UNIVERSITÄT
DUISBURG
ESSEN

Syllabus Book

Bachelor of Science
Electrical and Electronic Engineering

Version: 01.10.2005

				V	Ü	P	S	Cr
Bachelor of Science in Electrical and Electronic Engineering				**73**	**38**	**19**	**0**	**174**
1.	**General Chemistry**	Mayer	*e*	2	1	0	0	4
	Introduction to CAx	Hunger Köhler	*e*	0	0	2	0	3
	Fundamentals of Computer Engineering 1	Hunger	*e*	2	1	0	0	4
	Fundamentals of Electrical Engineering 1	Pertz	*e*	2	1	0	0	4
	Interdisciplinary Labs	NN	*e*	0	0	2	0	2
	Mathematics 1	Gottschling	*e*	4	2	0	0	7
	Mechanics 1	Braun Kecskemethy	*e*	2	1	0	0	4
	Non-Technical Subject 1	NN		2	0	0	0	2
			Sum:	**14**	**6**	**4**	**0**	**30**
2.	**Computer Based Problem Solving**	Gottschling Weyh	*e*	0	0	2	0	2
	Fundamentals of Computer Engineering 2	Heisel	*e*	2	1	0	0	4
	Fundamentals of Electrical Engineering 2	Pertz	*e*	2	1	0	0	4
	Design Theory 1	Mauk	*e*	1	1	0	0	3
	Mathematics 2	Gottschling		3	2	0	0	6
	Mechanics 2	Braun Kecskemethy	*e*	2	1	0	0	4
	Non-Technical Subject 2	NN		2	0	0	0	2
	Physics	Franke	*e*	2	1	1	0	5
			Sum:	**14**	**7**	**3**	**0**	**30**

3.	**Introduction to Materials of Electrical Engineering**	Bacher	*d*	2	1	0	0	4
	Electrical Engineering Lab	Waldow	*e*	0	0	3	0	4
	Fundamentals of Electrical Energy Technology	Brakelmann	*d*	2	1	1	0	5
	Fundamentals of Electrical Engineering 3	Willms		2	1	0	0	4
	Fundamentals of Programming 1 (Programming in C)	Kochs	*d*	2	1	0	0	4
	Mathematics 3	Schreiber	*d*	2	2	0	0	5
	Microcomputer Systems	Geisselhardt	*e*	2	1	0	0	4
			Sum:	**12**	**7**	**4**	**0**	**30**

4.	**Computer Based Engineering Mathematics**	Gottschling		1	1	1	0	4
	Introduction to Automation	Maier	*d*	2	1	1	0	5
	Introduction to Solid State Electronics	Tegude	*e*	2	2	0	0	5
	Introduction to Materials for Electrical Engineering Lab	Bacher	*d*	0	0	1	0	1
	Electrical Power Systems	Erlich	*d*	2	0	1	0	4
	Non-Technical Subject 3	NN		2	0	0	0	2
	Non-Technical Subject 4	NN		2	0	0	0	2
	Project or 2 Electives			0	6	0	0	6
			Sum:	**11**	**10**	**4**	**0**	**29**

5.	**Basic Electronic Devices**	Tegude	*d*	2	1	1	0	5
	High-Voltage Engineering	Hirsch	*d*	2	0	1	0	4
	Communications 1	Czylwik	*d*	2	1	1	0	5
	Non-Technical Subject 5	NN		2	0	0	0	2
	Optoelectronic or Microelectronic		*d*	2	1	0	0	3
	Systems and Control 1	Ding Maier	*d*	2	1	0	0	4
	Electromagnetic Field Theory 1	Waldow	*d*	2	1	0	0	4
			Sum:	**14**	**5**	**3**	**0**	**27**

6.	**Bachelor Thesis**	NN		0	0	0	0	15
	Electromagnetic Compatibility	Hirsch	*e*	2	1	0	0	3
	Microwave and RF Technology	Solbach	*e*	2	1	1	0	5
	Mobile Communications or Transmission and Modulation		*d* *e*	2	1	0	0	3
	Non-Technical Subject 6	NN		2	0	0	0	2
			Sum:	**8**	**3**	**1**	**0**	**28**

Description of the degree course

name of the degree course			shorthand expression of degree course
Bachelor of Science in Electrical and Electronic Engineering			
type	**period of study**	**SWS**	**ECTS-Credits**
Bachelor	6	130	174

description

One aim of the course is a special adaptation of the graduates for careers as Electrical and Information Technology engineers in all fields of industry, economics and civil service which were up to now occupied by technical graduates of the German Diplom degree courses in Electrical Engineering and Information Engineering. The level of training and the standard duration of study enables the graduates to enter into fields of activity which up to now were primarily assigned to graduates of Polytechnic Universities (Fachhochschule) and graduates of the Vocational Colleges i.e. 'Berufsakademie'. This mainly encompasses activities in service, testing, production, sales and distribution, project planning, consultancy and marketing being oriented towards electrical components, devices and systems in manufacturing companies and the specification, acquisition, test and integration of components, devices and systems in application companies and service providing entities.

