</u></b>				
<b>Campus Offenburg</b>				
Spanisch A1.2 (Spanish)	2	all		<b>WED 15:45</b>
Spanisch A2.2	2	all		
Spanisch B1.2	2	all		
<i>Seminar</i>	<i>Hours/ Week</i>	<i>Audience</i>	<i>Lecturer</i>	<i>Date</i>
<b><u>Other languages</u></b>				
<b>Campus Offenburg</b>				
Japanisch I (Blockkurs) (Japanese)	2	all	K. Müller-Shibayama	<b>Compact Course September 25.09.-30.09.23</b>
Japanisch III (Blockkurs)	2	all	K. Müller-Shibayama	During Semester Break 19.02.-24.2.24
Chinesisch I (Blockkurs) (Chinese)	2	all	Chengqi Song	During Semester Break 25.09.-30.09.23
Chinesisch II	2	all	Chengqi Song	<b>FRI 14:00</b>
Polnisch I (A1.1) (Polish)	2	all	Roman Zukowsky	<b>THU 8:00</b>
<b><u>German</u></b>				
<b>Campus Offenburg</b>				
Deutsch A1.1 (German)	4	all	Oday Al Kassab	<b>WED 14:00 + 15:45</b>
Deutsch CME (hybrid)	<b>6</b>	<b>all</b>	<b>Astrid Listner</b>	TUE 14:00 (online) WED 14:00 + 15:45 (on campus)
Deutsch A1.2	4	all	Frau Almert	<b>WED 14:00 + 15:45</b>
Deutsch A2.1	4	all	Anika Meckesheimer	<b>WED 14:00 + 15:45</b>
Deutsch A2.2	4	all	Alexandra Bruni	<b>WED 14:00 + 15:45</b>
Deutsch B1.1	4	all	Kornelia Klein	<b>WED 14:00 + 15:45</b>
Deutsch B2.1	4	all	Birgitta Fruttiger	<b>WED 14:00 + 15:45</b>
Deutsch B2.2	4	all	Frau Ihm	<b>WED 14:00 + 15:45</b>
Deutsch C1.1	4	all	N.N.	<b>WED 14:00 + 15:45</b>
<b><u>German</u></b>				
<b>Campus Gengenbach</b>				
German Language I (A1.1)	4	IBC	Susanne Ramm-Weber	<b>TUE 14:00 + 15:45</b>
German Language III (A2.1)	4	IBC	Susanne Schmidt- Lossau	<b>MON 14:00 + 15:45</b>
German Language V (B1.1)	4	IBC	Bettina Krück- Roblin	<b>MO 14:00 + 15:45</b>

[Back to table of contents.](#)