Description of the degree program

Industrial Engineering Specialized in Electrical Engineering (Master)

PO 5

Date: 25.02.2026

Table of contents

Compulsory Modules

Title	Ambits of Electromagnetic Field Theory		
Number	2419110	**Module version**	
Shorttext	ET-IEMV-11	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	Written exam (120 min) or oral exam (30 min)		
Course achievement			

Contents

- Energetic considerations, Poynting theorem, equivalent circuit
- Potentials in the dynamic case, Hertzian dipole and radiation, approximations for the field descriptions
- Analytical calculation methods and examples, numerical field calculation

Objective qualification

The students can explain the structure of the Maxwell equations in differential form, herefrom derive the fully dynamic field solution of the Hertzian dipole and, depending on the special case, give reasons for idealized approximate solutions. By this they can analyze fundamental electrotechnical configurations and abstract to the essential details. They can choose and apply appropriate solution methods for example for energetic problems, Poynting theorem and temporal and spatial variable fields. They can integrate electromagnetic interactions into the Schrödinger equation of quantum mechanics and solve elementary problems in this context. They are familiar with applications of field theory in the field of antenna design.

Literature

Remark

Students can either choose this module or the module "Advanced Applications of Field Theory". It is not possible to attend both.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Exercise	german

Major Specialisation: Information Technologies - Compulsory Elective Modules

Title	Electromagnetic Theory for Microwave Engineering		
Number	2415490	**Module version**	
Shorttext	ET-IHF-49	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 6,0	**Module owner**	Prof. Dr. Jörg Schöbel
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	written examination 90 minutes or oral examination 30 minutes or homework assignments or semester project assignment (§ 4)		
Course achievement			

Contents

- Theory of time-harmonic electromagnetic fields (Maxwell’s equations, wave equation, Poynting’s theorem, uniqueness theorem, reciprocity)
- Methods of calculation (vector potentials, Lorenz gauge, solution of the (in)homogeneous wave equation, source integrals, Green’s function)
- Eigenmodes of waveguides, surface waves, leaky waves
- Radiation fields (Huygens’ principle, image theory, Fresnel and Fraunhofer approximations)
- Introduction to the numerical solution of electromagnetic problems (FDTD, method of moments, eigenmode expansion)
- Exemplary implementation of solution methods in Matlab or Python
- simulation of electromagnetic structures using commercial 3D-EM-software

Objective qualification

After completing the module, students will have in-depth knowledge and a well-founded conceptual understanding of the theory of electromagnetic waves with respect to the solution of the homogeneous wave equation (waveguide structures) as well as of the inhomogeneous wave equation (antennas). They have become familiar with different analytical and numerical solution methods for electromagnetic problems and exemplarily implemented selected methods as well as applied them in the context of commercial 3D-EM software. They will be able to select problem-adapted solution methods and to apply them competently to electromagnetic problems.
According to the didactic concept of the course and the design of its individual parts, interdisciplinary qualifications are conveyed and practiced. In the context of assignments, colloquia and presentations these are scientific writing and documentation, scientific discussions and presentation techniques as well as teamwork in the laboratory or within team project assignments.

Literature

Harrington, Time-harmonic Electromagnetic Fields, Wiley & Sons, ISBN 047120806X
Unger, Elektromagnetische Theorie für die Hochfrequenztechnik I + II, Hüthig, ISBN 377851573X, ISBN 3778515748

Pozar, Microwave Engineering, Wiley & Sons, ASIN B001QA4I9C

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	1,0	Exercise	german
	1,0	Practical exercise	german

Title	New Architecture and Protocols in Communication Networks		
Number	2416760	**Module version**	
Shorttext	ET-IDA-76	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Admela Jukan
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min) or oral exam (30 min)		
Course achievement			

Contents

- Introduction to broadband communication
- Broadband access networks
- Optical Networks
- Control and management of broadband networks
- Wireless broadband networks
- Applications of broadband networks

Objective qualification

After completing this module, students will have in-depth knowledge of architectures and signaling protocols of new architecture and protocols in advanced communication networks, including the access networks, core and backone networks, optical transport networks, wireless networks and virtual private networks, such as data center networks and campus networks. The fundamentals learned enable students to design, analyze and evaluate new protocols, services and network architectures.

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

	2,0	Lecture	german
Literature			
Include latest research papers, tutorials and industrial standards			

	1,0	Exercise	german

Title	Coding Theory		
Number	2424420	**Module version**	
Shorttext	ET-NT-42	**Language**	english german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Kürner
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	Oral exam (20 min) or written exam (120 min)		
Course achievement	Colloquium or lab journal		

Contents

- Introduction
- Fundamentals of information theory
- Basics of channel coding
- Single-error-correcting block codes
- Block codes for correcting burst errors
- Convolutional codes
- Special coding techniques

Objective qualification

Upon completion of the module, students will have an understanding of the information-theoretical limits of data transmission and will have acquired knowledge of source and channel coding methods in theory and application. Students will be able to assess the performance of source and channel coding methods and construct simple codes.

Literature

Lecture notes
H.Rohling: Einführung in die Informations- und Codierungstheorie, Teubner
R.Togneri, C.J.S. deSilva: Fundamentals of Information Theory and Coding Design, Chapman&Hall/CRC
H.Schneider-Obermann: Kanalcodierung, Vieweg

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Coding Theory	2,0	Lecture	english german
Literature			
Vorlesungsskript H. Rohling: Einführung in die Informations- und Codierungstheorie, Teubner R. Togneri, C. J. S. de Silva: Fundamentals of Information Theory and Coding Design, Chapman&Hall/CRC H. Schneider-Obermann: Kanalcodierung, Vieweg			

Coding Theory	1,0	Exercise	english german
Literature			
siehe Vorlesung			

Computer exercise on Coding Theory	1,0	Laboratory	english german

Title	Information Theory		
Number	2424720	**Module version**	
Shorttext	ET-NT-72	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Eduard Jorswieck
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min) or oral exam (30 min)		
Course achievement			

Contents

- Basics from probability theory
  - Event, probability, random variable, random vector, stochastic process, convergence of random series, convergence theorems
- Basics from information theory
  - Measures for discrete random varaibles: entropy, conditional entropy, relativ entropy, mutual information, conditional mutual information, inequalities
  - Measures for continous random variables: differential entropy, conditional differential entropy, relative entropy, mutual information, inequalities
  - Measure for random series
  - Typical sequences and asymptotic equipartition property
- Source and source coding
  - Definition and properties
  - Source coding for discrete memoryless sources (fixed and variable-length)
  - Selected source codes: Morse, Huffman, Shannon-Fano-Elias
- Data transmission and channel capacity
  - Discrete memoryless channel: channel coding theorem
  - Discrete memoryless channel with state: channel capacities
  - Gaussian channel: model and channel coding theorem
  - Bandlimited Gaussian channel, vector valued channels

Objective qualification

The lecture provides an introduction to the fundamentals of Shannon information theory. The goal is that students can derive the main information theoretic results on maximal achievable lossless (source coding) and lossy (rate distortion theory) compression of data and on maximum data rates for reliable data transmission (channel coding). The methods and tools required, e.g., information measures (entropy, mutual information, capacity etc.) and their properties (typical sequences) will be covered as well as practical applicable simple codes (block, turbo and polar codes).

Literature

#R.W. Yeung: Information Theory and Network Coding, Part I, Springer, 2008.
R.W. Yeung: A First Course in Information Theory, Springer, 2002.
T.M. Cover und J.A. Thomas: Elements of Information Theory, Wiley-Interscience, 2006.

R.G. Gallager: Information Theory and Reliable Communication, Wiley, 1968.
R.G. Gallager: Principles of Digital Communication, Cambridge University Press, 2008.
S. Moser: S. Moser: Information Theory, https://moser-isi.ethz.ch/scripts.html#it

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Information Theory	2,0	Lecture	german
Literature			
- R.W. Yeung: Information Theory and Network Coding, Part I, Springer, 2008. - R.W. Yeung: A First Course in Information Theory, Springer, 2002. - T.M. Cover und J.A. Thomas: Elements of Information Theory, Wiley-Interscience, 2006. - R.G. Gallager: Information Theory and Reliable Communication, Wiley, 1968. - R.G. Gallager: Principles of Digital Communication, Cambridge University Press, 2008. - S. Moser: S. Moser: Information Theory, https://moser-isi.ethz.ch/scripts.html#it			

Information Theory	1,0	Exercise	german
Literature			
- R.W. Yeung: Information Theory and Network Coding, Part I, Springer, 2008. - R.W. Yeung: A First Course in Information Theory, Springer, 2002. - T.M. Cover und J.A. Thomas: Elements of Information Theory, Wiley-Interscience, 2006. - R.G. Gallager: Information Theory and Reliable Communication, Wiley, 1968. - R.G. Gallager: Principles of Digital Communication, Cambridge University Press, 2008. - S. Moser: S. Moser: Information Theory, https://moser-isi.ethz.ch/scripts.html#it			

Major Specialisation: Energy Systems and Drive Technologies/Powertrain - Compulsory Elective Modules

Title	Applied Power Electronics		
Number	2414230	**Module version**	
Shorttext	ET-IMAB-23	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Regine Mallwitz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	written exam (120 min) or oral exam (30 min)		
Course achievement			

Contents

- Power electronics and electromagnetic compatibility (EMC)
- EMC guidelines and filter circuits
- Power Factor Correction (PFC)
- Resonant power converters
- Quasi-resonant circuits
- Multi-level converters

Objective qualification

After completing the module, students will acquire knowledge of legal requirements regarding electromagnetic compatibility. They will learn the structure, function, application and design of passive and active filter circuits. An important aspect here is to obtain a mains current that is as sinusoidal as possible in phase with the mains voltage with the help of so-called power factor correction (PFC). Students should understand how resonant power converters and quasi-resonant circuits work and how they are used, also by means of simulations. Finally, they should be able to understand the structure and function of multi-level converters. They will be able to conceptually design, dimension and analyse (also by simulation) corresponding assemblies.

Literature

Grundkurs Leistungselektronik, Joachim Specovius, Vieweg-Verlag
Applikationshandbuch Leistungshalbleiter, Semikron, ISLE-Verlag

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture	german

Literature
- Skript - DIN 41750: "Begriffe für Stromrichter", Beuth Verlag GmbH, 1984 - Jötten, R.: "Leistungselektronik", Vieweg Verlag, Braunschweig, 1977 - Heumann/Stumpe: "Thyristoren", Teubner Verlag, Stuttgart, 1970

	2,0	Exercise	german

Title	A.C. Drive Systems and their Computer Simulation		
Number	2414250	**Module version**	
Shorttext	ET-IMAB-25	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	5 / 5,0	**Module owner**	Prof. Dr. Markus Henke
Workload (h)	150		
Class attendance (h)	70	**Self studying (h)**	80
Compulsory requirements			
Recommended requirements	Knowledge from Fundamentals of Electrical Power Engineering (Part 2: Electromechanical energy conversion) is recommended		
Expected performance/ Type of examination	Written exam (120 min) or oral exam (30 min)		
Course achievement			

Contents

- Overview of converter-fed drive systems: energy supply, power semiconductors, motors, loads
- Modelling and simulation of the components in the drive system
- Application of space vector theory
- Hardware in the loop methods
- Simulation of electromagnetic converters, numerical simulation programmes
- Practical simulation exercises with various simulation tools

Objective qualification

After completing the module, students can select drive systems and simulate simple electromechanical systems.

Literature

Schröder D., Elektrische Antriebe - Grundlagen, Springer 2009
Seefried / Müller, Frequenzgesteuerte Drehstrom-Asynchronantriebe, Verlag Technik Berlin, 1992

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

	3,0	Lecture	german
Literature			
R. Fischer, Elektrische Maschinen, Hanser, ISBN-13: 9783446452183 Binder A.: Elektrische Maschinen und Antriebe, Springer ISBN 978-3-540-71850-5			

	2,0	Exercise	german

Title	Electric Power Systems Engineering		
Number	2423550	**Module version**	
Shorttext	ET-HTEE-55	**Language**	english
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Michael Kurrat
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	oral examination (30 minutes) or presentation (20 minutes plus scientific talk with examination character)		
Course achievement			

Contents

- Discussion of power system overvoltages
- Calculation of electric fields
- Statistical analysis of ionization and breakdown phenomena
- Calculation of the breakdown of gases (SF6), liquids (insulating oil), solids, and composite materials, as well as the breakdown characteristics of long air gaps
- Description of insulation systems currently used in high-voltage engineering, including air insulation and insulators in overhead power transmission lines, gas-insulated substation (GIS) and cables, oil-paper insulation in power transformers, paper-oil insulation in high-voltage cables, and polymer insulation in cables
- Examination of contemporary practices in insulation coordination in association with the International Electrotechnical Commission (IEC) definition and the latest standards.

Objective qualification

The students have fundamental knowledge of Power Systems and special or in-depth expertise for High-Voltage Systems
Engineering.
They learn methods with the help of discipline experiments and simulations and interpret / evaluate texts and data from
Power Systems.
They are able to make scientifically sound judgments within the scope of High-Voltage and formulate research problems.
The students are able to select an adequate level of abstraction for a given research problem and work on that level.
They can assess the scientific value of High-Voltage research and can formulate development or application problems.
For Power Systems Engineering they have a systematic approach characterized by the application and development of
theories, models and coherent interpretations and they can use scientific theories / model concepts.
They reflect critically on their own way of thinking, their decisions and actions and are able to think logically (recognize
fallacies and deceptions) and critically interpret scientific data (origin, completeness, relevance, etc.) and formulate a wellfounded

opinion.
They can communicate to others in writing and orally the results of the scientific work in the given examples and behave
professionally (in the sense of reliability, commitment, correctness, precise work, perseverance, independence, etc.).
The students work task-related and target-oriented in the learning group and deal with group-dynamic processes. They
analyze social, economic or cultural consequences of new developments in High-Voltage Transmission.

Literature

- High Voltage Engineering Farouk A.M. Rizk, Giao N. Trinh CRC Press 2014
- High Voltage Engineering: Fundamentals - Technology - Applications Küchler, Andreas VDI-Buch 2018

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture	english

Literature

High Voltage Engineering Farouk A.M. Rizk, Giao N. Trinh CRC Press 2014 High Voltage Engineering: Fundamentals - Technology - Applications Küchler, Andreas VDI-Buch 2018

	2,0	Exercise	english

Title	Electrical Systems and Grids		
Number	2423560	**Module version**	
Shorttext	ET-HTEE-56	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Bernd Engel
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 min) or written exam (120 min)		
Course achievement			

Contents

Line and network types
Equivalent circuits of the networks
Electrical characteristics of the equipment
Calculation of lines and networks
Network control
Short circuit and load flow calculation
Stability
Protective measures

Objective qualification

After completing the module, students will be able to understand the structure and operation of electrical power supply networks from extra-high to low voltage. The basics they have learnt enable them to independently analyse networks in the event of operation and faults.

Literature

Elektrische Energieversorgung, K. Heuck, Vieweg Elektrische Kraftwerke und Netze, D. Oeding, Springer

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language

	1,0	Exercise	german
	2,0	Lecture	german

Title	Control of Electrical Devices		
Number	2412680	**Module version**	
Shorttext	ET-IFR-68	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Markus Henke
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 min) or written exam (60 min), depending on number of participants		
Course achievement			

Contents

motion equation and non-stationary movement, heating processes, dynamic behaviour of DC and AC motor drives, servo drives with inverters, control of inverter drives with DC and AC motors, sensor-less field-oriented control

Objective qualification

Students understand the models of DC and AC motor drives and the mathematical concept of space vectors and can utilise them in simulations. They know the control structures for the motor types DC motor, asychronous machine and synchronous machine with and without speed sensor. They can design and analyse their own control structures and tune the control parameters. They understand sensors commonly used in drive systems like compensated current sensor, resolver, incremental angular sensor and the corresponding evaluation functions. They can use the principle of space vector modulation and similar modulation methods to design their own hardware and software.