The broadly diversified areas of deployment require a similarly broad training in the

- basics of mathematics and science necessary for the technical subjects,
- basics of electrical engineering, mechanical engineering and computer science,

as well as an in depth training in the major fields of electrical engineering

- Electrical Power Engineering,
- Communications Engineering and
- Electronics.

The additional non-technical subjects are intended for to complementing the professional competence of graduates who work in teams and whose products must be in a position to economically compete on the international market.

The Bachelor education should also provide the ability for pursuing continuous professional development, to adapt to new professional areas and furthermore to proceed with studies aiming at a Master's degree.

Modul- und lecture catalogue

modul name	shorthand expression of module
Computer Engineering	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Fundamentals of Computer Engineering 1	1	3	120	4
2	Fundamentals of Computer Engineering 2	2	3	120	4
total			**6**	**240**	**8**

description:

This module covers the fundamentals of computer science necessary for the design and the analysis of hardware. The design and the analysis on the sides of software- as well as on the sides of hardware-implementation are herewith considered.

modul name	shorthand expression of module
Computer Engineering	
lecture name	**shorthand expression of lecture**
Fundamentals of Computer Engineering 1	
lecturer	**department**
Prof. Dr.-Ing. Axel Hunger	

semester	cycle	language	requirements
1		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

This course covers the fundamentals of computer science necessary for design and analysis of hardware. The topics include Boolean algebra, basic minimization methods, coding of information, arithmetic and logic functions with binary codes, design of digital circuits (combinational and sequential) as well as basics of automata and microprogramming. Based on Boolean algebra and information coding, the functions of gates and similar components of digital circuits are explained. These components are used to design more complex functions up to the modules required for the set up of a basic microcomputer.

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 Roth, Charles: Fundamentals of Logic Design, PWS Publ., 2001 Boston, 45YGQ4426
·2 Green, Derek C: Digital Electronics,Longman, 2002 Harlow, 45YGQ4434
·3 Milos Ercegovac, Tomas Lang, Jaime H. Moreno: Introduction to Digital Systems, John Wiley & Sons Inc, 1999 New York, 45YGQ1436
·4 Ronald J. Tocci: Digital Systems: Principles and Applications, Prentice Hall, 1977 New Jersey, 43YGQ1436
·5 John Crisp: Introduction to Digital Systems, Newnes, 2000 Oxford, 45YGQ4141
·6 Judith L. Gersting: Mathematical Structures for Computer Science, W.H. Freeman and Company, 1982, New York, San Francisco, 01TVA1033 , 07TVA1033 , 45TVA1033
·7 Frederick J. Hill, Gerald R. Peterson: Introduction to Switching Theory and Logical Design, John Wiley & Sons Inc., 1974 Canada, 43YGQ175

remark

modul name	shorthand expression of module
Computer Engineering	
lecture name	**shorthand expression of lecture**
Fundamentals of Computer Engineering 2	
lecturer	**department**
Prof. Dr. rer. nat. Maritta Heisel	

semester	cycle	language	requirements
2		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
- Notion of algorithm - Functional vs. imperative paradigm - Notation for algorithms - Specification notation for algorithms - Method for developing correct algorithms - Transforming algorithms into programs - Analyzing the complexity of algorithms - Notion of abstract data type (ADT) - Examples of simple ADTs
kind of examination
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literature
David Gries: The Science of Programming, Springer-Verlag, 1981. Bertrand Meyer: Object-Oriented Software Construction, Prentice Hall, 1997.
remark

modul name	shorthand expression of module
Electrical Power Engineering	
course coordinator	**faculty**
Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Electrical Power Systems	4	3	120	4
2	Electromagnetic Compatibility	6	3	90	3
3	Fundamentals of Electrical Energy Technology	3	4	150	5
4	High-Voltage Engineering	5	3	120	4
total			**13**	**480**	**16**

modul name	shorthand expression of module
Electrical Power Engineering	
lecture name	**shorthand expression of lecture**
Electrical Power Systems	
lecturer	**department**
Prof. Dr.-Ing. Istvan Erlich	