Literature

- W. Leonhard: Regelung elektrischer Antriebe, Springer-Verlag, ISBN: 978-3540671794
- W. Leonhard: Control of elektrical Drives, Springer-Verlag, ISBN: 978-3540418207

Remark

Requirements: Lecture „Fundamentals of control technologies“

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Exercise	german

Title	Introduction to power grid technology		
Number	2423000020	**Module version**	
Shorttext		**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	elenia Institut für Hochspannungstechnik und Energiesysteme
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Michael Kurrat
Workload (h)	150		
Class attendance (h)	70	**Self studying (h)**	80
Compulsory requirements			
Expected performance/ Type of examination	Oral exam 30 min.		
Course achievement			

Contents

- Nodes in the network, all voltage levels
- Basics of networks: Grounding system, Error types
- Isolation Coordination
- Thermal and mechanical stress
- Protection Systems
- Switching operations: Component network interface
- Switches: AC and DC extinguishing principle
- Fundamentals of Plasma Technology
- Vacuum switch
- Gas switch
- DC Voltage Switches
- Transformer
- Structure of switchgear and basic circuits used

Objective qualification

After successful completion of the module, students will have knowledge of key technologies, structure and function of future power grids. They are able to understand their complex interaction and derive requirements for components in order to ensure the operation and protection of the power grids in a wide variety of system states. In addition, they are able to apply the knowledge imparted in the design of switches at all voltage levels for direct and alternating current of the power grids. On the basis of excursions and exercises, the knowledge is applied and insiqhts into practice are provided.

Literature

Adil Erk und Martin Schmelzle. Grundlagen der Schaltgerätetechnik: Kontaktglieder und Löscheinrichtungen elektrischer Schaltgeräte der Energietechnik. Berlin: Springer, 1974. ISBN: 3-540-06075-8

W. Rieder. Plasma und Lichtbogen. Braunschweig: Friedr. Vieweg & Sohn GmbH, 1967

Josef Lutz. Halbleiter-Leistungsbauelemente: Physik, Eigenschaften, Zuverlässigkeit. 2. Aufl. Berlin and Heidelberg: Springer Vieweg, 2012. ISBN: 978-3-642-29795-3

Andreas Küchler. Hochspannungstechnik: Grundlagen - Technologie -Anwendungen. 3., neu bearbeitete und erweiterte Auflage. VDI-Buch. Heidelberg et al.: Springer, 2009. ISBN: 978- 3-540-78412-8

Stefan Kopatsch und Gerald Kopatsch. ABB Schaltanlagen-Handbuch 13. Auflage. Wurth und Körner, Werbung und Design, 68163 Mannheim

Remark

This module replaces "Elektrische Energieanlagen 2/Betriebsmittel" ("Electrical Power Systems 2").

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Introduction to power grid technology	2,0	Lecture	german

Literature

Adil Erk und Martin Schmelzle. Grundlagen der Schaltgerätetechnik: Kontaktglieder und Löscheinrichtungen elektrischer Schaltgeräte der Energietechnik. Berlin: Springer, 1974. ISBN: 3-540-06075-8

W. Rieder. Plasma und Lichtbogen. Braunschweig: Friedr. Vieweg & Sohn GmbH, 1967

Josef Lutz. Halbleiter-Leistungsbauelemente: Physik, Eigenschaften, Zuverlässigkeit. 2. Aufl. Berlin and Heidelberg: Springer Vieweg, 2012. ISBN: 978-3-642-29795-3

Andreas Küchler. Hochspannungstechnik: Grundlagen - Technologie -Anwendungen. 3., neu bearbeitete und erweiterte Auflage. VDI-Buch. Heidelberg et al.: Springer, 2009. ISBN: 978- 3-540-78412-8

Stefan Kopatsch und Gerald Kopatsch. ABB Schaltanlagen-Handbuch 13. Auflage. Wurth und Körner, Werbung und Design, 68163 Mannheim

Introduction to power grid technology	2,0	Exercise	german

Literature

Adil Erk und Martin Schmelzle. Grundlagen der Schaltgerätetechnik: Kontaktglieder und Löscheinrichtungen elektrischer Schaltgeräte der Energietechnik. Berlin: Springer, 1974. ISBN: 3-540-06075-8

W. Rieder. Plasma und Lichtbogen. Braunschweig: Friedr. Vieweg & Sohn GmbH, 1967

Josef Lutz. Halbleiter-Leistungsbauelemente: Physik, Eigenschaften, Zuverlässigkeit. 2. Aufl. Berlin and Heidelberg: Springer Vieweg, 2012. ISBN: 978-3-642-29795-3

Andreas Küchler. Hochspannungstechnik: Grundlagen - Technologie -Anwendungen. 3., neu bearbeitete und erweiterte Auflage. VDI-Buch. Heidelberg et al.: Springer, 2009. ISBN: 978- 3-540-78412-8

Stefan Kopatsch und Gerald Kopatsch. ABB Schaltanlagen-Handbuch 13. Auflage. Wurth und Körner, Werbung und Design, 68163 Mannheim

Major Specialisation: Photonics and Quantum Technologies - Compulsory Elective Modules

Title	Nano- and Bioelectronic Systems		
Number	2413560	**Module version**	
Shorttext	ET-IHT-56	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Tobias Voß
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Oral exam (30 minutes) or written exam (120 minutes), depending on number of participants		
Course achievement			

Contents

Introduction to nanotechnology
growth, nanostructuring and characterization processes and tools (lithography, microscopy, raster probe technique, spectroscopy, nanotubes, nanowires, nanoparticles, hybrid nanostructures
bio-organic functionalization of surfaces (Langmuir-Blodgett, self-assembled monolayers on metals and semiconductors)
semiconductor nano- and biosensors based on different inorganic and organic nanomaterials
hybrid nanostructures for optoelectronics

Objective qualification

After completion of the module Nano- and Bioelectronic Systems, the students possess
- a basic understanding of the most important techniques for the preparation and characterization of inorganic and hybrid nanoelectronic systems (nanoparticles, nanotubes, nanowires, quantum well structures)
- the ability to combine acquired fundamental knowledge to understand and evaluate advanced semiconductor-based nano and biosensors as well as nanoscale hybrid optoelectronic devices

Literature

"Nanoelectronics and Information Technology. Advanced Electronic Materials and Novel Devices", R. Waser (Ed.), Wiley-VCH, 2nd Ed. (2005): ISBN-13: 978-3527405428
"Springer Handbook of Nanotechnology", B. Bhushan (Ed.), Springer, 2nd. Ed. (2006): ISBN-13: 978-3540298557

Remark

primarily master module

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
Literature			
"Nanoelectronics and Information Technology. Advanced Electronic Materials and Novel Devices", R. Waser (Ed.), Wiley-VCH (2003) "Springer Handbook of Nanotechnology", B. Bhushan (Ed.), Springer (2004)			

	1,0	Exercise	german
Literature			
"Nanoelectronics and Information Technology. Advanced Electronic Materials and Novel Devices", R. Waser (Ed.), Wiley-VCH (2003) "Springer Handbook of Nanotechnology", B. Bhushan (Ed.), Springer (2004)			

Title	Optoelectronics		
Number	2415290	**Module version**	
Shorttext	ET-IHF-29	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Wolfgang Kowalsky
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min) or oral exam (30 min) or presentation		
Course achievement			

Contents

- Propagation of electromagnetic waves in free space and in guiding structures
- Refraction, reflexion, total reflexion at dielectric interfaces
- Optical guiding in film and strip waveguides, mechanisms of losses
- Optical modes and theoretical description
- field distribution in step and gradient profiles, analogy to quantum mechanics
- Periodic structures to distributed feedback: DFB, DBR
- Electrooptical interaction, directional couplers

Objective qualification

After completion of the module students have gained knowledge in the functional mechanisms and the design of devices for integrated optics, particularly of waveguides. They are able to apply these competences in the analysis of optoelectronic systems with regard to device and circuit level and to qualify and optimize these systems.

Literature

K. J. Ebeling, Integrierte Optoelektronik, Springer, ISBN 3540546553

↑

Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language

	2,0	Lecture	german
	1,0	Exercise	german

Title	Nonlinear Photonics		
Number	2415470	**Module version**	
Shorttext	ET-IHF-47	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Schneider
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	Written exam, 90 minutes, or oral exam, 30 minutes		
Course achievement			

Contents

- Basics of linear optics
- 2nd order nonlinear optical effects
- 3rd order nonlinear optical effects
- Nonlinear scattering
- Optical telecommunications
- Nonlinear effects in optical fibers
- Suppression of nonlinear effects
- Applications of nonlinear effects

Objective qualification

After a successful participation, the students know the main basics of nonlinear photonics and will be able to use them for the evaluation of optical systems and optical data transmission systems.

Literature

T. Schneider "#Nonlinear Optics in Telecommunications#", Springer Verlag

↑

Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Nonlinear Photonics	2,0	Lecture	english

Nonlinear Photonics	2,0	Exercise	english

Title	Analog Integrated Circuits		
Number	2420150	**Module version**	
Shorttext	ET-BST-15	**Language**	english
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Vadim Issakov
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	Oral exam 30 min		
Course achievement			

Contents

All modern mobile radio applications (e.g. GSM, WLAN, GPS, Bluetooth, Dect. etc.) use analog receiver and transmitter circuits that are composed of a few elementary circuit blocks. For cost reasons, these are increasingly being integrated in low-cost CMOS technology, which results in significant differences to the classic design of high-frequency circuits based on discrete components. The lecture gives an introduction to the design of analog, integrated CMOS mobile radio receiver circuits.

The lecture is divided into the following chapters:
- High frequency amplifier circuits
- Simulation of electronic noise
- Low-noise input amplifiers in CMOS
- Mixer circuits
- Phase-locked loops (PLLs)
- Voltage-controlled oscillators

Objective qualification

After completing the module, students will have acquired knowledge of analog receiver and transmitter circuits in CMOS technology and have an advanced understanding of the design and function of modern analog integrated circuits for mobile radio applications (e.g. high-frequency amplifier circuits and simulation of electronic noise).

Literature

Thomas H. Lee " The Design of CMOS Radio-Frequency Integrated Circuits" Cambridge University Press

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Related courses			
Rules for the choice of courses			
Prerequisite for this module: Circuit Design (ST)			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Analog Integrated Circuits (2013)	1,0	Exercise	english
Analog Integrated Circuits (2013)	2,0	Lecture	english

Title	Gallium Nitride Technology		
Number	2413000030	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	Institut für Halbleitertechnik
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Andreas Waag
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min) or oral exam (30 min)		
Course achievement			

Contents

The course builds on ‘Lighting Technology I’. While Lighting Technology I focusses on general questions of lighting and lighting technology, this course discusses LED technology and gallium nitride technology in particular:

- Physical principles of LEDs. Band gap engineering in LEDs.
- Semiconductor materials for optoelectronics
- Relationship between material properties and LED properties
- Manufacturing processes
- Efficiency considerations
- Front-end and back-end processing
- Application examples in general lighting, automotive technology, sensor technology
- Infrared LEDs, visible light, UV LEDs

Objective qualification

After completing the module, students will have an overview of the current state of LED technology and the development opportunities that solid state lighting will offer in the future. In addition, they will have a basic understanding of the physical processes within LEDs.

Literature

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Gallium Nitride Technology	2,0	Lecture	german
Gallium Nitride Technology	1,0	Exercise	german

Major Specialisation: Metrology and Measurement Technology - Compulsory Elective Modules

Title	Fundamentals of Nano Optics		
Number	1520430	**Module version**	
Shorttext	PHY-AP-43	**Language**	english
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Stefanie Kroker
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Written exam (120 min) or oral exam (30 min)		
Course achievement			

Contents

1. Basic concepts (photonic cristals, plasmonics)
2. Production and characterisation (metrology) of nano structures
3. Photonic nano materials / meta materials / meta surfaces
4. Optic nano emitters and nano antennae
5. Active photonic elements

Objective qualification

The participants can describe basic phenomena of light propagation (reflection, scattering, absorption, transmission) at interfaces and in homogeneous media qualitatively and quantitatively.
Participants can name important basic elements of nanooptics, such as waveguides, optical gratings, photonic crystals or metamaterials, discuss their properties qualitatively and name fields of application.
Participants are able to identify the basic elements in complex optical systems and describe their respective functions.
The participants can name important processes of micro- and nanostructuring and explain how they work.
The participants can solve the wave equation in simple dielectric, metallic and hybrid nanooptical systems analytically and semi-analytically and interpret the solutions.
Participants can classify optical resonance phenomena in nanooptical systems and name their essential properties.

Literature

Novotny, Hecht: Principles of nano-optics, Cambridge University Press 2016
Prasad: Nanophotonics, John Wiley & Sons 2004
Jahns, Helfert: Introduction to Micro- and Nanooptics, Wiley VCH 2012

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Fundamentals of Nano Optics	2,0	Lecture	english
Fundamentals of Nano Optics	1,0	Exercise	english

Title	Sensors with Lab		
Number	2411160	**Module version**	
Shorttext	ET-EMG-16	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	Institut für Elektrische Messtechnik und Grundlagen der Elektrotechnik
Hours per Week / ECTS	6 / 8,0	**Module owner**	Prof. Dr. Meinhard Schilling
Workload (h)	240		
Class attendance (h)	84	**Self studying (h)**	156
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 min); written exam (120 min) only in case of large numbers of participants		
Course achievement			

Contents

- Characteristics of measuring sensors
- Temperature measurement
- Magnetic field measurement
- Optical sensors
- Measurement of geometric quantities
- Measurement of dynamometric quantities
- Flow measurement

Objective qualification

After completing the module ‘Sensors for non-electrical quantities’, students will have an overview of the use and dimensioning of electrical sensors for non-electrical quantities. The in-depth fundamentals enable the selection, use and error assessment of modern sensors. In accordance with the didactic concept of the course and the design of the individual components, interdisciplinary qualifications are taught and practised. In the context of papers, colloquia and final presentations, these include scientific writing and documentation, dialogue and presentation techniques as well as teamwork in the laboratory or project.

Literature

- P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag), ISBN 978-3486225921
- H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart), ISBN 978-3519061250
- J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag), ISBN 978-3540622314 ?#8226? J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig), ISBN 978-3446219779

↑

Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			

	2,0	Exercise	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			

	3,0	Laboratory	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			

Title	Digital signal processing with microcontrollers with experiments		
Number	2411170	**Module version**	
Shorttext	ET-EMG-17	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	5 / 6,0	**Module owner**	Prof. Dr. Meinhard Schilling
Workload (h)	180		
Class attendance (h)	70	**Self studying (h)**	110
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 min); written exam (120 min) only in case of large numbers of participants		
Course achievement			

Contents

Statistical treatment of measurement data,
Interpolation of measurement data,
Signal analysis: discrete (DFT) and fast (FFT) Fourier transformation
z-transform: digital filters, correlation, simulation of a closed control loop,
Controller and controlled system as IIR and FIR filters.
Assembly language of microprocessors
Implementation of digital signal processing algorithms in assembler and C

Objective qualification

After completing the module ‘Digital Measurement Data Processing with Microcomputers’, students will have an overview of the functionality and programming of microcontrollers for measurement data processing. The
acquired practical knowledge enables the programming of embedded systems for metrological applications. In accordance with the didactic concept of the course and the design of the individual components, interdisciplinary skills are taught and practised. In the context of papers, colloquia and final presentations, these include scientific writing and documentation, dialogue and presentation techniques as well as teamwork in the laboratory or project.

Literature

A multimedia CD-ROM with lecture notes and exercises is offered for the lecture
- Weber, H.: Laplace Transformation, Teubner Verlag, Stuttgart, 1984, ISBN 978-3519001416
- Doetsch, G.: Anleitung zum praktischen Gebrauch der Laplace-Transformation und der z-Transformation, Oldenbourg Verlag, München, Wien, 1985, ISBN 978-3486298451
- Stearns, S.D.: Digitale Verarbeitung analoger Signale, Oldenbourg Verlag, München, Wien, 1979, ISBN 978-3486245288
- Birk, H.; Swik, R.: Mikroprozessoren und Mikrorechner und ihre Anwendung in der Automatisierungstechnik, Oldenbourg Verlag, München, Wien, 1983, ISBN 978-3486244328

↑

Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture	german

Literature

- Weber, H.: Laplace Transformation, Teubner Verlag, Stuttgart, 1984
- Doetsch, G.: Anleitung zum praktischen Gebrauch der Laplace-Transformation und der z-Transformation, Oldenbourg Verlag, München, Wien, 1985
- Stearns, S.D.: Digitale Verarbeitung analoger Signale, Oldenbourg Verlag, München, Wien, 1979
- Birk, H.; Swik, R.: Mikroprozessoren und Mikrorechner und ihre Anwendung in der Automatisierungstechnik, Oldenbourg Verlag, München, Wien, 1983

	1,0	Exercise	german

Literature

- Weber, H.: Laplace Transformation, Teubner Verlag, Stuttgart, 1984
- Doetsch, G.: Anleitung zum praktischen Gebrauch der Laplace-Transformation und der z-Transformation, Oldenbourg Verlag, München, Wien, 1985
- Stearns, S.D.: Digitale Verarbeitung analoger Signale, Oldenbourg Verlag, München, Wien, 1979
- Birk, H.; Swik, R.: Mikroprozessoren und Mikrorechner und ihre Anwendung in der Automatisierungstechnik, Oldenbourg Verlag, München, Wien, 1983

Title			
Number	2413580	**Module version**	
Shorttext	ET-IHT-58	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Tobias Voß
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 minutes) or written exam (120 minutes), depending on number of participants		
Course achievement	Presentation		

Contents

Basic laser technology
generation of ultrashort laser pulses
characterization of laser beams and laser pulses
spectroscopy with sub-nanosecond time resolution
basics of nonlinear optics
light-matter interaction
laser-based material processing of semiconductors
modern spectroscopy methods in semidonductor technology

Objective qualification

Students will be familiar with the functionality of modern laser systems used in the field of semiconductor technology and can explain their mode of operation based on theoretical models. They can describe the interaction of laser light with matter theoretically. They analyze optical emission spectra (luminescence, plasma, Raman scattering, time-resolved signals) and can draw conclusions about material and interaction processes. They know the basic processes of laser material processing, especially with modern ultrashort pulse lasers. They can describe nonlinear optical processes theoretically and understand their significance for laser-based methods in semiconductor technology. They record optical spectra from laser-based processes under guidance and independently prepare a scientific evaluation and interpretation, which they present in a short presentation.

Literature

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	1,0	Exercise	german

Title	Microwave and Wireless Metrology		
Number	2424530	**Module version**	
Shorttext	ET-NT-53	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Kürner
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 min)		
Course achievement			

Contents

- Introduction to metrology
- Fundamentals of high-frequency technology
- Measurements in the time domain
- Spectrum analysis
- Vector network analysis
- Antenna measurement technology
- Channel measurements
- Protocol measurement technology

Objective qualification

The lecture deals with the basics of modern communication measurement technology. Students will learn about the measurement of signals and transmission characteristics in the time and frequency domain, antenna measurement technology, protocol measurement technology and channel measurement, which are essential for understanding and using state-of-the-art measuring devices, for example in the field of mobile communications. After completing the module, students will be able to use current measurement systems in research and development independently.

Literature

- Slides
- C.Rauscher: Grundlagen der Spektrumanalyse, Rohde & Schwarz, 2004
- M.Hiebel: Grundlagen der vektoriellen Netzwerkanalyse, Rohde & Schwarz, 2007
- A.Molisch: Wireless Communications, Wiley, 2005

Remark

↑

Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
Literature			
- Foliensammlung - C.Rauscher: Grundlagen der Spektrumanalyse, Rohde & Schwarz, 2004 - M.Hiebel: Grundlagen der vektoriellen Netzwerkanalyse, Rohde & Schwarz, 2007 - A.Molisch: Wireless Communications, Wiley, 2005			

	2,0	Exercise	german
Literature			
- Foliensammlung - C.Rauscher: Grundlagen der Spektrumanalyse, Rohde & Schwarz, 2004 - M.Hiebel: Grundlagen der vektoriellen Netzwerkanalyse, Rohde & Schwarz, 2007 - A.Molisch: Wireless Communications, Wiley, 2005			

Title	Gallium Nitride Technology		
Number	2413000030	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	Institut für Halbleitertechnik
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Andreas Waag
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	Written exam (90 min) or oral exam (30 min)		
Course achievement			

Contents

The course builds on ‘Lighting Technology I’. While Lighting Technology I focusses on general questions of lighting and lighting technology, this course discusses LED technology and gallium nitride technology in particular:

- Physical principles of LEDs. Band gap engineering in LEDs.
- Semiconductor materials for optoelectronics
- Relationship between material properties and LED properties
- Manufacturing processes
- Efficiency considerations
- Front-end and back-end processing
- Application examples in general lighting, automotive technology, sensor technology
- Infrared LEDs, visible light, UV LEDs

Objective qualification

After completing the module, students will have an overview of the current state of LED technology and the development opportunities that solid state lighting will offer in the future. In addition, they will have a basic understanding of the physical processes within LEDs.

Literature

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Gallium Nitride Technology	2,0	Lecture	german
Gallium Nitride Technology	1,0	Exercise	german

Major Specialisation: Autonomous Intelligent Systems - Compulsory Elective Modules

Title	Sensors with Lab		
Number	2411160	**Module version**	
Shorttext	ET-EMG-16	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	Institut für Elektrische Messtechnik und Grundlagen der Elektrotechnik
Hours per Week / ECTS	6 / 8,0	**Module owner**	Prof. Dr. Meinhard Schilling
Workload (h)	240		
Class attendance (h)	84	**Self studying (h)**	156
Compulsory requirements			
Expected performance/ Type of examination	oral exam (30 min); written exam (120 min) only in case of large numbers of participants		
Course achievement			

Contents

- Characteristics of measuring sensors
- Temperature measurement
- Magnetic field measurement
- Optical sensors
- Measurement of geometric quantities
- Measurement of dynamometric quantities
- Flow measurement

Objective qualification

After completing the module ‘Sensors for non-electrical quantities’, students will have an overview of the use and dimensioning of electrical sensors for non-electrical quantities. The in-depth fundamentals enable the selection, use and error assessment of modern sensors. In accordance with the didactic concept of the course and the design of the individual components, interdisciplinary qualifications are taught and practised. In the context of papers, colloquia and final presentations, these include scientific writing and documentation, dialogue and presentation techniques as well as teamwork in the laboratory or project.

Literature

- P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag), ISBN 978-3486225921
- H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart), ISBN 978-3519061250
- J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag), ISBN 978-3540622314 ?#8226? J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig), ISBN 978-3446219779

↑

Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			

	2,0	Exercise	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			

	3,0	Laboratory	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			

Title	Automated Road Vehicles: from Assistance to Autonomy		
Number	2412620	**Module version**	
Shorttext	ET-IFR-62	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Markus Maurer
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	Written exam (60 min) or oral exam (30 min)		
Course achievement			

Contents

-probabilistic knowledge representation for driver assistance and vehicle guidance systems
- radar-based and visual machine perception
- machine situation detection and behavioural decision-making
- human-machine-interaction
- design and test of driver assistance and vehicle guidance systems

Objective qualification

After completing this module, students will have basic knowledge of driver assistance systems and automated vehicles. They are familiar with the current state of the art in driver assistance systems and automated driving functions and know about the function-determining factors. The students are able to independently plan customer-value driver assistance systems and systems for vehicle automation.

Literature

- Handbook of Driver Assistance Systems;
Basic Information, Components and Systems for Active Safety and Comfort; Editors: Winner, H., Hakuli, S., Lotz, F.,
Singer, C. (eds.); 1. Edition 2016 Springer;
available free of charge for students via Springer-Link

Remark

The course “Automotive Systems Engineering” provides helpful background knowledge for this course; however, it is not a mandatory prerequisite for participation.

↑

Related courses
Rules for the choice of courses
Only one of the three modules ET-IFR-42, ET-IFR-58, ET-IFR-62 can be chosen.
Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture	german

Literature
- Hermann Winner (Hrsg.), Stephan Hakuli (Hrsg.), Gabriele Wolf (Hrsg.): Handbuch Fahrerassistenzsysteme Grundlagen, Komponenten und Systeme für aktive Sicherheit und Komfort, Springer, 3. Auflage 2015, ISBN: 978-3658057336 - R. Bishop. Intelligent Vehicle Technology and Trends, Artech House, Boston, 2005, ISBN: 978-1580539111 - M. Maurer, C. Stiller. Fahrerassistenzsysteme mit maschineller Wahrnehmung, Springer, Heidelberg, 2005, ISBN: 978-3540232964 - S. Thrun, W. Burgard, D. Fox. Probabilistic Robotics

	2,0	Exercise	german

Literature
- Hermann Winner (Hrsg.), Stephan Hakuli (Hrsg.), Gabriele Wolf (Hrsg.): Handbuch Fahrerassistenzsysteme Grundlagen, Komponenten und Systeme für aktive Sicherheit und Komfort, Springer, 3. Auflage 2015, ISBN: 978-3658057336 - R. Bishop. Intelligent Vehicle Technology and Trends, Artech House, Boston, 2005, ISBN: 978-1580539111 - M. Maurer, C. Stiller. Fahrerassistenzsysteme mit maschineller Wahrnehmung, Springer, Heidelberg, 2005, ISBN: 978-3540232964 - S. Thrun, W. Burgard, D. Fox. Probabilistic Robotics

Title	Advanced Computer Architecture		
Number	2416520	**Module version**	
Shorttext	ET-IDA-52	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Selma Saidi
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Expected performance/ Type of examination	oral exam (20 min)		
Course achievement			
Contents			
Objective qualification			
Literature			
- J. L. Hennessy & David A. Patterson, "Computer Architecture - A Quantitative Approach (4th rev. Edition)", Academic Press, ISBN 978-0123704900 - additional materials during lectures			

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	1,0	Exercise	german

Title	Pattern Recognition		
Number	2424690	**Module version**	
Shorttext	ET-NT-69	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Tim Fingscheidt
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	Oral exam 30 min. or written exam 90 min.		
Course achievement			

Contents

- Bayesian decision rule
- Quality metrics in pattern recognition
- Supervised learning with parametric distributions
- Supervised learning with non-parametric distributions, classification
- Linear discriminant functions, single-layer perceptron
- Support vector machines (SVMs)
- Multi-layer perceptron, neural networks (NNs)
- Deep learning
- Unsupervised learning, clustering methods

Note: For pattern recognition using hidden Markov models (HMMs), a separate more in-depth module, Spoken Language Processing (ET-NT-68), is offered in the summer semester.

Objective qualification

Upon completion of this module, students gain fundamental knowledge about methods and algorithms for classification of data. They are capable to select the appropriate means for real-world problems, to design a solution and to evaluate it.

Literature

- R.O. Duda, P.E. Hart, D.G. Stork: Pattern Classification, Wiley, 2001
- C.M. Bishop: Pattern Recognition and Machine Learning, Springer, 2006

Remark

Basic knowledge of statistics, such as acquired in the module "Probability Theory and Statistics", facilitates the understanding of the lecture.

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	SWS	Eventtype	Language
	2,0	Lecture	english german

Literature
- R. O. Duda, P. E. Hart, D. G. Stork: Pattern Classification, Wiley, 2001 - C. M. Bishop: Pattern Recognition and Machine Learning, Springer, 2006

	2,0	Seminar	english german

Literature
- Vorlesungsfolien - R. O. Duda, P. E. Hart, D. G. Stork: Pattern Classification, Wiley, 2001 - C. M. Bishop: Pattern Recognition and Machine Learning, Springer, 2006

Laboratory Courses

Title	Laboratory Courses		
Number	2499660	**Module version**	
Shorttext	ET-STDE-50	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	2	**Institution**	
Hours per Week / ECTS	1 / 10,0	**Module owner**	
Workload (h)	330		
Class attendance (h)	1	**Self studying (h)**	1
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

↑

Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Electronics measurement internship	3,0	Internship	german
Literature			
Internship script			

	3,0	Laboratory	german
Literature			
P. Profos und T. Pfeiffer: Handbuch der industriellen Messtechnik (R. Oldenbourg Verlag) H. Schaumburg: Sensoren (B.G. Teubner Verlag Stuttgart) J. Hoffmann: Messen nichtelektrischer Größen (VDI Verlag) J. Hoffmann: Taschenbuch der Messtechnik (Fachbuchverlag Leipzig)			
	4,0	Laboratory	german
	3,0	Laboratory	german
	3,0	Laboratory	german
Literature			
Skript			
	3,0	Laboratory	german
Literature			
Skript zum Herunterladen.			
	3,0	Laboratory	german
Literature			
Skript			
Laboratory practical course indoor lighting	2,0	Laboratory	german
Literature			
DIN 5035-5			
	2,0	Internship	german
	2,0	Internship	german
	2,0	Internship	german
	1,0	Laboratory	english
Literature			
Skript zum Praktikum			
	4,0	Internship	german
	4,0	Internship	german
	4,0	Internship	german
	5,0	Internship	german
Literature			
J. Liebeherr und M. El Zarki,: Mastering Networks -An Internet Lab Manual-, Pearson, 2004, ISBN: 0-201-78134-4			

	4,0	Internship	german
Literature			
J. Liebeherr und M. El Zarki,: Mastering Networks -An Internet Lab Manual-, Pearson, 2004, ISBN: 0-201-78134-4			

	4,0	Internship	german

	2,0	Internship	german
Literature			
J. Liebeherr und M. El Zarki,: Mastering Networks -An Internet Lab Manual-, Pearson, 2004, ISBN: 0-201-78134-4			

	5,0	Internship	english

	5,0	Internship	german
Literature			
Skript			

	4,0	Internship	german

	2,0	Internship	german

	2,0	Internship	german

	2,0	Internship	german

	2,0	Laboratory	german
Literature			
siehe Vorlesung			

	2,0	Laboratory	german
Literature			
siehe Vorlesung			

	2,0	Laboratory	german
Literature			
siehe Vorlesung			

	2,0	Laboratory	german
Literature			
siehe Vorlesung			

	2,0	Laboratory	german
Literature			
siehe Vorlesung			

	4,0	Internship	german
Literature			
Skripte (Download: https://www.tu-braunschweig.de/ifn/lehre/praktika-und-labore/skripte)			

	3,0	Laboratory	german

	4,0	Laboratory	german
Literature			
- R.O. Duda, P.E. Hart, D.G. Stork: Pattern Classification, Wiley, 2001 - C.M. Bishop: Pattern Recognition and Machine Learning, Springer, 2006 - I. Goodfellow, Y. Bengio, A. Courville: Deep Learning, MIT Press, 2016			

	3,0	Internship	german

	4,0	Internship	german

	5,0	Internship	english
Literature			
• Book: Network of Things Engineering (NoTE) Lab • Herausgeber: # Springer; 1st ed. 2023 Edition (10. Januar 2023) • Sprache: # Englisch • Gebundene Ausgabe: # 240 Seiten • ISBN-10: # 3031206347 • ISBN-13: # 978-3031206344			

	5,0	Internship	german
Literature			
• Book: Network of Things Engineering (NoTE) Lab • Herausgeber: # Springer; 1st ed. 2023 Edition (10. Januar 2023) • Sprache: # Englisch • Gebundene Ausgabe: # 240 Seiten • ISBN-10: # 3031206347 • ISBN-13: # 978-3031206344			

Computer Network Engineering Lab - CNE Lab	5,0	Internship	english
Literature			
For literature, we will use the Mastering Networks book and the instructions based on it. Liebeherr, Jorg, and Magda El Zarki. Mastering Networks: An Internet Lab Manual. Addison-Wesley Longman Publishing Co., Inc., 2003.			

Network of Things Engineering Domain Lab – NoTED Lab	5,0	Internship	english
Literature			
For literature, we will use the NoteLab script, or the instructions based on it.			

Computer Lab Pattern Recognition	4,0	Laboratory	english german
Literature			
Christopher M. Bishop, Nasser M. Nasrabadi, “Pattern Recognition and Machine Learning”, Springer 2006 Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press 2016			

Practical course in lasers and coherent optics	3,0	Laboratory	german
Literature			
- Skript zum Praktikum - zusätzlich kann auf die vorlesungsbegleitende Literatur zurückgegriffen werden. Ergänzende Unterlagen werden während des Praktikums verteilt.			

Low-Power Embedded Systems Laboratory	5,0	Laboratory	english
Literature			
Tutorials and example code will be provided on Gitlab. Further literature: - Edward A. Lee and Sanjit A. Seshia: Introduction to Embedded Systems, A Cyber- Physical Systems Approach, Second Edition, MIT Press, ISBN 978- 0-262-53381-2, 2017. - P. Marwedel: Embedded System Design, Springer, ISBN 978- 3-030-60909-2, 2021. - G.C. Buttazzo: Hard Real- Time Computing Systems. Springer Verlag, ISBN 978- 1-4614-0676-1, 2011. - M. Wolf: Computers as Components – Principles of Embedded System Design. Morgan Kaufman Publishers, ISBN 978-0-128-05387-4, 2016. - Avelino J. Gonzalez: Computer Programming in C for Beginners, Springer, ISBN 978-3-030-50752-7, 2020. - Joseph Yiu. The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors. Newnes, 2013.			