semester	cycle	language	requirements
4		German	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
The lecture deals with elements, build-up and main functions of electrical power systems. At the beginning the structure of the system will be explain. Then, the common construction of lines, cables, transformers, generators and switchgear are described. Also mathematical descriptions are given to develop and discuss operational issues. Computer-based methods will be introduced for solving power flow and short circuit problems. Some aspects of network protections will be discussed too. The objective of the lecture is to enable students treating problems of power system engineering.
kind of examination
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literature
·1 H. Happold, D. Oeding: Elektrische Kraftwerke und Netze, Springer Verlag ·2 V. Crastan: Elektrische Energieversorgung 1, Springer Verlag 2000, ISBN 3-540-64193-9 ·3 K. Heuck, K.-D. Dettmann: Elektrische Energieversorgung, Vieweg-Verlag 1999, ISBN 3-528-48547-7
remark

modul name	shorthand expression of module
Electrical Power Engineering	
lecture name	**shorthand expression of lecture**
Electromagnetic Compatibility	
lecturer	**department**
Prof. Dr.-Ing. Holger Hirsch	

semester	cycle	language	requirements
6		English	Mathematics 1,2,3,4; Fundamentals of Electrical Engineering

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	45	90	3

description

Electric and electronic appliances are based on the intended use and transport of electric and magnetic fields. Beside this intended use, fields of external sources may influence the function of an electronic component. Furthermore the emission of fields of this electronic component either radiated or conducted can potentially disturb other equipment in the neighbourhood or radio services. These disturbance phenomena are covered by the lecture Electromagnetic Compatibility. After introduction of the special definitions the disturbance phenomena are considered in detail. This is done with the fundamental coupling model beginning with electromagnetic emissions through coupling towards the electromagnetic victims. Measures to change an apparatus into an electromagnetic compatible apparatus will be discussed. The lecture closes with an overview of the legal aspects of EMC.

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 Schwab: Elektromagnetische Verträglichkeit , Springer Verlag 1996
·2 Perez: Handbook of EMC, Academic Press 1995

remark

modul name	shorthand expression of module
Electrical Power Engineering	
lecture name	**shorthand expression of lecture**
Fundamentals of Electrical Energy Technology	
lecturer	**department**
Prof. Dr.-Ing. Heinrich Brakelmann	

semester	cycle	language	requirements
3		German	Grundlagen der Elektrotechnik, der Physik und der Mathematik

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description

Aim is the introduction into problems as well as into mathematical and technical methods of electrical power engineering. Fundamentals of high voltage and high current technologies, energy production, net structures (with the emphasis on three-phase power supply) as well as of the individual net facilities are explained. Contents: I. High Voltage Technologies II. High Current Technologies III. Power Circuits IV. Power Generation, Transmission and Distribution V. Basics of Network Operation VI. Devices in Electrical Networks

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 H. Happoldt, D. Oeding : Elektrische Kraftwerke und Netze, Springer-Verlag, Berlin, 1978
·2 G. Hosemann, W. Boeck: Grundlagen der elektrischen Energietechnik, Springer-Verlag, Berlin, 1979
·3 D. Peier: Einführung in die elektrische Energietechnik, Hüthig-Verlag, Heidelberg, 1987

remark

modul name	shorthand expression of module
Electrical Power Engineering	
lecture name	**shorthand expression of lecture**
High-Voltage Engineering	
lecturer	**department**
Prof. Dr.-Ing. Holger Hirsch	

semester	cycle	language	requirements
5		German	Mathematics 1,2,3,4, Fundamentals of Electrical Engineering

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
Due to economic reasons the transport of electrical energy must make use of high voltages. The available geometric extensions of the apparatus used for the energy transport yield to an extremely high stress of the material. Beside the stress due to the normal operation additional stress occurs during atmospheric and switching activities. Although this results in a short term stress only, the apparatus must also withstand this transient field strength. The behaviour of matter in the presence of such high (short or long term) electrical fields is main topic of the lecture. Beginning with the sources of high field strength, breakdown and flashover mechanism will be covered. The phenomenon of failures of high stressed material will be complimented by lab experiments.
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
·1 Beyer, Boeck, Möller, Zaengl: Hochspannungstechnik, Springer Verlag, 1986
remark

modul name	shorthand expression of module
Electrical Engineering	
course coordinator	**faculty**
Prof. Dr.-Ing. Klaus Solbach	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Fundamentals of Electrical Engineering 1	1	3	120	4
2	Fundamentals of Electrical Engineering 2	2	3	120	4
total			**6**	**240**	**8**

description:

The module introduces fundamental methods of network analysis and first considerations of field theoretical methods, which is important for later modules. Secondly, application oriented questions concerning solid state circuits and electric machines and energy transport are discussed with a view to ready application to practical problems of mechanical engineers and material technologists.