Laboratory AI safety assurance in automated driving	4,0	Laboratory	german

Laboratory: AI applications in automated driving	4,0	Internship	german

	5,0	Internship	german
Literature			
J. Liebeherr und M. El Zarki,: Mastering Networks -An Internet Lab Manual-, Pearson, 2004, ISBN: 0-201-78134-4			

	5,0	Internship	german
Literature			
J. Liebeherr und M. El Zarki,: Mastering Networks -An Internet Lab Manual-, Pearson, 2004, ISBN: 0-201-78134-4			

Autonomous Drone Tracking	5,0	Internship	english
Literature			
Tutorials and example codes will be provided on StudIP.			

	5,0	Internship	english german
Literature			
Tutorials and example codes will be provided on StudIP.			

Specialisation Economic Sciences - Compulsory Elective Modules

Title	Orientation Economics		
Number	2212150	**Module version**	V2
Shorttext	WW-VWL-15	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Volkswirtschaftslehre
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Felix Rösel
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		

Contents

Selected topics from urban and regional economics:

Location theories
Spatial structure and sector theories
Regional economic growth theories

Selected topics from cost-benefit analysis:

Fundamentals of welfare theory
Theory of cost-benefit analysis (and other ex ante analysis methods)
Application of cost-benefit analysis in transport, health, environment and other subject areas

Objective qualification

Students have in-depth knowledge of the structure, functioning and efficiency of different market forms and can determine government measures to improve market outcomes. They are able to apply previously learnt economic thinking to the political system. Students specialise in one area of economics and become familiar with the latest research findings.

Literature

Urban and regional economics:

Farhauer, Oliver, Kröll, Alexandra: Location theories: Regional and urban economics in theory and practice, Springer, current edition.
Maier, Gunther, Tödtling, Franz: Stadt- und Regionalökonomik 1: Standorttheorie und Raumstruktur, Springer, current edition.

Cost-benefit analysis:

Boardman, Anthony, Greenberg, David, Vining, Aidan, Weimer, David: Cost-Benefit Analysis: Concepts and Practice, Pearson New International Edition, current edition.
Hanusch, Horst: Benefit-Cost Analysis, Vahlen, current edition.
Pindyck, Robert S., Rubinfeld, Daniel L.: Mikroökonomie, Pearson Studium, current edition.

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Related courses			
Rules for the choice of courses			
1 event of your choice			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Urban and Regional Economics	4,0	Lecture/Exercise	german
Literature			
• Farhauer, Oliver, Kröll, Alexandra: Standorttheorien: Regional- und Stadtökonomik in Theorie und Praxis, Springer, aktuelle Auflage • Maier, Gunther, Tödtling, Franz: Stadt- und Regionalökonomik 1: Standorttheorie und Raumstruktur, Springer, aktuelle Auflage.			
Cost-Benefit Analysis	4,0	Lecture/Exercise	german
Literature			
• Boardman, Anthony, Greenberg, David, Vining, Aidan, Weimer, David: Cost-Benefit Analysis: Concepts and Practice, Pearson New International Edition, aktuelle Auflage • Hanusch, Horst: Nutzen-Kosten-Analyse, Vahlen, aktuelle Auflage • Pindyck, Robert S., Rubinfeld, Daniel L.: Mikroökonomie, Pearson Studium, aktuelle Auflage			

Title	Specialisation Economics		
Number	2212170	**Module version**	V2
Shorttext	WW-VWL-17	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Volkswirtschaftslehre
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Markus Ludwig
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination performance: 1 written exam (90 min) or 1 term paper or 1 oral exam (30 min) or 1 take-at-home exam		

Contents

Due to a constantly growing amount of data with a socio-economic background, professional fields with a quantitative focus are becoming increasingly important. Quantitative issues include the evaluation of economic policy measures, the forecasting of economic development and the prediction of consumer behaviour based on socio-demographic characteristics.

The course Empirical Economic Research 2 takes this development into account. In the course, students acquire advanced knowledge of theoretical principles in the field of regression modelling. In particular, students are familiarised with methods from the fields of panel data and time series analysis. Furthermore, students sharpen their analytical skills in the field of empirical economic research and train statistical thinking. The lecture is practically orientated and students learn how to apply the methods using case studies from current research. The accompanying exercise takes place in the PC pool and students practise the handling of data sets and the practical application of panel data and time series methods using statistical software.

Students have in-depth knowledge of the basic methods in the field of panel data and time series analysis. They develop an intuitive approach to processing and analysing these specific forms of data. Students can apply the methods they have learnt in their own research projects and continue to interpret and classify research results in this area independently.

Selected topics:

Pooled cross-sectional data: Difference-in-differences estimation method, experiments
Panel data: Fixed-effects estimation method
Time series: AR models, ARMA models
Time series: forecasts

Objective qualification

Students have in-depth knowledge of the structure, functioning and efficiency of different market forms and can determine government measures to improve market outcomes. They are able to apply previously learnt

economic thinking to the political system. Students specialise in one area of economics and become familiar with the latest research findings.
Literature
• Wooldridge, Jeffrey: Introductory Econometrics: A Modern Approach, Cengage Learning, aktuelle Auflage. • Stock, James, Watson, Mark: Introduction to Econometrics, Pearson/Addison Wesley, aktuelle Auflage. • Hill, R. Carter, Griffiths, William E., Lim, Guay C.: Principles of Econometrics, Wiley, aktuelle Auflage.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Empirical Economics 2	4,0	Lecture/Exercise	german
Literature			
• Wooldridge, Jeffrey: Introductory Econometrics: A Modern Approach, Cengage Learning, aktuelle Auflage • Stock, James, Watson, Mark: Introduction to Econometrics, Pearson/Addison Wesley, aktuelle Auflage • Hill, R. Carter, Griffiths, William E., Lim, Guay C.: Principles of Econometrics, Wiley, aktuelle Auflage.			

Title	Specialisation Management Control		
Number	2214160	**Module version**	V2
Shorttext	WW-ACuU-16	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Heinz Ahn
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
• Weber/Schäffer: Einführung in das Controlling, Stuttgart, aktuelle Auflage • Ewert/Wagenhofer: Interne Unternehmensrechnung, Berlin et al., aktuelle Auflage • Eisenführ/Weber/Langer: Rationales Entscheiden, Berlin et al., aktuelle Auflage			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Advanced Performance Analytics	1,0	Lecture	english

Actual Topics of Management Control	3,0	Series of lectures	german

Literature

- Weber, U./Schäffer, J. (2016), Einführung in das Controlling, Stuttgart
- Ahn, H. (2003), Effektivitäts- und Effizienzsicherung - Controlling-Konzept und Balanced Scorecard, Frankfurt/M. et al.
- Ahn, H./Dyckhoff, H. (2004), Zum Kern des Controllings - Von der Rationalitätssicherung zur Effektivitäts- und Effizienzsicherung, in: Scherm/Pietsch (Hrsg.): Controlling - Theorien und Konzeptionen, München, S. 501-525

Actual Topics of Management Control	3,0	Series of lectures	german

Literature

- Weber, U./Schäffer, J. (2016), Einführung in das Controlling, Stuttgart
- Ahn, H. (2003), Effektivitäts- und Effizienzsicherung - Controlling-Konzept und Balanced Scorecard, Frankfurt/M. et al.
- Ahn, H./Dyckhoff, H. (2004), Zum Kern des Controllings - Von der Rationalitätssicherung zur Effektivitäts- und Effizienzsicherung, in: Scherm/Pietsch (Hrsg.): Controlling - Theorien und Konzeptionen, München, S. 501-525

Performance Analysis Projects	4,0	Series of lectures	german

Title	Orientation Management Control		
Number	2214170	**Module version**	V2
Shorttext	WW-ACuU-17	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Controlling und Unternehmensrechnung
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Heinz Ahn
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Recommended requirements	Basic knowledge of economics is a prerequisite for the module.		
Expected performance/ Type of examination	1 Klausur (90 min) oder 1 Take-at-Home-Exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 written exam, 90 minutes or take-at-home exam		

Contents

Selected contents - depending on the respective current course:
- Effectiveness and efficiency measurement
- Performance indicators
- Budgeting systems
- Transfer pricing systems

Objective qualification

The students understand fundamental topics and methods of management control. Based on this, they are able to analyze related problems, critically evaluate proposed concepts, and soundly support respective decision-making in practice.

Literature

- Weber/Schäffer: Einführung in das Controlling, Stuttgart, aktuelle Auflage
- Ewert/Wagenhofer: Interne Unternehmensrechnung, Berlin et al., aktuelle Auflage
- Eisenführ/Weber/Langer: Rationales Entscheiden, Berlin et al., aktuelle Auflage

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Related courses			
Rules for the choice of courses			
In this module, the courses Coordination Instruments of Controlling (V2, Ü1) and Performance Measurement (V1) are compulsory. Optional colloquia and tutorials are voluntary.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Coordination Instruments for Management Control	3,0	Lecture/Exercise	german
Literature			
Ewert, R./Wagenhofer, (2014): Interne Unternehmensrechnung, 8. Aufl., Berlin et al.			
Performance Analytics	1,0	Lecture	english

Title	Orientation Finance		
Number	2215080	**Module version**	V2
Shorttext	WW-FIWI-08	**Language**	
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Marc Gürtler
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
• Gürtler (2013): Finanzwirtschaftliches Risikomanagement • Breuer (2000): Unternehmerisches Währungsmanagement • Breuer/Gürtler/Schuhmacher (2010): Portfoliomanagement I • Breuer/Gürtler (2003): Internationales Management • Hartmann-Wendels/Pfingsten/Weber (2007): Bankbetriebslehre			

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Financial Risk Management	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			

Risk Management and Sustainability	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			

Title	Specialisation Finance		
Number	2215100	**Module version**	V2
Shorttext	WW-FIWI-10	**Language**	
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Marc Gürtler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

- Gürtler (2013): Finanzwirtschaftliches Risikomanagement
- Wooldridge (2015): Introductory Econometrics – A Modern Approach
- von Auer (2011): Ökonometrie
- Brooks (2008): Econometrics for Finance
- Galeotti/Gürtler/Winkelvos (2013): Accuracy of Premium - Calculation Models for CAT Bonds – an Empirical Analysis
- Gürtler/Hibbeln (2013): Do Investors Consider Asymmetric Information in Pricing Securitizations?
- Gürtler/Hibbeln/Winkelvos (2016): The Impact of the Financial Crisis and Natural Catastrophes on CAT Bonds

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**

Empirical Finance	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			

	2,0	Colloquium	german

Machine Learning and Data Science in Finance	4,0	Lecture/Exercise	german
Literature			
vergleiche Homepage des Lehrstuhls			

Title	Specialisation Decision Support		
Number	2218250	**Module version**	V2
Shorttext	WW-WINFO-25	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Wirtschaftsinformatik - Lehrstuhl für Decision Support
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dirk Mattfeld
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (60 min) or 1 take-at-home exam (2.5 CP)		
Course achievement	Exercises (for the exercise(s)) (2.5 CP) only for Organisation, Governance, Education instead of the examination additionally 1 exam (60 min) or 1 take-at-home exam (2.5 CP)		

Contents

Selected content - depending on the course selection:

Business requirements for information systems in logistics and transport (ISLV)
Conception of ISLV
Functionality and examples of ISLV
Importance of information modelling for planning problems
Classification methods
Cluster analysis
Association analysis
Network models for route planning
Exciting trees, shortest paths

Objective qualification

Students have an in-depth understanding of the structure and design of information systems for mobility applications. The module enables students to transfer their basic knowledge of information systems for mobility applications to other domains. Through exercises, students consolidate the use of methods and models.

Literature

- Vahrenkamp, R.; Mattfeld, D.C.: Logistiknetzwerke: Modelle für Standortwahl und Tourenplanung. Gabler, 2007.
- Berthold, M. et al: Guide to Intelligent Data Analysis
- Gabriel, R. et al: Computergestützte Informations- und Kommunikationssysteme in der Unternehmung. Technologien, Anwendungen, Gestaltungskonzepte. 2. Auflage. Springer, 2001.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Data Driven Decision Making	2,0	Lecture	german
Literature			
wird in der Vorlesung bekannt gegeben			
Data Driven Decision Making - Exercise	2,0	Exercise	german

Title	Orientation Law		
Number	2216350	**Module version**	V2
Shorttext	WW-RW-35	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Anne Paschke
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

Für den Studienschwerpunkt Öffentliches Recht
- Gesetzbücher:
  - Umweltrecht dtv. Beck, 31. Aufl. 2022
  - Bundes-Immissionsschutzgesetz, dtv. Beck, 17. Aufl. 2022
- Lehrbücher:
  - Ensthaler, Jürgen, Technikrecht: Rechtliche Grundlagen des Technologiemanagments, 2. Aufl. 2022
  - Schlacke, Umweltrecht, 8. Aufl. 2021
  - Rodi, Handbuch Klimaschutzrecht, 2022

Für den Studienschwerpunkt Zivilrecht
- Gesetzbücher:
  - Datenschutzrecht, dtv Beck, 14. Aufl. 2022
  - IT- und Computerrecht, dtv. Beck, 15. Aufl. 2022
  - Arbeitsgesetze, dtv. Beck, 100. Aufl. 2022
- Lehrbücher:
  - Informations- und Kommunikationsrecht, 2018
  - Kühling/Klar/Sackmann, Datenschutzrecht, 2021
  - Schädel, Wirtschaftsrecht für Hightech-Start-ups, 2019

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Environmental Law	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			
Technology Law	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			
IT- and Data Law	2,0	Lecture	german
Literature			
Wird in der Vorlesung bekannt gegeben.			
Law for StartUps	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			
Mobility Law	4,0	Lecture	english

Title	Specialisation Law		
Number	2216360	**Module version**	V3
Shorttext	WW-RW-36	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Rechtswissenschaften
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Anne Paschke
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-at-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 written exam (120 min) or 1 take-at-home exam		

Contents

The content depends on the choice of specialisation:

In the Public Law specialisation, the basic principles of energy law are taught in Energy Law I and Energy Law II.
The Energy Law I course serves to present the fundamentals of energy law at European and German level. At the beginning of the course, the development of energy law in recent decades is presented. The lecture focuses on the regulation of grid operation and related topics such as unbundling, grid connection, grid utilisation and grid utilisation fees. The main contractual structures of energy supply relationships and the position of end consumers in the energy industry will be the subject of the course. A further focus is on the supply of end consumers, e.g. basic supply and contract adjustment options. The lecture is designed to be interactive and offers the opportunity for discussion. The topics discussed will be illustrated using numerous practical cases.

The Energy Law II lecture is primarily dedicated to the law of the ‘energy transition’. It complements the Energy Law I lecture - however, it is not essential to have attended Energy Law I beforehand. One focus of the lecture is the introduction to the law of renewable energies (EEG) including historical developments and European references, including expansion targets, connection and feed-in priority, tenders/tariffs and financing, as well as an in-depth look at the specific legal situation of onshore and offshore wind turbines (including planning and approval, contract design). The event will also cover the most important legal foundations for the expansion of the electricity grid (from the Energy Industry Act, EnLAG, NABEG, BBPlG). Finally, there will be an opportunity to look at current developments in energy law, e.g. with regard to sector coupling or green hydrogen. The lecture is designed to be interactive and offers the opportunity for discussion. The topics discussed will be illustrated using numerous practical cases.

Depending on the students' choice, the Civil Law specialisation teaches content from public procurement law, patent and trademark law and IT security law.
In the Patent and Trade Mark Law lecture, students learn the basics of German and European patent law, the relevant patenting requirements and procedures at the German Patent and Trade Mark Office (DPMA) and the European Patent Office (EPO). The requirements for patenting and the corresponding case law are then applied and analysed in particular to computer-implemented inventions, i.e. especially inventions that

contain a substantial amount of software. To a lesser extent, utility models and their differences to patents as well as registered designs and Community designs are also discussed.

The lecture on public procurement law deals with the scope and procedure of public procurement procedures as well as the legal protection options under public procurement law. It is based on the regulations of EU procurement law (cartel procurement law) in accordance with Part 4 of the GWB and the VgV. However, excursions into sub-threshold procurement law and the special procurement regimes of sector contracts, defence and security-related contracts and concessions will be made at appropriate points. An initial focus of the lecture is on the question of the cases in which public procurement law is applicable and, if applicable, which public procurement law regime is to be applied. On the basis of upper-threshold procurement law, an overview of the procedure is given, starting with the possible types of procedure, the requirements to be met by bidders and the subject matter of the contract, the necessary notices, through to the evaluation of bids and the conclusion of the award procedure. Finally, the legal protection options under public procurement law (primary and secondary legal protection) are dealt with in detail. The lecture takes into account current developments in public procurement law and deals with the respective topics using examples from public procurement law practice.