modul name	shorthand expression of module
Electrical Engineering	
lecture name	**shorthand expression of lecture**
Fundamentals of Electrical Engineering 1	
lecturer	**department**
Dr.-Ing. Oliver Pertz	

semester	cycle	language	requirements
1		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
The first semester of this two semester course deals with three main topics. First, simple dc circuit elements are introduced (Sources, resistors) and methods for circuit analysis are taught (e.g. node and loop method). After that, amplifiers are introduced and various important circuits for operational amplifiers are discussed. At the end of the semester, ac circuit analysis and ac circuit elements like inductances and capacitors are introduced. Complex analysis is used for solving ac problems with sinusoidal voltages.
kind of examination
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literature
S.E. Schwarz, W. G. Oldham: Electrical Engineering: An Introduction ISBN 0195105850 List price: USD 102
remark

modul name	shorthand expression of module
Electrical Engineering	
lecture name	**shorthand expression of lecture**
Fundamentals of Electrical Engineering 2	
lecturer	**department**
Dr.-Ing. Oliver Pertz	

semester	cycle	language	requirements
2		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
"Fundamentals of Electrical Engineering" is a two semester course in the field of Electrical Engineering for the students of the first and second semester. The second semester continues with the ac circuit analysis already started with in the first semester. After that basic transistor and diode circuits are introduced and explained. At the end of the semester a brief introduction into electric machines and transformers finishes the second semester.
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
S.E. Schwarz, W. G. Oldham: Electrical Engineering: An Introduction ISBN 0195105850 List price: USD 102
remark

modul name	shorthand expression of module
Supplements to Fundamentals of Electrical Engineering	EGE
course coordinator	**faculty**
Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Control and Information Systems • Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Electrical Engineering Lab	3	3	120	4
2	Fundamentals of Electrical Engineering 3	3	3	120	4
total			**6**	**240**	**8**

modul name	shorthand expression of module
Supplements to Fundamentals of Electrical Engineering	EGE
lecture name	**shorthand expression of lecture**
Electrical Engineering Lab	
lecturer	**department**
Dr.-Ing. Peter Waldow	

semester	cycle	language	requirements
3		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
Linear Networks R-L, R-C Networks Twoports Wheatestone Bridge Diode characteristics, rectifier Voltage and current sources, techniques for voltage/current measurements Time dependent periodic functions
kind of examination
literature
·1 Tegude, F. J.: Festkörperelektronik. Vorlesungsskript, Universität Duisburg. ·2 Möschwitzer, A.j Lunze, K.: Halbleiterelektronik Lehrbuch. Dr. Alfred Hüthig Verlag, Heidelberg, 1988. ·3 PauI, R.: Halbleiterdioden, Dr. Alfred Hüthig Verlag, Heidelberg, 1976. ·4 Mueseler, H.j Schneider, T.: Elektronik,Carl Hanser Verlag, München, Wien, 1975. ·5 Bystron, K.j Borgmeyer, J.: Grundlagen der Technischen Elektronik,Carl Hanser Verlag, München, Wien, 1988. ·6 Wagner, S. W.: Stromversorgung elektronischer Schaltungen und Geräte. R. v. Decker`s Verlag G. Schenk, Hamburg, 1964. ·7 N. N.: Applikationsbericht 1200, SGS-ATES Germanland GmbH, Grafing 1980. ·8 Lanchester, P. C.: Digital thermometer circuit for silicon diode sensors, Cryogenics, Vol. 29, Dec. 1989, p. 1156. ·9 Unger, K.j Schneider, H. G.: Verbindungshalbleiter. Akademische Verlagsgesellschaft Geest & Portig K.-G., Leipzig, 1986, S. 14, 64 u. 100.
remark

modul name	shorthand expression of module
Supplements to Fundamentals of Electrical Engineering	EGE
lecture name	**shorthand expression of lecture**
Fundamentals of Electrical Engineering 3	
lecturer	**department**
Prof. Dr.-Ing. Hans-Ingolf Willms	

semester	cycle	language	requirements
3			

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
In lessons and execises of this course the following topics are dealt with: 1) Methods for determining the behaviour of switched electrical circuits by means of the Laplace transform. 2) Introduction into the theory of electrical networks. Especially four-pole networks and equivalent networks are covered. 3) Introduction into the basics of long-distance lines. Here the relevant line equations and some special cases, which are important in the applications are described. Moreover some selected chapters of the fundamentals of signal theory are repeated in the form of examples.
kind of examination
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literature
remark

modul name	shorthand expression of module
Supplements to Fundamentals of Mathematics	EGM
course coordinator	**faculty**
Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Control and Information Systems • Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Computer Based Engineering Mathematics	4	3	120	4
2	Mathematics 3	3	4	150	5
total			**7**	**270**	**9**