The IT security law lecture examines one of the key areas of the coming decades from a legal perspective. Students will learn about the legal framework conditions that govern the introduction and maintenance of appropriate IT protection standards. They will also learn how IT security risks are distributed at a contractual level. The unit conveys a holistic approach and enables students to independently develop scientific and practice-orientated solutions together with the relevant specialist literature in order to supervise the necessary information technology steps.

Objective qualification

The courses teach the following theoretical legal content in order to enable graduates to independently identify the relevant legal standards in their respective specialist area and to make subject-related legal decisions taking into account the current legal situation and to present these in a scientific and practice-oriented manner in writing and orally. Only the application-orientated integrative consideration of legal requirements and technical processes enables legally compliant company/product/production design (compliance).

After completing the module in the Public Law specialisation, students will be able to independently deal with the specialist laws in energy law and identify relevant legal norms. Here, technical examples from other lectures are taken up and jointly assessed on the basis of the existing legal situation. They will also learn the sector-specific "state of the art" with examples from technical practice.

After completing the module in the specialisation Civil Law, students will be able to independently find the specialist laws and relevant standards relevant to them and solve legal issues in public procurement law, patent and trademark law and/or IT security law by working with the law. After completing the module, students are sensitised to the content of the lectures in order to be able to participate in public procurement procedures and are sufficiently qualified to ask the right questions in practice in the context of patent and trademark law procedures.

Literature

For the Public Law specialisation:

Legal texts:

- Energierecht, dtv. Beck, 17. Aufl. 2022

Textbooks:

- Kühling/Rasbach/Busch, Energierecht, 5. Aufl. 2022
- Baumgart, Energierecht, 2022

For the civil law specialisation:

Legal texts:

Public procurement law, dtv. Beck, 25th ed. 2022
Patent and design law, dtv. Beck, 16th ed. 2022
Competition law, trade mark law and antitrust law, dtv. Beck, 44th ed. 2022
Textbooks:
Naumann, Public Procurement Law, 2nd ed. 2022
Burgi, Public Procurement Law, 3rd ed. 2021
Samer, The new patent law, 2022
Ann, Patent Law, 8th ed. 2022
Hornung/Schallbruch (ed.) IT Security Law, 2020

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Related courses

Rules for the choice of courses

One of the two specialisations must be chosen (the same specialisation that was taken in the orientation must be chosen).

Public law:
Energy Law 1
Energy Law 2
Civil law: (2 of the 3 courses must be chosen)
IT security law
Patent and trade mark law
Public procurement law

Students on the Sustainable Energy Technology Master's programme can only choose the Public Law specialisation.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Energy Law 1	2,0	Lecture	german
Energy Law 2	2,0	Lecture	german
IT Security Law	2,0	Lecture	german
Patent Law and Trademark Law	2,0	Lecture	german

Literature

- Patent- und Musterrecht (Verlag dtv-Beck)
- Wettbewerbsrecht und Kartellrecht (Verlag dtv-Beck)

Procurement Law	2,0	Lecture	german

Title	Orientation Decision Support		
Number	2218220	**Module version**	V2
Shorttext	WW-WINFO-22	**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Wirtschaftsinformatik - Lehrstuhl für Decision Support
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dirk Mattfeld
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-at-home exam		
Course achievement	only for Organisation, Governance, Education instead of the exam: 1 exam (120 min) or 1 take-at-home exam		

Contents

Selected contents - depending on the course selection:

Importance of information modelling for planning problems
Classification methods
Cluster analysis
Association analysis
Network models for route planning
Exciting trees, shortest paths
Round trip and route planning problems
Exact and heuristic methods for route planning

Objective qualification

Students have an insight into models and methods of data analysis and decision support. Students are able to map processes from the areas of mobility and transport in information and decision support models. They are familiar with algorithmic methods for analysing systems and generating recommendations for action.

Literature

- Vahrenkamp, R.; Mattfeld, D.C.: Logistiknetzwerke: Modelle für Standortwahl und Tourenplanung. Gabler, 2007.
- Berthold, M. et al: Guide to Intelligent Data Analysis
- Gabriel, R. et al: Computergestützte Informations- und Kommunikationssysteme in der Unternehmung. Technologien, Anwendungen, Gestaltungskonzepte. 2. Auflage. Springer, 2001.

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Intelligent Data Analysis	2,0	Lecture	german
Literature			
M.R. Berthold, C. Borgelt, F. Höppner, F. Klawonn: Guide to Intelligent Data Analysis: How to Intelligently Make Sense of Real Data. Springer, London (2010)			

Planning for Mobility and Transportation Purposes	2,0	Lecture	german
Literature			
Dirk C. Mattfeld, Richard Vahrenkamp: Logistiknetzwerke - Modelle für Standortwahl und Tourenplanung, Springer, 2. Aufl. 2014			

Title	Orientation Production and Logistics		
Number	2220250	**Module version**	V2
Shorttext	WW-AIP-25	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Produktion und Logistik
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Spengler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 written exam 120 (min) or 1 take-at-home exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 written exam 120 (min) or 1 take-at-home exam		

Contents

Selected content - depending on course selection:

Production Facility Management:
The course “Production Facility Management” deals with various issues that arise in the context of production facility planning and operation. First of all, an overview is given of the tasks involved in the project management of a production facility construction project. Of particular relevance here is the interdisciplinary handling of such projects. A special focus is placed on investment and cost planning. Methods are taught with which economically relevant parameters can be estimated based on the technical planning in various project phases. Students are also taught methods for static and dynamic capacity planning. Finally, students are given an overview of configuration planning and maintenance.

Sustainability in Production and Logistics:
The course “Sustainability in Production and Logistics” teaches the main conditions and options to design a sustainable production and logistics system. The initial focus is laid on approaches for the static and dynamic modeling of energy and material flows as well as the design of disassembly and recycling processes. Within the subsequent sustainability assessment, approaches for an economic, environmental, and social assessment of products and processes are presented. This is followed by an introduction to multi-criteria decision-making, which enables the consideration of various sustainability aspects in the context of corporate decisions. The lecture is accompanied by interactive discussions and practical examples from various sectors, such as the steel industry or electromobility.

Operations Management in the Automotive Industry:
In the course "Operations Management in the Automotive Industry," students gain a detailed insight into the methods and concepts for planning and controlling automotive production. Students are introduced to model-based planning approaches, enabling them to solve strategic (network planning), tactical (assembly line balancing), and operational (assembly line sequencing) problems within automotive production. Special focus is the development of mathematical planning models from Operations Management.

Supply Chain Management:
In the course “Supply Chain Management”, a model-based analysis of industrial supply chains is carried out. Special features of various industries such as the automotive, steel, and semiconductor industries are worked out and their effects on the supply chain are illustrated using the models presented. During the course, typical efficiency losses of industrial supply chains are discussed and approaches to maximize the efficiency of a supply chain are presented. Finally, a quantitative planning approach is presented that can be used to create distribution networks depending on product-specific requirements.

Objective qualification

In the "Production and Logistics" orientation, students are taught various quantitative and qualitative methods from Operations Management for evaluating, designing, planning, and controlling sustainable value creation networks. These methods are applied to practical production and logistics-related issues across various disciplines, such as process engineering, electrical engineering, electromobility, mechanical engineering, or the chemical industry.

Through the course, students are empowered to independently apply and develop quantitative and qualitative methods from Operations Management. Additionally, they are able to appropriately apply and adapt the learned methods in collaboration with different disciplines to address specific challenges.

Literature

Textbooks and further literature will be mentioned in the lectures.

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Related courses

Rules for the choice of courses

Production and Logistics A: Supply Chain Management + Operations Management in the Automotive Industry
Production and Logistics B: Asset Management + Sustainability in Production and Logistics

Students in the Master of Social Sciences can only choose option B.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Sustainability in Production and Logistics	2,0	Lecture	german

Literature

- Baumast, A.; Pape, J. (2008): Betriebliches Umweltmanagement: Nachhaltiges Wirtschaften in Unternehmen, Eugen Ulmer: Stuttgart
- Deutsches Institut für Normung (2006): Umweltmanagement – Ökobilanz – Anforderungen und Anleitungen (ISO 14044:2006). Beuth-Verlag. Berlin. Ausgabedatum: 2006-10
- Erbguth, W.; Schlacke, S. (2010): Umweltrecht, Nomos: Baden-Baden
- Spengler, T. (1998): Industrielles Stoffstrommanagement, Erich Schmidt: Berlin
- Walther, G. (2010): Nachhaltige Wertschöpfungsnetzwerke – Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus, Gabler-Verlag: Wiesbaden.

Operations Management in the Automotive Industry	2,0	Lecture	english

Literature

Examples:
- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Supply Chain Management	2,0	Lecture	english

Literature

- Chopra, S./Meindl, P. (2016): Supply Chain Management – Strategy, Planning, and Operation. Pearson
- Shapiro, J. (2006): Modeling The Supply Chain, Duxbury/Thomson Learning
- Simchi-Levi, D./Kaminsky, P./Simchi-Levi, E. (2007): Designing and Managing the Supply Chain: Concepts, Strategies, and Case studies, McGraw-Hill/Irwin
- Stadtler, H./Kilger, C. (2007): Supply Chain Management and Advanced Planning, Springer

Production Facility Management	2,0	Lecture	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Exercise Supply Chain Management & Operations Management in the Automotive Industry	2,0	Exercise	english

Literature

Examples:
- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Exercise Production Facility Management and Sustainability in Production & Logistics	2,0	Exercise	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Title	Specialisation Production and Logistics		
Number	2220260	**Module version**	V2
Shorttext	WW-AIP-26	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Produktion und Logistik
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Thomas Spengler
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam 120 (min) or 1 take-at-home exam (on the 2 lectures of the chosen combination)		
Course achievement	only for Organisation, Governance, Education instead of the exam: 1 exam 120 (min) or 1 take-at-home exam (on the 2 lectures of the chosen combination)		

Contents

Selected content - depending on the course selection:

Plant management:
The course ‘Plant Management’ deals with various issues that arise in the context of plant planning and plant operation. Firstly, an overview is given of the tasks involved in the project management of a plant construction project. Of particular relevance here is the interdisciplinary handling of such projects. A special focus is placed on investment and cost planning. Methods are taught with which economically relevant parameters can be estimated on the basis of technical planning in various project phases. Students are also taught methods for static and dynamic capacity planning. Finally, students are given an overview of plant configuration planning and plant maintenance.

Sustainability in production and logistics:
In the course ‘Sustainability in Production and Logistics’, the relevant framework conditions and possibilities for designing sustainable production and logistics are taught. The focus is initially placed on approaches to static and dynamic modelling of energy and material flows as well as the design of dismantling and recycling. Within the subsequent sustainability assessment, approaches for an economic, ecological and social assessment of a product or process are presented. This is followed by an introduction to multi-criteria decision-making, which enables various aspects of sustainability to be taken into account when making business decisions. The lecture is accompanied by interactive discussions and application examples from various sectors, such as the steel industry or electromobility.

Operations Management in the Automotive Industry:
As part of the course ‘Operations Management in the Automotive Industry’, students gain a detailed insight into the methods and concepts for planning and controlling automotive production. Students learn about model-based planning approaches that enable them to solve strategic (network planning), tactical (assembly line balancing) and operational (assembly line sequencing) problems in the context of automotive production. A particular focus is always on integrating the special technical challenges of the automotive industry into the respective planning approaches.

Supply Chain Management:
In the course ‘Supply Chain Management’, a model-based analysis of industrial supply chains is carried out. Special features of various industries such as the automotive, steel and semiconductor industries are analysed and their effects on the supply chain are illustrated using the models presented. During the course, typical efficiency losses of industrial supply chains are discussed and approaches to maximise the efficiency of a supply chain are presented. Finally, a quantitative planning approach is presented that can be used to create distribution networks depending on product-specific requirements.

Master's Colloquium - Production and Logistics:
In the Master's colloquium, students are given the opportunity to present and discuss their Master's and diploma theses.

Objective qualification

The Production and Logistics specialisation builds on the quantitative and qualitative methods of economics learned in the orientation. The methods learnt are extended and further methods are introduced. Furthermore, additional subject areas are addressed in which the methods are applied.

The course enables students to independently apply and develop quantitative and qualitative methods in economics. In addition, students will be able to apply and adapt the methods they have learnt in cooperation with different subject areas to the specific challenges of the subject.

Literature

Textbooks and further reading will be given in the lectures

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Related courses

Rules for the choice of courses

Depending on the chosen combination in the corresponding orientation, the following combinations are possible:

Production and Logistics A: Supply Chain Management + Operations Management in the Automotive Industry
(Orientation consisted of Production and Logistics B: Plant Management + Sustainability in Production and Logistics)

Production and Logistics B: Plant Management + Sustainability in Production and Logistics
(Orientation consisted of Production and Logistics A: Supply Chain Management + Operations Management in the Automotive Industry)

The colloquium is voluntary.

Compulsory attendance

Name of the course	SWS	Eventtype	Language

Sustainability in Production and Logistics	2,0	Lecture	german

Literature

- Baumast, A.; Pape, J. (2008): Betriebliches Umweltmanagement: Nachhaltiges Wirtschaften in Unternehmen, Eugen Ulmer: Stuttgart
- Deutsches Institut für Normung (2006): Umweltmanagement – Ökobilanz – Anforderungen und Anleitungen (ISO 14044:2006). Beuth-Verlag. Berlin. Ausgabedatum: 2006-10
- Erbguth, W.; Schlacke, S. (2010): Umweltrecht, Nomos: Baden-Baden
- Spengler, T. (1998): Industrielles Stoffstrommanagement, Erich Schmidt: Berlin
- Walther, G. (2010): Nachhaltige Wertschöpfungsnetzwerke – Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus, Gabler-Verlag: Wiesbaden.

	2,0	Colloquium	german

Operations Management in the Automotive Industry	2,0	Lecture	english

Literature

Examples:
- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
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- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Production Facility Management	2,0	Lecture	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Supply Chain Management	2,0	Lecture	english

Literature

- Chopra, S./Meindl, P. (2016): Supply Chain Management – Strategy, Planning, and Operation. Pearson
- Shapiro, J. (2006): Modeling The Supply Chain, Duxbury/Thomson Learning
- Simchi-Levi, D./Kaminsky, P./Simchi-Levi, E. (2007): Designing and Managing the Supply Chain: Concepts, Strategies, and Case studies, McGraw-Hill/Irwin
- Stadtler, H./Kilger, C. (2007): Supply Chain Management and Advanced Planning, Springer

Exercise Supply Chain Management & Operations Management in the Automotive Industry	2,0	Exercise	english

Literature

Examples:

- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Exercise Production Facility Management and Sustainability in Production & Logistics	2,0	Exercise	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Title	Specialisation Services Management		
Number	2201000020	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Dienstleistungsmanagement
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. David Woisetschläger
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 portfolio or 1 take-home exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 portfolio or 1 take-home exam		

Contents

Contents - depending on the course selection:

Strategic Brand Management & Brand Strategy Bootcamp
Contents of the lecture include
- Brand understanding and the importance of brands
- Measurement of brand associations
- Secondary brand associations
- Instruments for building brand associations
- Brand strategy and positioning
- Brand architecture
- Measuring brand performance
- International brand management
- Internal brand management
- Organizational aspects of brand management
- Sectoral specialties in retail, industrial goods and the luxury sector.

Contents of the exercise are:
Working on a real practical problem in the field of brand management in cooperation with a company partner.

Business Model Innovation & Service Innovation
Contents of the lecture include:
- Relevance, importance and understanding of business model innovations
- Organizational success factors and barriers
- Transformation of existing business models
- Methods of business model innovation
- Building blocks of business model innovation and related methods
- Sectoral aspects such as innovation in mobility

Contents of the exercise are:
Application of service innovation methods on a practical example.