modul name	shorthand expression of module
Supplements to Fundamentals of Mathematics	EGM
lecture name	**shorthand expression of lecture**
Computer Based Engineering Mathematics	
lecturer	**department**
Prof. Dr. rer. nat. Johannes Gottschling	

semester	cycle	language	requirements
4			

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
.1 Script der Vorlesung .2 Gramlich, G; Werner, W.: Numerische Mathematik mit MATLAB, dpunkt.verlag, Heidelberg, ISBN 3-932588-55-X
remark

modul name	shorthand expression of module
Supplements to Fundamentals of Mathematics	EGM
lecture name	**shorthand expression of lecture**
Mathematics 3	
lecturer	**department**
Prof. Dr. rer. nat. Wolfgang Schreiber	

semester	cycle	language	requirements
3		German	

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description
1 Integral Transforms Convolution, Fourier Transform, Inverse Fourier Transform, Applications, Laplace Transform 2 Ordinary Differential Equations of 1. Order Linear Differential Equations, Differential equations with separated variables Exact Equations, Homogeneous Equations 3 Linear Equations of 2. Order Algebraic properties, Constant Coefficients, Reduction of the Order, Inhomogeneous Equations 4 Solution by Power Series 5 Linear Systems Homogeneous Systems, Inhomogeneous Systems, Systems with constant coefficients, Solving Systems with the Laplace Transformation
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
·1 Folland, M.: Fourier Analysis and its Applications. Wadsworth and Brooks 1992 ·2 Pinkus, A. , Zafrany, S.: Fourier Series and Integral Transforms. Cambridge University Press 1997 ·3 Gasquet, C., Witomski;P.: Fourier Analysis and Applications. Springer 1999 ·4 Braun, M.; Differentialgleichungen und ihre Anwendungen. Springer
remark

modul name	shorthand expression of module
Field and Materials	FM
course coordinator	**faculty**
Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Electromagnetic Field Theory 1	5	3	120	4
2	Introduction to Materials for Electrical Engineering Lab	4	1	30	1
3	Introduction to Materials of Electrical Engineering	3	3	120	4
total			**7**	**270**	**9**

modul name	shorthand expression of module
Field and Materials	FM
lecture name	**shorthand expression of lecture**
Electromagnetic Field Theory 1	
lecturer	**department**
Dr.-Ing. Peter Waldow	

semester	cycle	language	requirements
5		German	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

Basic mathematics, scalar and vector fields, gadiant, flux, divergence, curl. Gauss‘ Theorem, Stokes‘ Theorem, Green‘s Theorem The electric field, Coulomb force law, electric potential, charge distribution, capacitance, polarization, dielectric medium, boundary conditions method of images, boundary value problems.

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 Ingo Wolff, Maxwellsche Theorie, Springer Verlag, Berlin - Heidelberg, 1997, ISBN 3-540-63012-0, 459 Seiten.
·2 Küpfmüller, K., Einführung in die Theoretische Elektrotechnik, Springer Verlag, Berlin - Heidelberg
·3 Simonyi, K., Theoretische Elektrotechnik, VEB Germaner Verlag der Wissenschaften, Berlin

remark

modul name	shorthand expression of module
Field and Materials	FM
lecture name	**shorthand expression of lecture**
Introduction to Materials for Electrical Engineering Lab	
lecturer	**department**
Prof. Dr. rer. nat. Gerd Bacher	

semester	cycle	language	requirements
4		German	Vorlesung Einführung in die Werkstoffe der Elektrotechnik Lecture Introduction to Materials for Electrical Engineering

SWS	presence hours	self-study hours	workload	ECTS-Credits
1	15	15	30	1

description

In this course the topics of the corresponding lecture are supported and discussed in more detail by the following lab exercises: * Electrical conductivity of semiconductors * Piezoelectricity * Micro- and macroscopic properties of ferro- and ferri-magnetic materials * Frequency-dependence of the complex permittivity * Thermoelectricity (Seebeck-/Peltier-Effect) * Electric polarization of ferroelectric materials * Conductivity of High Tc-superconductors * Hall effect

kind of examination

Questioning, authoring of protocols

literature

1. H. Schaumburg, “Einführung in die Werkstoffe der Elektrotechnik“, Teubner Verlag 1993
2. E. Ivers-Tiffée, W. v. Münch, “Werkstoffe der Elektrotechnik“, Teubner Verlag 2004
3. H. Fischer, H. Hofmann, J. Spindler, “Werkstoffe der Elektrotechnik“, Hanser Fachbuchverlag 2002
4. G. Fasching, "Werkstoffe für die Elektrotechnik", Springer Verlag 1994
5. C. Kittel, "Einführung in die Festkörperphysik", Oldenbourg Verlag 2002
6. D. Meschede, “Gerthsen Physik”, Springer Verlag 2004
7. H. Haken, H.C. Wolf, “Atom- und Quantenphysik“, Springer Verlag 2003
8. R. Waser, “Nanoelectronics and Information Technology“, Wiley-VCH 2003