Customer Relationship Management & Customer Analytics
Contents of the lecture include:
- Relevance, importance and understanding of customer relationship management
- Theoretical foundations of CRM
- Target indicators of CRM
- Lifecycle perspective of the customer relationship
- Acquisition and new customer management
- Customer loyalty programs
- Types and management of switching barriers
- Customer evaluation and segmentation
- Expansion of customer relationships
- Complaint management
- Termination prevention and reactivation management
- Customer data and privacy

Contents of the exercise include learning and applying methods
- to calculate customer value
- to evaluate the customer relationship (e.g. satisfaction, loyalty, recommendation)
- to calculate customer churn or the probability of churn
- to evaluate the success of promotions and reactivation measures

Objective qualification

Depending on the selected courses:

After successful participation, students will have a basic understanding of brands and knowledge of which aspects play a role in branding. In addition, they will understand and be able to critically discuss how brands are developed and positioned and which instruments are suitable for this. They can argue on the basis of theory why certain brand-related measures can be expected to have an effect and have methodological knowledge in order to measure the brand and quantify influencing factors. Students will be able to formulate precise problems and research questions based on a complex practical issue in the field of brand management and develop a solution to the problem using the content and methods learned in the lecture.

After successful participation, students have a basic understanding of business model innovation and know which factors play a role in the development of business model innovations. In addition, they will understand and be able to critically discuss how innovations are developed and which methods are suitable for this. They can argue on the basis of theory why certain corporate measures can be expected to have an effect on the success of innovation and have methodological knowledge to develop, evaluate and critically reflect on business model innovations themselves. Students can formulate precise problems and research questions based on a complex practical issue in the field of innovation management and develop solutions to problems using the content and methods learned in the lecture and taught in the exercise.

Students have an understanding of issues that arise in the context of recording, designing and evaluating customer relationships. Based on the concepts and methods they have learned, students will be able to independently record, conceptually structure and analyze customer relationship management issues in various industry contexts. They have methodological and application knowledge for the qualitative and quantitative analysis of customer and company data required to answer customer relationship management tasks.

Literature

Strategic Brand Management & Brand Strategy Bootcamp
- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Supplementary journal paper per chapter
- Lecture notes for download.
- Supplementary information and literature as bibliography and/or download for the exercise.

Business Model Innovation & Service Innovation

- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

Customer Relationship Management & Customer Analytics
- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

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Related courses

Rules for the choice of courses

Students must choose a course from the following program:
- Strategic Brand Management & Brand Strategy Bootcamp
- Business Model Innovation & Service Innovation
- Customer Relationship Management & Customer Analytics

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Business Model Innovation: Concepts and Applications	4,0	Lecture/Exercise	english

Literature

- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download)

Strategic Brand Management: Concepts and Applications	4,0	Lecture/Exercise	german

Literature

- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Ergänzende Journalpaper je Kapitel
- Vorlesungsunterlagen zum Download.
- Ergänzende Informationen und Literatur als Literaturverzeichnis und/oder zum Download zur Übung.

Customer Relationship Management and Customer Analytics	4,0	Lecture/Exercise	german

Literature

- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download

Title	Orientation Services Management		
Number	2201000000	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Automobilwirtschaft und Industrielle Produktion - Lehrstuhl für Dienstleistungsmanagement
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. David Woisetschläger
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 portfolio or 1 take-home exam		
Course achievement	for Organization, Governance, Education / MA Social Sciences instead of the examination performance: 1 portfolio or 1 take-home exam		

Contents

Contents - depending on the course selection:

Strategic Brand Management & Brand Strategy Bootcamp
Contents of the lecture include
- Brand understanding and the importance of brands
- Measurement of brand associations
- Secondary brand associations
- Instruments for building brand associations
- Brand strategy and positioning
- Brand architecture
- Measuring brand performance
- International brand management
- Internal brand management
- Organizational aspects of brand management
- Sectoral specialties in retail, industrial goods and the luxury sector.

Contents of the exercise are:
Working on a real practical problem in the field of brand management in cooperation with a company partner.

Business Model Innovation & Service Innovation
Contents of the lecture include:
- Relevance, importance and understanding of business model innovations
- Organizational success factors and barriers
- Transformation of existing business models
- Methods of business model innovation
- Building blocks of business model innovation and related methods
- Sectoral aspects such as innovation in mobility

Contents of the exercise are:
Application of service innovation methods on a practical example.

Customer Relationship Management & Customer Analytics
Contents of the lecture include:
- Relevance, importance and understanding of customer relationship management
- Theoretical foundations of CRM
- Target indicators of CRM
- Lifecycle perspective of the customer relationship
- Acquisition and new customer management
- Customer loyalty programs
- Types and management of switching barriers
- Customer evaluation and segmentation
- Expansion of customer relationships
- Complaint management
- Termination prevention and reactivation management
- Customer data and privacy

Contents of the exercise include learning and applying methods
- to calculate customer value
- to evaluate the customer relationship (e.g. satisfaction, loyalty, recommendation)
- to calculate customer churn or the probability of churn
- to evaluate the success of promotions and reactivation measures

Objective qualification

Depending on the selected courses:

After successful participation, students will have a basic understanding of brands and knowledge of which aspects play a role in branding. In addition, they will understand and be able to critically discuss how brands are developed and positioned and which instruments are suitable for this. They can argue on the basis of theory why certain brand-related measures can be expected to have an effect and have methodological knowledge in order to measure the brand and quantify influencing factors. Students will be able to formulate precise problems and research questions based on a complex practical issue in the field of brand management and develop a solution to the problem using the content and methods learned in the lecture.

After successful participation, students have a basic understanding of business model innovation and know which factors play a role in the development of business model innovations. In addition, they will understand and be able to critically discuss how innovations are developed and which methods are suitable for this. They can argue on the basis of theory why certain corporate measures can be expected to have an effect on the success of innovation and have methodological knowledge to develop, evaluate and critically reflect on business model innovations themselves. Students can formulate precise problems and research questions based on a complex practical issue in the field of innovation management and develop solutions to problems using the content and methods learned in the lecture and taught in the exercise.

Students have an understanding of issues that arise in the context of recording, designing and evaluating customer relationships. Based on the concepts and methods they have learned, students will be able to independently record, conceptually structure and analyze customer relationship management issues in various industry contexts. They have methodological and application knowledge for the qualitative and quantitative analysis of customer and company data required to answer customer relationship management tasks.

Literature

Strategic Brand Management & Brand Strategy Bootcamp
- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Supplementary journal paper per chapter
- Lecture notes for download.
- Supplementary information and literature as bibliography and/or download for the exercise.

Business Model Innovation & Service Innovation

- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

Customer Relationship Management & Customer Analytics
- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Textbooks and further literature will be announced in the lectures
- Supplementary literature (PDF documents, lecture notes for download)

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Related courses

Rules for the choice of courses

Students must choose a course from the following program:
- Strategic Brand Management & Brand Strategy Bootcamp
- Business Model Innovation & Service Innovation
- Customer Relationship Management & Customer Analytics

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Business Model Innovation: Concepts and Applications	4,0	Lecture/Exercise	english

Literature

- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download)

Strategic Brand Management: Concepts and Applications	4,0	Lecture/Exercise	german

Literature

- Keller, Kevin L. und V. Swaminathan (2019): Strategic Brand Management - Building, Measuring, and Managing Brand Equity, 5th ed., Prentice Hall
- Ergänzende Journalpaper je Kapitel
- Vorlesungsunterlagen zum Download.
- Ergänzende Informationen und Literatur als Literaturverzeichnis und/oder zum Download zur Übung.

Customer Relationship Management and Customer Analytics	4,0	Lecture/Exercise	german

Literature

- Kumar, V. and Werner Reinartz (2018): Customer Relationship Management: Concept, Strategy, and Tools, 3. ed., Springer.
- Lehrbücher und weiterführende Literatur werden in den Veranstaltungen bekannt gegeben
- Ergänzende Literatur (PDF-Dokumente, Vorlesungsunterlagen zum Download

Title	Orientation Marketing		
Number	2221110	**Module version**	V3
Shorttext	WW-MK-11	**Language**	english german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Marketing und Innovation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Christof Backhaus
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (120 min) or 1 take-home exam		
Course achievement	for Organisation, Governance, Education / MA Social Sciences instead of the examination: 1 exam (120 min) or 1 take-home exam		

Contents

Selected content - depending on the event selection:

Special features of international marketing
Consumer behaviour and organisational buying behaviour
Techniques of data collection and data analysis in marketing

Objective qualification

The aim of the orientation module Marketing is to give students the opportunity to expand their knowledge in a subject that is not one of their specialisations. After completing the module, students will have a sound knowledge of the following areas: 1. buyer behaviour and marketing research, 2. international marketing

Literature

- Zentes, J./Swoboda, B./Schramm-Klein, H. (2006): Internationales Marketing, München 2006
- Kroeber-Riel, W./Weinberg, P./Gröppel-Klein, A. (2008): Konsumentenverhalten, 9. Aufl., München 2008
- Fantapié Altobelli, C. (2007): Marktforschung, Stuttgart 2007
- Folienskripte

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Consumer Behaviour	2,0	Lecture	german

Sales Management	2,0	Lecture	german

Literature

- Johnston, Mark W. und Marshall, Greg W. (2021). Sales Force Management – Leadership, Innovation, Technology, 13. ed., New York: Routledge.
- sowie zu den einzelnen Kapiteln weitere, in den Veranstaltungsunterlagen aufgeführte Literatur.

Sales Management	2,0	Exercise	german

Literature

- Johnston, Mark W. und Marshall, Greg W. (2021). Sales Force Management – Leadership, Innovation, Technology, 13. ed., New York: Routledge.
- sowie zu den einzelnen Kapiteln weitere, in den Veranstaltungsunterlagen aufgeführte Literatur.

Title	Specialisation Marketing		
Number	2221120	**Module version**	V4
Shorttext	WW-MK-12	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Marketing und Innovation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Christof Backhaus
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 exam (60 min) or 1 take-at-home exam (2.5 CP)		
Course achievement	1 written exam (60 min) or 1 exercise task or 1 take-at-home exam (for the exercise) (2.5 CP) for Organisation, Governance, Education / MA Social Sciences instead of the examination additionally: 1 exam (60 min) or 1 take-at-home exam (2.5 CP)		

Contents

Selected contents - depending on the course selection:

Selected aspects of distribution management
Techniques of data collection and data analysis in marketing
In-depth study of selected marketing topics using case studies and exercises

Objective qualification

After completing this module, students have a sound knowledge of the areas of distribution management, international marketing, buyer behaviour and marketing research. They are able to think through, structure and solve marketing problems of various kinds.

Literature

- Zentes, J./Swoboda, B./Schramm-Klein, H. (2006): Internationales Marketing, München 2006
- Kroeber-Riel, W./Weinberg, P./Gröppel-Klein, A. (2008): Konsumentenverhalten, 9. Aufl., München 2008
- Fantapié Altobelli, C. (2007): Marktforschung, Stuttgart 2007
- Specht, G./Fritz, W. (2005): Distributionsmanagement, 4. Aufl., Stuttgart 2005
- Folienskripte

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Related courses			
Rules for the choice of courses			
The lecture and exercise Sustainability Transformation Management are compulsory.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Sustainability Transformation Management	2,0	Lecture	english
Exercise - Sustainability Transformation Management	2,0	Exercise	english

Title	Orientation Information Management		
Number	2222210	**Module version**	V2
Shorttext	WW-WII-21	**Language**	
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	2	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Susanne Robra-Bissantz
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
• Bodendorf, F., Robra-Bissantz, S.: E-Business-Management, Berlin 2009 • Bodendorf, F.: Wirtschaftsinformatik im Dienstleistungsbereich, Berlin et al. 1995 • Hofmann, J., Schmidt, W. (Hrsg.): Masterkurs IT-Management , Berlin 2007			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Digital Transformation: Collaborations	2,0	Lecture	german
Literature			
• Vorlesungsunterlagen zum Download • Weitere Literatur wird in der Veranstaltung bekannt gegeben			

Digital Transformation: Services	2,0	Lecture	german
Literature			
Vorlesungsunterlagen per Download, weitere Literatur wird in der Veranstaltung bekannt gegeben.			

	2,0	Colloquium	german

Title	Specialisation Information Management		
Number	2222230	**Module version**	
Shorttext	WW-WII-23	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Susanne Robra-Bissantz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements	The module “Orientation Service Information Systems” must be successfully completed.		
Recommended requirements	The prerequisite for the module is basic knowledge in economics.		
Expected performance/ Type of examination			
Course achievement			

Contents

Selected content which students apply in a practical project building on the knowledge gained in the “Orientation Service Information Systems”:

- Servicification
- Role of IT in Service Processes
- Service Dominant Logic
- Digital Products
- Value in Interaction
- E-Services
- Service Design
- Service Ecosystems and Platforms
- Digital Economy
- Digital Management
- Cooperation and Collaboration
- Digital Collaboration

Objective qualification

Students understand the strategic relevance of information systems for companies in terms of operational tasks, people and technology. They are familiar with concepts for internal and/or inter-company IT-supported co-operation as well as their objectives and strategies in the context of strategic management. A possible specialisation is the view of application systems as e-services. Students acquire the technical and methodological knowledge and skills to develop, design, critically reflect on, present and at least partially technically implement strategically relevant IT-supported innovations for companies. Through project work, they are familiarised with working in teams and with modern media and are therefore able to apply their knowledge, make it sustainably accessible for themselves and expand it independently.

Literature

The course materials are available in Stud.IP; further reading can also be found there.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	4,0	Project	german
	2,0	Colloquium	german

Title	Orientation Management and Organisation Science		
Number	2223100	**Module version**	
Shorttext	WW-ORGF-10	**Language**	german
Frequency of offer	only in the winter term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dietrich von der Oelsnitz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

- Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart.
- Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München.
- Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.
- Stock-Homburg, R. (2008): Personalmanagement, Wiesbaden.
- Gemünden, H.G./Högl, M. (2005): Teamarbeit in innovativen Projekten, in: Högl, M./Gemünden, H.G. (Hrsg.): Management von Teams, 3. Aufl., Wiesbaden, S. 1-31.

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language

Organization	2,0	Lecture	german
Literature			
• Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart. • Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München • Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.			

Team Management	1,0	Lecture	german
Literature			
• Stock-Homburg, R. (2008): Personalmanagement, Wiesbaden. • Gemünden, H.G./Högl, M. (2005): Teamarbeit in innovativen Projekten, in: Högl, M./Gemünden, H.G. (Hrsg.): Management von Teams, 3. Aufl., Wiesbaden, S. 1-31. • Oelsnitz, D. von der (2005): Kooperation: Entwicklung und Verknüpfung von Kernkompetenzen, in: Zentes, J./Swoboda, B./Morschett, D. (Hrsg.): Kooperationen, Allianzen und Netzwerke, 2. Aufl., Wiesbaden, S. 183-210.			

Team and Organizational Management	1,0	Exercise	german

		Colloquium	german

Organization and Change	4,0	Lecture/Exercise	english german
Literature			
• Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart. • Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München • Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.			

Title	Specialisation Management and Organisation Science		
Number	2223110	**Module version**	
Shorttext	WW-ORGF-11	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Dietrich von der Oelsnitz
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			

Contents

Objective qualification

Literature

- North, K.: Wissensorientierte Unternehmensführung, 4. Aufl., Wiesbaden 2005.
- Oelsnitz, D. von der/Hahmann, M.: Wissensmanagement, Stuttgart 2003.
- Probst, G./Raub, S./Romhardt, K.: Wissen managen, 5. Auflage, Wiesbaden 2006.
- Oelsnitz, D. von der (2005): Kooperation: Entwicklung und Verknüpfung von Kernkompetenzen, in: Zentes, J./Swoboda, B./Morschett, D. (Hrsg.): Kooperationen, Allianzen und Netzwerke, 2. Aufl., Wiesbaden, S. 183-210.

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Networkmanagement	1,3	Lecture/Exercise	german

Literature

Wird in der Vorlesung bekannt gegeben.

Knowledge Management	2,0	Lecture/Exercise	german
Literature			
• North, K.: Wissensorientierte Unternehmensführung, 4. Aufl., Wiesbaden 2005. • Oelsnitz, D. von der/Hahmann, M.: Wissensmanagement, Stuttgart 2003. • Probst, G./Raub, S./Romhardt, K.: Wissen managen, 5. Auflage, Wiesbaden 2006.			

	1,0	Colloquium	german

Team and Network Management	4,0	Lecture/Exercise	german
Literature			
Wird in der Vorlesung bekannt gegeben.			