remark

modul name	shorthand expression of module
Field and Materials	FM
lecture name	**shorthand expression of lecture**
Introduction to Materials of Electrical Engineering	
lecturer	**department**
Prof. Dr. rer. nat. Gerd Bacher	

semester	cycle	language	requirements
3		German	keine

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

The macroscopic properties of different materials are based on their microscopic structure (e.g. the type of atoms, the chemical composition, the spatial arrangement of the atoms, the existence of defects, the band structure). The knowledge of the atomistic material properties is the basis for the understanding of the macroscopic material behaviour. Therefore, in this course the atomistic fundamentals, the band model of solid state materials, the electrical conductivity, the metals, semiconductors, polymers, dielectric, and magnetic materials will be discussed

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

1. H. Schaumburg, “Einführung in die Werkstoffe der Elektrotechnik“, Teubner Verlag 1993
2. E. Ivers-Tiffée, W. v. Münch, “Werkstoffe der Elektrotechnik“, Teubner Verlag 2004
3. H. Fischer, H. Hofmann, J. Spindler, “Werkstoffe der Elektrotechnik“, Hanser Fachbuchverlag 2002
4. G. Fasching, "Werkstoffe für die Elektrotechnik", Springer Verlag 1994
5. C. Kittel, "Einführung in die Festkörperphysik", Oldenbourg Verlag 2002
6. D. Meschede, “Gerthsen Physik”, Springer Verlag 2004
7. H. Haken, H.C. Wolf, “Atom- und Quantenphysik“, Springer Verlag 2003
8. R. Waser, “Nanoelectronics and Information Technology“, Wiley-VCH 2003

remark

modul name	shorthand expression of module
Fundamental Labs	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Computer Based Problem Solving	2	2	60	2
2	Interdisciplinary Labs	1	2	60	2
3	Introduction to CAx	1	2	90	3
total			**6**	**210**	**7**

description:

The labs contained in this module should impart the basic knowledge of and abilities in general dealing with computers, in computer-aided development and the deportment-comprehensive subjects beyond that.

modul name	shorthand expression of module
Fundamental Labs	
lecture name	**shorthand expression of lecture**
Computer Based Problem Solving	
lecturer	**department**
Prof. Dr. rer. nat. Johannes Gottschling Dr.-Ing. Bernhardt Weyh	

semester	cycle	language	requirements
2		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
·1 Pratap, R.: Getting Started with MATLAB 6. A Quick Introduction for Sci-entists and Engineers. Oxford University Press, New York-Oxford 2002 ·2 Überhuber, C., Katzenbeisser, S.: MATLAB 6, eine Einführung. Springer Verlag, Wien New York 2000
remark

modul name	shorthand expression of module
Fundamental Labs	
lecture name	**shorthand expression of lecture**
Interdisciplinary Labs	
lecturer	**department**
NN	

semester	cycle	language	requirements
1		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
During the Interdisciplinary Lab the students get a general idea in the research fields of each department of the faculty of engineering disciplines. The students can choose 5 experiments out of the offer, where at least one experiment from each department should be chosen. By this the students have the chance to set up their priorities and get at the same time an overview over the research fields.
kind of examination
literature
Script
remark

modul name	shorthand expression of module
Fundamental Labs	
lecture name	**shorthand expression of lecture**
Introduction to CAx	
lecturer	**department**
Prof. Dr.-Ing. Axel Hunger Prof. Dr.-Ing. Peter Köhler	

semester	cycle	language	requirements
1		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	60	90	3

description

The Lab Exercise will give an introduction into the possibilities of computer aided development in general. It consists of two parts. The first part is an introduction to the computer aided Design (CAD), in particular the creating of technical drawings with the CAD-system MegaCAD. The second half covers computer aided development of digital circuits. The software Workview will be used to draw and simulate logical circuits such as code converters, adders and counters.

kind of examination

literature

·1 Krulikowski, A.: Fundamentals of Geometric Dimensioning and Tolerancing.Delmar Learning,2 edition (1997).
·2 Hoischen: Technisches Zeichnen. Cornelson-Verlag.
·3 Köhler, P.: Moderne Konstruktionsmethoden im Maschinenbau. Vogel Buchverlag. Würzburg 2002
·4 http://www.megacad.de/download/index.htm

remark

modul name	shorthand expression of module
Auxiliary Engineering Disciplines	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger	-
used in degree course	
• Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Fundamentals of Programming 1 (Programming in C)	3	3	120	4
2	Microcomputer Systems (wP)	3	3	120	4
total			**6**	**240**	**8**

description:
This module offers the basic knowledge necessary for design and implementation of simple computer systems. Focus is laid on microprocessors and programming close to machine level.

modul name	shorthand expression of module
Auxiliary Engineering Disciplines	
lecture name	**shorthand expression of lecture**
Fundamentals of Programming 1 (Programming in C)	
lecturer	**department**
Prof. Dr.-Ing. Hans-Dieter Kochs	

semester	cycle	language	requirements
3		German	keine

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

A widely-used programming language is C, especially for industrial applications and for network and communication applications. C is also the basic syntax of C++. The course gives a detailed introduction to the syntax and semantics of C. Contents: 1) Introduction,. 2) Information - Representation and Modelling. 3) Design of algorithms. 4) From an algorithm to a program. 5) Lexical elements. 6) Objects. 7) Input and output. 8) Expressions. 9) Elementary steps and statements. 10) Functions. 11) Pointers. 12) Dynamical memory allocation - Memory management functions. 13) Structures.

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 American National Standards Institute: American National Standard for Information Systems - Programming Language C. ANSI X3.159-1989, Published by American National Standards Institute, 11 West 42nd Street, New York, New York 10036. 1989.
·2 Kernighan, Brian W., Tondo, Clovis L., Ritchie, Dennis M. : The C programming language . - Englewood Cliffs, NJ : Prentice-Hall . - (Prentice-Hall software series). 1988.
·3 U. Rembold: Einführung in die Informatik für Naturwissenschaftler und Ingenieure. Carl-Hanser-Verlag, München. 3. Auflage. 1999.
·4 K. Zeiner: Programmieren lernen mit C. Carl-Hanser-Verlag, München. ISBN 3446215964. 4. Auflage. 2000.

remark

modul name	shorthand expression of module
Auxiliary Engineering Disciplines	
lecture name	**shorthand expression of lecture**
Microcomputer Systems (wP)	
lecturer	**department**
Prof. Dr.-Ing. Walter Geisselhardt	

semester	cycle	language	requirements
3		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

Design and implementation of small process control systems. Microprocessors and microcontrollers as constituents of electrical and mechanical systems defining their function and performance. Simple man-machine interface, interconnection to monitoring systems at a higher level. Examples: Automobile electronics, telecommunication, traffic control. Operating systems, device driver, I/0, high level vs. Assembler programming.

kind of examination

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literature

• J. L. Hennessy, D. A. Patterson: Rechnerarchitektur; Vieweg, 1994 or later English editions
• W. Stallings: Computer Organization and Architecture; McMillan, 1993
• R. Y. Kain: Computer Architecture Vol. 1,2; Prentice Hall, 1989 (43 1419)
• G. Küveler, D. Schwoch: Arbeitsbuch Informatik; Vieweg, 1996
• H. Eberle: Architektur moderner RISC-Mikroprozessoren; Informatik-Spektrum 20, H.5, Okt.1997, S. 259-267
• B. Jacob, T. Mudge: Virtual Memory: Issues of Implementation; IEEE Computer, vol.31, 1998, No. 6, pp.33-43
• S. A. McKee, et al.: Smarter Memory: Improving Bandwith for Streamed References; IEEE Computer, July 98, pp. 54-63
• J. Altenburg: Mikrocontroller-Programmierung, Carl Hanser Verlag 2000, ISBN 3-446-21408-9

remark

modul name	shorthand expression of module
Mechanical Engineering	
course coordinator	**faculty**
Prof. Dr. rer. nat. Jan-Dirk Herbell	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Design Theory 1	2	2	90	3
2	Mechanics 1	1	3	120	4
3	Mechanics 2	2	3	120	4
total			**8**	**330**	**11**

description:

This module provides basic statics and dynamics to solve scientific and technical problems. Design Theory I deals with rules and approaches for the construction of tools with respect of function, production and economy. Material sciences presented in Mechanics 1 + 2 are elementary.

modul name	shorthand expression of module
Mechanical Engineering	
lecture name	**shorthand expression of lecture**
Design Theory 1	
lecturer	**department**
Prof. Dr.-Ing. Paul Josef Mauk	

semester	cycle	language	requirements
2		English	keine

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	60	90	3

description

At the beginning the product design process as problem solving procedure for technical problems is explaint, with problem definition and customer demands for the product. Following the basic forces are discussed which machines and their parts under operating conditions are subdued. Further on are discussed the boundary forces of construction basic materials at static and dynamic forces, with the definition of the shape stability of real parts. At least are the location- and mold tolerances, the fitting systems and allowance discussed. To practice the basic principles, it will be clarified at the example of an bolt connection.