Title	Specialisation Economic Sciences		
Number	2299600	**Module version**	
Shorttext	WW-STD-60	**Language**	german
Frequency of offer		**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration		**Institution**	
Hours per Week / ECTS	0 / 5,0	**Module owner**	
Workload (h)			
Class attendance (h)		**Self studying (h)**	
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Title	Specialisation Economic Sciences		
Number	2299610	**Module version**	
Shorttext	WW-STD-61	**Language**	german
Frequency of offer		**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration		**Institution**	
Hours per Week / ECTS	0 / 5,0	**Module owner**	
Workload (h)			
Class attendance (h)		**Self studying (h)**	
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Title	Orientation Data-Driven Enterprise		
Number	2218300	**Module version**	
Shorttext	WW-WINFO-30	**Language**	german
Frequency of offer	only in the summer term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Wirtschaftsinformatik/Abt. Data-Driven Enterprise
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Frederik Möller
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 term paper & 1 presentation or 1 portfolio or 1 written exam (120 min) or 1 oral exam (30 minutes) or 1 term paper or 1 presentation or 1 take-at-home exam		
Course achievement			

Contents

In “Digital Business Engineering”, students acquire in-depth knowledge about the transformation of business models through a series of practical case studies and the strategic use of digital technologies and data. Business Engineering provides the theoretical framework. It offers a methodology for designing business models and is a model-driven and design-oriented approach to transforming companies. In the practical part of the course, students learn to apply various business engineering techniques (e.g. customer process modeling, information architecture design, SWOT analysis and more). The aim of the practical part is the independent (but guided) solving of a practical problem using the methods and techniques taught by the chair.

Objective qualification

After completing the module, students are able to apply business engineering techniques. Students will also be able to explain business engineering concepts and apply them to unfamiliar problems.

Literature

- OSTERWALDER, Alexander; PIGNEUR, Yves. Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons, 2010.
- OSTERWALDER, Alexander; PIGNEUR, Yves; TUCCI, Christopher L. Clarifying business models: Origins, present, and future of the concept. Communications of the association for Information Systems, 2005, 16. Jg., Nr. 1,
- MÖLLER, Frederik, et al. Designing business model taxonomies–synthesis and guidance from information systems research. Electronic Markets, 2022, S. 1-26.

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Digital Business Engineering	4,0	Lecture/Exercise	german

Literature

- OSTERWALDER, Alexander; PIGNEUR, Yves. *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons, 2010.
- OSTERWALDER, Alexander; PIGNEUR, Yves; TUCCI, Christopher L. Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems*, 2005, 16. Jg., Nr. 1,
- MÖLLER, Frederik, et al. Designing business model taxonomies–synthesis and guidance from information systems research. *Electronic Markets*, 2022, S. 1-26.

Digital Business Models and Sustainability	4,0	Lecture/Exercise	german

Literature

- Hahn, R. (2022). Sustainability management: Global perspectives on concepts, instruments, and stakeholders.
- Lüdeke-Freund, F., Carroux, S., Joyce, A., Massa, L., & Breuer, H. (2018). The sustainable business model pattern taxonomy—45 patterns to support sustainability-oriented business model innovation. Sustainable Production and Consumption, 15, 145-162.
- Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers (Vol. 1). John Wiley & Sons.
- Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2016). Business models for sustainability: A co-evolutionary analysis of sustainable entrepreneurship, innovation, and transformation. Organization & environment, 29(3), 264-289.
- Schoormann, T., Stadtländer, M., & Knackstedt, R. (2021). Designing business model development tools for sustainability—a design science study. Electronic Markets, 1-23.

Title	Orientation Business Ethics		
Number	2224000000	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Unternehmensführung und Organisation
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Ann-Marie Nienaber
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Recommended requirements	Prerequisite for the module is a basic knowledge of business administration in the field of business ethics.		
Expected performance/ Type of examination	1 written exam (90 minutes) or 1 take-home exam		
Course achievement	For Organization, Governance, Education / MA Social Sciences instead of the exam: 1 written exam (90 minutes) or 1 take-home exam		

Contents

Depending on the chosen courses, practical and theoretical knowledge in the areas of organization and team management, as well as inter-organizational networks, are covered.

Objective qualification

After completing this module, students will have an in-depth understanding of the organization and processes within and between companies. They will learn how to systematically develop and maintain a company's knowledge base. Students will be able to explain the actions and behavior of organizational members and understand organizations as socio-technical systems.

Literature

- Oelsnitz, D. von der (2009): Die innovative Organisation, 2. Aufl., Stuttgart.
- Schulte-Zurhausen, M. (2005): Organisation, 4. Aufl., München.
- Schreyögg, G. (2008): Organisation, 5. Aufl., Wiesbaden.
- Stock-Homburg, R. (2008): Personalmanagement, Wiesbaden.
- Gemünden, H.G./Högl, M. (2005): Teamarbeit in innovativen Projekten, in: Högl, M./Gemünden, H.G. (Hrsg.): Management von Teams, 3. Aufl., Wiesbaden, S. 1-31.

↑

Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Strategic Business Ethics	4,0	Lecture/Exercise	english german
Innovation and Societal Change	4,0	Lecture/Exercise	english german

Title	Specialization - Business Ethics		
Number	2224000010	**Module version**	
Shorttext		**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Institut für Unternehmensführung und Organisation
Hours per Week / ECTS	3 / 5,0	**Module owner**	Prof. Dr. Ann-Marie Nienaber
Workload (h)	150		
Class attendance (h)	42	**Self studying (h)**	108
Compulsory requirements			
Recommended requirements	Prerequisite for the module is a basic knowledge of business administration in the field of business ethics as well as in academic work, if applicable.		
Expected performance/ Type of examination	1 portfolio or 1 term paper or 1 presenation or 1 written exam (90 minutes) or 1 oral exam or 1 take-home exam		
Course achievement	For Organization, Governance, Education / MA Social Sciences instead of the exam: 1 portfolio or 1 term paper or 1 presenation or 1 written exam (90 minutes) or 1 oral exam or 1 take-home exam		

Contents

The module provides in-depth knowledge of ethical issues in the context of innovation, digitalisation and organisational change. The focus is on the social impact of technological developments and the responsibility of companies and organisations in transformation processes.

Students examine ethical dilemmas that arise, for example, in the development and application of new technologies, in data-based business models or in the use of artificial intelligence. Key reference points are participation, transparency, sustainability and social justice.

Objective qualification

The aim is to develop ethical judgement in order to be able to make responsible decisions in innovation and management processes. Current debates and practical examples encourage reflection on the contribution of organisations to value-oriented and sustainable change.

Literature

Specific references to literature on the respective topics will be presented and made available during the course of the seminar.

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Related courses			
Rules for the choice of courses			
1 course of your choice			
Compulsory attendance			
The examination performance requires active participation in the block seminars, especially in the context of group presentations and individual contributions. An assessment of the examination performance is only possible if these contributions are made in the seminar. Participation is therefore necessary for reasons of assessability.			
Name of the course	**SWS**	**Eventtype**	**Language**
Business ethics in change: responsibility, decision-making and impact	3,0	Seminar	english german
Master-Seminar Business Ethics	3,0	Seminar	english german

Title	Orientation Business Creation and Succession		
Number	2225000030	**Module version**	
Shorttext		**Language**	english
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Department Wirtschaftswissenschaften
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Bastian Kindermann
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 Portfolio or 1 written exam (120 min) or 1 oral exam (30 min) or 1 term paper oder 1 presentation oder 1 term paper & 1 presentation oder 1 Take-at-Home-Exam		
Course achievement			

Contents

Principles of Strategy & Entrepreneurship
In our research-oriented master-level course “Principles of Strategy & Entrepreneurship”, we will explore core questions of strategic management and delve into the process of new venture creation.
The course covers seven main areas:
1. Foundations: Tracing the origins of the strategy concept
2. Strategy & economics: Exploring the influence of economics on the notion of strategy
3. Strategy making: Understanding different perspectives on the strategy formation process
4. Competitive strategies: Learning about strategy in competitive settings
5. Cooperative strategies: Examining strategy in cooperative settings
6. Strategic entrepreneurship: Getting familiarized with strategy perspectives on new venture creation
7. Digital strategy: Delving into digital platform strategies.

Strategic Innovation Management
The master-level course “Strategic Innovation Management” offers participants a holistic guideline through the process of innovation management. The course content spans topics such as strategy development, the creation of innovation-focused firm cultures and leadership, and the expansion into global markets. In addition, we will explore concrete innovation strategies related to open innovation and (digital) platforms.

Objective qualification

After completing this module, students will be able to understand the processes of strategy development and innovation management and implement them in established companies and start-ups. Students also learn which criteria to apply when choosing a suitable strategy and how they can drive innovation processes on this basis. These skills not only prepare participants for future research-related work (e.g. Master's theses, doctorates), but also for career opportunities in management consulting, strategy departments, corporate development, innovation departments and start-ups.

Literature

wird zu Beginn der Veranstaltung bekanntgegeben.

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Related courses			
Rules for the choice of courses			
1 course of your choice			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Principles of Strategy & Entrepreneurship	4,0	Lecture/Exercise	english
Literature			
will be announced at the beginning of the course			
Strategic Innovation Management	4,0	Lecture/Exercise	english
Literature			
will be announced at the beginning of the course			

Title	Specialisation Business Creation and Succession		
Number	2225000040	**Module version**	
Shorttext		**Language**	english
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	Department Wirtschaftswissenschaften
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Bastian Kindermann
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination	1 Portfolio or 1 written exam (120 min) or 1 oral exam (30 min) or 1 term paper oder 1 presentation oder 1 term paper & 1 presentation oder 1 Take-at-Home-Exam		
Course achievement			

Contents

Principles of Strategy & Entrepreneurship
In our research-oriented master-level course “Principles of Strategy & Entrepreneurship”, we will explore core questions of strategic management and delve into the process of new venture creation.
The course covers seven main areas:
1. Foundations: Tracing the origins of the strategy concept
2. Strategy & economics: Exploring the influence of economics on the notion of strategy
3. Strategy making: Understanding different perspectives on the strategy formation process
4. Competitive strategies: Learning about strategy in competitive settings
5. Cooperative strategies: Examining strategy in cooperative settings
6. Strategic entrepreneurship: Getting familiarized with strategy perspectives on new venture creation
7. Digital strategy: Delving into digital platform strategies.

Strategic Innovation Management
The master-level course “Strategic Innovation Management” offers participants a holistic guideline through the process of innovation management. The course content spans topics such as strategy development, the creation of innovation-focused firm cultures and leadership, and the expansion into global markets. In addition, we will explore concrete innovation strategies related to open innovation and (digital) platforms.

Objective qualification

After completing this module, students will be able to understand the processes of strategy development and innovation management and implement them in established companies and start-ups. Students also learn which criteria to apply when choosing a suitable strategy and how they can drive innovation processes on this basis. These skills not only prepare participants for future research-related work (e.g. Master's theses, doctorates), but also for career opportunities in management consulting, strategy departments, corporate development, innovation departments and start-ups.

Literature

wird zu Beginn der Veranstaltung bekanntgegeben.

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Related courses			
Rules for the choice of courses			
1 course of your choice			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Principles of Strategy & Entrepreneurship	4,0	Lecture/Exercise	english
Literature			
will be announced at the beginning of the course			
Strategic Innovation Management	4,0	Lecture/Exercise	english
Literature			
will be announced at the beginning of the course			

Integration Modules

Title	Orientation Law		
Number	2216270	**Module version**	V3
Shorttext	WW-RW-27	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Anne Paschke
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

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Related courses
Rules for the choice of courses
Compulsory attendance

Name of the course	**SWS**	**Eventtype**	**Language**
Environmental Law	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			

Technology Law	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			

IT- and Data Law	2,0	Lecture	german
Literature			
Wird in der Vorlesung bekannt gegeben.			

Law for StartUps	2,0	Lecture	german
Literature			
Wird in der Veranstaltung bekanntgegeben.			

Mobility Law	4,0	Lecture	english

Title	Specialisation Law		
Number	2216300	**Module version**	V3
Shorttext	WW-RW-30	**Language**	german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Anne Paschke
Workload (h)	150		
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
Energy Law 1	2,0	Lecture	german
Energy Law 2	2,0	Lecture	german
IT Security Law	2,0	Lecture	german

Patent Law and Trademark Law	2,0	Lecture	german
Literature			
• Patent- und Musterrecht (Verlag dtv-Beck) • Wettbewerbsrecht und Kartellrecht (Verlag dtv-Beck)			

Procurement Law	2,0	Lecture	german

Title	Orientation Production and Logistics		
Number	2220140	**Module version**	V2
Shorttext	WW-AIP-14	**Language**	
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration		**Institution**	
Hours per Week / ECTS	0 / 5,0	**Module owner**	Prof. Dr. Thomas Spengler
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
Lehrbücher und weiterführende Literatur werden in den Vorlesungen angegeben.			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Production Facility Management	2,0	Lecture	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Sustainability in Production and Logistics	2,0	Lecture	german

Literature

- Baumast, A.; Pape, J. (2008): Betriebliches Umweltmanagement: Nachhaltiges Wirtschaften in Unternehmen, Eugen Ulmer: Stuttgart
- Deutsches Institut für Normung (2006): Umweltmanagement – Ökobilanz – Anforderungen und Anleitungen (ISO 14044:2006). Beuth-Verlag. Berlin. Ausgabedatum: 2006-10
- Erbguth, W.; Schlacke, S. (2010): Umweltrecht, Nomos: Baden-Baden
- Spengler, T. (1998): Industrielles Stoffstrommanagement, Erich Schmidt: Berlin
- Walther, G. (2010): Nachhaltige Wertschöpfungsnetzwerke – Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus, Gabler-Verlag: Wiesbaden.

Operations Management in the Automotive Industry	2,0	Lecture	english

Literature

Examples:

- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Supply Chain Management	2,0	Lecture	english

Literature

- Chopra, S./Meindl, P. (2016): Supply Chain Management – Strategy, Planning, and Operation. Pearson
- Shapiro, J. (2006): Modeling The Supply Chain, Duxbury/Thomson Learning
- Simchi-Levi, D./Kaminsky, P./Simchi-Levi, E. (2007): Designing and Managing the Supply Chain: Concepts, Strategies, and Case studies, McGraw-Hill/Irwin
- Stadtler, H./Kilger, C. (2007): Supply Chain Management and Advanced Planning, Springer

Exercise Supply Chain Management & Operations Management in the Automotive Industry	2,0	Exercise	english

Literature

Examples:

- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Exercise Production Facility Management and Sustainability in Production & Logistics	2,0	Exercise	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Title	Specialisation Production and Logistics		
Number	2220170	**Module version**	V2
Shorttext	WW-AIP-17	**Language**	
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration		**Institution**	
Hours per Week / ECTS	0 / 5,0	**Module owner**	Prof. Dr. Thomas Spengler
Workload (h)			
Class attendance (h)	56	**Self studying (h)**	94
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement			
Contents			
Objective qualification			
Literature			
Lehrbücher und weiterführende Literatur werden in den Vorlesungen angegeben.			

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Production Facility Management	2,0	Lecture	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Sustainability in Production and Logistics	2,0	Lecture	german

Literature

- Baumast, A.; Pape, J. (2008): Betriebliches Umweltmanagement: Nachhaltiges Wirtschaften in Unternehmen, Eugen Ulmer: Stuttgart
- Deutsches Institut für Normung (2006): Umweltmanagement – Ökobilanz – Anforderungen und Anleitungen (ISO 14044:2006). Beuth-Verlag. Berlin. Ausgabedatum: 2006-10
- Erbguth, W.; Schlacke, S. (2010): Umweltrecht, Nomos: Baden-Baden
- Spengler, T. (1998): Industrielles Stoffstrommanagement, Erich Schmidt: Berlin
- Walther, G. (2010): Nachhaltige Wertschöpfungsnetzwerke – Überbetriebliche Planung und Steuerung von Stoffströmen entlang des Produktlebenszyklus, Gabler-Verlag: Wiesbaden.

Operations Management in the Automotive Industry	2,0	Lecture	english

Literature

Examples:

- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

	2,0	Colloquium	german

Supply Chain Management	2,0	Lecture	english

Literature

- Chopra, S./Meindl, P. (2016): Supply Chain Management – Strategy, Planning, and Operation. Pearson
- Shapiro, J. (2006): Modeling The Supply Chain, Duxbury/Thomson Learning
- Simchi-Levi, D./Kaminsky, P./Simchi-Levi, E. (2007): Designing and Managing the Supply Chain: Concepts, Strategies, and Case studies, McGraw-Hill/Irwin
- Stadtler, H./Kilger, C. (2007): Supply Chain Management and Advanced Planning, Springer

Exercise Supply Chain Management & Operations Management in the Automotive Industry	2,0	Exercise	english

Literature

Examples:

- Meyr, H. (2004): Supply chain planning in the German automotive industry, in: OR Spectrum, Vol. 26, No. 4, pp. 447-470 (online available)
- Brabazon, P. G.; MacCarthy, B. (2004): Virtual-build-to-order as a mass Customization order fulfilment model, in: Concurrent Engineering Research and Applications, Vol. 12, No. 2, pp. 155-165 (online available)
- Boysen et al. (2007): A classification of assembly line balancing problems, in: European Journal of Operational Research, Vol. 183, No. 2, pp. 674-693 (online available)
- Boyer, K.; Leong, G. K. (1996): Manufacturing flexibility at the plant level, in: Omega, Vol. 24, No. 5, pp. 495-510.
- Fleischmann, B. et al. (2006): Strategic Planning of BMWs Global Production Network, in: Interfaces, Vol. 36, No. 3, pp. 194-208

Exercise Production Facility Management and Sustainability in Production & Logistics	2,0	Exercise	german

Literature

- Bernecker (2013): Planung und Bau verfahrenstechnischer Anlagen: Projektmanagement und Fachplanungsfunktionen, 4. Auflage, Springer-Verlag, Berlin.
- Bronner (2001): Industrielle Planungstechniken: Unternehmens-, Produkt- und Investitionsplanung, Kostenrechnung und Terminplanung, Springer-Verlag, Berlin.
- Geldermann, Jutta (2014): Anlagen- und Energiewirtschaft – Kosten- und Investitionsschätzung sowie Technikbewertung von Industrieanlagen, Verlag Franz Vahlen, München.
- Günther, Hans-Otto; Tempelmeier, Horst (2016): Produktion und Logistik, 12. Auflage, Springer-Verlag, Berlin.
- Thonemann, Ulrich (2015): Operations Management – Konzepte, Methoden und Anwendungen, 3. Auflage, Pearson Studium, München.
- Birolini, Alessandro (2017): Reliability Engineering: Theory and Practice, 8. Auflage, Springer-Verlag, Berlin.
- Peters et al. (2003): Plant Design and Economics for Chemical Engineers, 5th Edition, McGraw-Hill, New York.

Title	Development and Project Management		
Number	2514230	**Module version**	
Shorttext	MB-ILR-23	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	0 / 6,0	**Module owner**	Prof. Dr. Stefan Levedag
Workload (h)	180		
Class attendance (h)	56	**Self studying (h)**	124
Compulsory requirements			
Expected performance/ Type of examination	2 exams: a) 1 exam: written exam, 60 min (weighting for overall score: 1/2) b) 1 exam: written exam, 60 min (weighting for overall score: 1/2)		
Course achievement			

Contents

In addition to excellent technical skills, the development and integration of modern high technology is increasingly dependent on knowledge and skills in the area of implementation processes and the human interaction of those carrying out the work. The lecture series Development and Project Management is intended to impart knowledge about the implementation of complex products, from the formulation of requirements to the verification of modern integration processes. In preparation for this, the necessary topics of human interaction, basic technical topics and, in brief, project management are described. The knowledge imparted is an interdisciplinary combination of findings from work psychology, behavioural research, cognitive and work sciences, organizational science and system integration. Internationally, a research field of “systems engineering” has long been established, and in Germany the first institutions of this kind are becoming active at leading universities.

In EuP 1, the foundations of human cooperation are laid, starting with the basics of human motivation, through transactional analysis and the basics of communication, to the analysis of human behavior in complex situations. The vast majority of serious crises and problems in industrial practice are caused by human factors, and the university must take this into account. This lecture series attempts to make a contribution to this.

EuP 2 begins by examining the simple tools of the trade from the engineering implementation of projects through to project management, which extends to the recording of facts with earned value management and risk management. Finally, the overall process is presented using the current V-model for complex projects and critical elements are discussed.

Objective qualification

Graduates have acquired the skills to recognize the critical factors of human behavior in highly complex technical development projects and to develop appropriate behaviors in order to implement constructive and cooperative forms of work. They are able to recognize typical situations and identify specific risks and thus develop their social skills in the direction of effective technology management.

Graduates will have become familiar with the basic tools of individual work organization as required in professional practice today. They have gained an overview of the procedures and critical success factors of modern project management and have acquired basic knowledge of risk management and earned value

management. They have received an introduction to the complex processes of modern high technology (V-model of system development, systems engineering).

Literature

- Karl Kälin, Peter Müri: Psychologie für Führungskräfte, Mitarbeiterinnen und Mitarbeiter, ISBN-10: 3-7225-0002-8
- Dietrich Dörner: Strategisches Denken in komplexen Situationen, ISBN-10: 3-499-61578-9
- Friedemann Schulz von Thun: Miteinander reden 1-3, ISBN-10: 3-499-62407-9
- Gerd Gigerenzer: Bauchentscheidungen, ISBN-10: 3-442-15503-7
- „Zeitmanagement im Projekt“, Hedwig Keller, Hanser-Verlag, 2003
- Der PM-Fachmann, Bd. 1 und 2, Publikation der Gesellschaft für Projektmanagement (GPM)
- Das V-Modell XT, Dokumentation, freely accessible

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Related courses

Rules for the choice of courses

Compulsory attendance

Name of the course	SWS	Eventtype	Language

Title	Entrepreneurship for Engineers		
Number	2537280	**Module version**	
Shorttext	MB-IWF-52	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Maschinenbau
Module duration	1	**Institution**	
Hours per Week / ECTS	4 / 5,0	**Module owner**	Prof. Dr. Reza Asghari
Workload (h)	150		
Class attendance (h)	30	**Self studying (h)**	120
Compulsory requirements	Requirements for "TechnologyBusiness Model Creation": Successful participation in the "Technology Entrepreneurship" event/lecture		
Expected performance/ Type of examination	Writing paper		
Course achievement	Presentation: The participants have to generate a business model for a research project in teams #especially within the area of production technology and systems technology. Furthermore they have to present the milestones in the plenary session. Moreover they have to record their results by writing a research paper. The research project will be given by the chair. The institutes will present the research projects in the plenary session.		

Contents

The economical relevance of innovative technology companies is explained in context of knowledge economy after an introduction in the topic Entrepreneurship. Furthermore the role and function of technology based start-ups as initiator and supporter innovations are analyzed. In addition an involvement with the topic #Business model# and Business model innovation takes place: especially the components of a business model are defined and systematized. Afterwards elements and methods are presented to generate business models. So students have to generate own business ideas and business models with their acquired skills. As part of the course we cooperate with several institutes and research establishments; especially with the institute for Connecting and Welding, Technologies surface engineering, micro mechanics, institute for Factory operation and Business Research. The participants have the opportunity to deal with the utilization of future-oriented research projects and to draft suitable business models on a basis within Business Model Canvas.

Objective qualification

At the beginning of the course, theoretical content is taught in the lecture Technology Entrepreneurship (winter semester). In the following summer semester, the students are asked to apply the acquired knowledge as teams in the seminar Technology Business Model Creation by generating their own business ideas based on scientific and technological research results and to put them into practice. (self-regulated learning). After completing the module, students have knowledge and understanding of technology-oriented companies in the entrepreneurship environment. They have developed a basic knowledge regarding the analysis and application of business models in the field of e-entrepreneurship, high-tech entrepreneurship and knowledge-oriented business start-ups. The students are able to independently analyze, evaluate and optimize subject-specific issues and to present these in writing and orally in a scientific and practice-oriented manner by discussing the relevant specialist literature. The students have developed their communication skills through discussions on general and current topics related to entrepreneurship and have trained their cooperation and teamwork skills through group work. The students are able to identify and develop a business idea and set up a business model.

Literature

Faltin, Günter: Kopf schlägt Kapital, 2010, Berlin

Faltin, Günter: Wir sind das Kapital, 2015, Berlin
Fueglistaller/Volery et al.: Entrepreneurship, 5. Auflage, 2020
Grichnik, D. et al.: Entrepreneurship, 2. Auflage, 2017
Keese, Christoph: Silicon Valley # Was aus dem mächtigsten Tal der Welt auf uns zukommt, 2014
Matzler, K./Bailom, F. u.a., Digital Disruption, 2016, München
Röpke, Jochen: Der lernende Unternehmer, 2004, Marburg
Gassmann, O./Frankenberger, K./Csik, M.: Geschäftsmodelle Entwickeln, 2017
Vorlesungsfolien: Die Vorlesungsmaterialien werden in Stud.IP zum Download bereitgestellt.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**
	2,0	Lecture	german
	2,0	Seminar	german

Interdisciplinary Qualification

Title	Scientific Working - Seminar		
Number	2299820	**Module version**	
Shorttext	Wiwi-Seminare-Master	**Language**	english german
Frequency of offer	every term	**Teaching unit**	Carl-Friedrich-Gauß-Fakultät
Module duration	2	**Institution**	Department Wirtschaftswissenschaften
Hours per Week / ECTS	6 / 8,0	**Module owner**	Studiendekan der Wirtschaftswissenschaften
Workload (h)	240		
Class attendance (h)	84	**Self studying (h)**	156
Compulsory requirements			
Expected performance/ Type of examination	Either 2 term papers (each worth 4 CP) or 1 term paper (worth 8 CP)		
Course achievement			

Contents
The content of the seminar depends on the topic to be dealt with.
Objective qualification
Independent familiarization, preparation and presentation of a topic. Learning key qualifications such as presentation techniques and rhetoric.
Literature
depending on the chosen course and the specific task

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Related courses

Rules for the choice of courses

The following assignments are possible:
1. two seminars with a scope of 4 CP or
2. one seminar with the scope of 8 CP or
3. a research project with a scope of 8 CP
from the range of courses offered by the Department of Economics must be completed. The seminars must be selected in the chosen Master's specializations. As an additional requirement for financial and business mathematics, financial economics must be included.

Please note that the completion of certain coursework (e.g. orientation, coursework for the specialization, etc.) may be expected in advance. Please contact the individual institutes for the exact conditions.

Compulsory attendance

Name of the course	SWS	Eventtype	Language
Master-Seminar Economics 1	3,0	Seminar	german
Master-Seminar Management Control and Business Accounting	3,0	Seminar	german
Master-Seminar Finance	3,0	Seminar	german
Literature			
vergleiche Homepage des Lehrstuhls			
Master-Seminar Law	3,0	Seminar	german
Master-Seminar Decision Support	3,0	Seminar	english german
Literature			
themenabhängig			
	3,0	Seminar	german
Literature			
Wird in der Veranstaltung bekannt gegeben.			
Master-Seminar Services Management	3,0	Seminar	german
Literature			
Wird in der Veranstaltung bekannt gegeben.			
Master-Seminar Marketing	3,0	Seminar	german
Literature			
Die Literaturempfehlungen sind themenabhängig und werden in der Veranstaltung mitgeteilt.			
Master-Seminar Service Information Systems	3,0	Seminar	german
Master-Seminar Management and Organisation Science	3,0	Seminar	english german
Master-Seminar Data-Driven Enterprise	3,0	Seminar	german

Master-Seminar Decision Support	3,0	Seminar	english german
Literature			
themenabhängig			

Master-Seminar Business Ethics	3,0	Seminar	english german

Title	Industrial Internship		
Number	2499040	**Module version**	
Shorttext	ET-STDE-04	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	8 / 12,0	**Module owner**	
Workload (h)	360		
Class attendance (h)		**Self studying (h)**	
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement	Final presentation in accordance with the separate regulations "Internship guidelines of the Faculty of Electrical Engineering, Information Technology, Physics" in the version valid at the beginning of the course.		

Contents

individual; requirements according to internship guidelines

Objective qualification

The industrial internship provides in-depth preparation for professional life by working directly in an industrial company for at least 10 weeks. Students gain insight into organisational and operational processes and structures as well as into the work methods of engineering activities in industrial companies. Within the wide variety and breadth of structural areas (e.g. research, development, production, sales,...) and fields of activity (e.g. hardware or software development, production planning, quality assurance, sales, (project) management,...) in an industrial company, an exemplary selection with in-depth familiarisation with one or a few of these areas or fields is expected.
The aim of the module is the further development of action patterns and techniques appropriate to the situation and task as well as the further development and adaptation of the methodological skills taught during the course in the engineering solution of technical problems. In addition, students deepen their interdisciplinary knowledge and skills (e.g. discussion and negotiation skills, presentation techniques, documentation, etc.), for example by participating in meetings or by being involved in conceptual, planning or management tasks. They also carry out their own engineering activities (e.g. in conceptual planning, development or quality assurance) independently and represent their own interests. In doing so, they apply the technical knowledge and skills acquired during their studies to practical tasks in an industrial environment.
The activities carried out as part of the industrial internship must be presented in an ungraded presentation. The presentation, including preparation and follow-up work, is worth 3 credits within the 12 credits of this module.

Literature

Remark

The activities carried out as part of the industrial internship must be presented in an ungraded presentation. The presentation, including preparation and follow-up work, is worth 3 credits within the 12 credits of this module. The workload is exclusively at the location of the industrial partner, usually outside the university.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Title			
Number	2499520	**Module version**	
Shorttext	ET-STDE-52	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	0 / 8,0	**Module owner**	
Workload (h)	240		
Class attendance (h)	160	**Self studying (h)**	80
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement	The Master's team project corresponds to the examination requirements of the draft (§ 9 APO). A written project plan must be submitted for the Master's team project at the beginning, which is to be updated during the course of the project. The comparison between initial planning and actual progress must be presented and justified in the final report. The results of the Master's team project must be summarized in a report in which the individual contributions of the project participants are identified. Furthermore, the results must be presented in a presentation (§ 9 APO).		
Contents			
individual			
Objective qualification			
The Master's team project is generally completed in groups of at least three students who carry out the design, analysis, construction or simulation of an electrical or information technology system using an overarching topic as an example.			
Literature			

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Related courses			
Rules for the choice of courses			
The Master's team project can replace the industrial internship.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Title	Professionalisation		
Number	2499580	**Module version**	
Shorttext	ET-STDE-58	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	2	**Institution**	
Hours per Week / ECTS	0 / 8,0	**Module owner**	
Workload (h)	240		
Class attendance (h)		**Self studying (h)**	
Compulsory requirements			
Expected performance/ Type of examination			
Course achievement	according to the requirements of the course taken from the pool		
Contents			
Objective qualification			
Key skills are acquired in the areas listed below: - Action-orientated courses, scientific cultures Courses from the overall programme (pool) of interdisciplinary courses at the Technische Universität Braunschweig must be selected for this purpose. The type of examination or coursework and the number of credit points will be announced individually for each module. https://www.tu-braunschweig.de/studium-lehre/im-studium/lehrveranstaltungen The Dean of Studies ensures that a list of available courses is published each semester, in which recommendations are made for courses with particular practical relevance.			
Literature			

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Related courses			
Rules for the choice of courses			
A total of 4-8 credits must be earned.			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**

Master's Thesis

Title	Master's Thesis		
Number	2499510	**Module version**	
Shorttext	ET-STDE-51	**Language**	german
Frequency of offer	every term	**Teaching unit**	Fakultät für Elektrotechnik, Informationstechnik, Physik
Module duration	1	**Institution**	
Hours per Week / ECTS	0 / 30,0	**Module owner**	Studiendekan Elektrotechnik
Workload (h)	900		
Class attendance (h)		**Self studying (h)**	
Compulsory requirements			
Expected performance/ Type of examination	• Preparation of the Master's thesis (28 credits) • Presentation (according to § 4 para. 14 BPO) (2 credits) The assessment of the presentation is included in the overall grade of the final module with double weighting.		
Course achievement			

Contents

individual

Objective qualification

With the successful completion of the final thesis (§ 14 APO) and the presentation, the student demonstrates that he/she is able to work independently on a problem from the chosen subject area using scientific methods within a specified period of time. The qualification objectives of the degree program (Annex 1, § 2 APO) are reflected in the implementation and results of the final thesis with regard to the following components:

- Independent familiarisation with and scientific methodical processing of a topic fundamentally relevant to further development and research in the field of electrical engineering
- Literature research and presentation of the state of the art
- Development of new solution approaches for a scientific problem
- Presentation of the approach and results in the form of a paper
- Presentation of the main results in a comprehensible form
- Consolidation and refinement of key qualifications: management of an own project, presentation techniques and rhetorical skills

Literature

Remark

The Master's thesis is credited with 28 credits and the presentation with 2 credits; the assessment of the presentation is included in the overall grade of the final module with double weighting.

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Related courses			
Rules for the choice of courses			
Compulsory attendance			
Name of the course	**SWS**	**Eventtype**	**Language**