kind of examination

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literature

·1 Robert L. Norton, Machine Design – An Integrated Approach, Prentice Hall, Inc. 2001, Upper Saddle River, ISBN 0-13-017706-7
·2 George E. Dieter, Engineering Design – A Materials and Processing Approach, McGraw Hill Publ., Boston, 2001, ISBN 0-07-366136-8
·3 Bernard J. Hamrock, Bo Jacobson, Steven R. Schmid, Fundamentals of Machine Elements, McGraw Hill Publ. Boston, 1999, ISBN 0-256-19069-0
·4 U. Claussen, Methodisches Auslegen – Rechnergestütztes Konstruieren,Carl Hanser Verlag, München, 1993
·5 Robert C. Juvinal, Kurt M. Marshek, Fundamentals of Machine Component Design, John Wiley & Sons Inc., New York, 2003, ISBN 0-471-44844-3
·6 U. Claussen, Methodisches Auslegen – Rechnergestütztes Konstruieren, Carl Hanser Verlag, München, 1993
·7 K. Lingaiah, Machine Design Data Book,McGraw Hill Publ., New York, 2001
·8 J. E. Shigley, C.R. Mischke, Standard Handbook of Machine Design, McGraw Hill, New York, 1996, ISBN 0-07-056958-4

remark

modul name	shorthand expression of module
Mechanical Engineering	
lecture name	**shorthand expression of lecture**
Mechanics 1	
lecturer	**department**
Prof. Dr. rer. nat. Manfred Braun Prof. Dr.-Ing. Andres Kecskemethy	

semester	cycle	language	requirements
1		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

Introduction; Vector Notation Kinematics of point masses ”Geometry of Motion” Dynamics of point masses (”Interaction between forces and motion”) Kinematics and dynamics of multi-particle systems(center of mass, constraint forces, degrees of freedom, etc.)Rotational Motion (planar)Energy Methods

kind of examination

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literature

·1 Segel: Mathematics applied to Continuum Mechanics, Dover
·2 Goldstein: Classical mechanics, Addison-Wesley
·3 Lanczos: The Variational Principle of Mechanics, Dover
·4 kleppner, Kolenkow: An Introduction to Mechanics, McGraw-Hill

remark

modul name	shorthand expression of module
Mechanical Engineering	
lecture name	**shorthand expression of lecture**
Mechanics 2	
lecturer	**department**
Prof. Dr. rer. nat. Manfred Braun Prof. Dr.-Ing. Andres Kecskemethy	

semester	cycle	language	requirements
2		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

Continuation of Mechanics 1: Dynamics of planar rigid bodies, some special kinematics properties of planar motion Statics: special solutions of systems at rest, friction, beam theory

kind of examination

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literature

·1 Segel: Mathematics applied to Continuum Mechanics, Dover
·2 Goldstein: Classical mechanics, Addison-Wesley
·3 Lanczos: The Variational Principle of Mechanics, Dover
·4 Kleppner, Kolenkow: An Introduction to Mechanics, McGraw-Hill

remark

modul name	shorthand expression of module
Communications Engineering	
course coordinator	**faculty**
Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Communications 1	5	4	150	5
2	Microwave and RF Technology	6	4	150	5
3	Mobile Communications or Transmission and Modulation	6	3	90	3
total			**11**	**390**	**13**

modul name	shorthand expression of module
Communications Engineering	
lecture name	**shorthand expression of lecture**
Communications 1	
lecturer	**department**
Prof. Dr.-Ing. Andreas Czylwik	

semester	cycle	language	requirements
5		German	

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description
Introduction; Test signals; Linear continuous-time systems; Fourier transform; Laplace transform; Hilbert transform; Sampling theorem; Linear discrete-time systems; z transform
kind of examination
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literature
R. Unbehauen: Systemtheorie
remark

modul name	shorthand expression of module
Communications Engineering	
lecture name	**shorthand expression of lecture**
Microwave and RF Technology	
lecturer	**department**
Prof. Dr.-Ing. Klaus Solbach	

semester	cycle	language	requirements
6		English	Mathematics 1,2,3 and Fund. of Electr. Engineering

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description

The lectures start with a short history of Radio Frequency engineering and an introduction to system considerations, describing the function of antennas and sub-circuits (building blocks) and then analyzing the function of communication systems. Circuits for Radio Frequency (RF) and Microwave applications employ passive concentrated (R,L,C) and distributed elements (transmission lines) and active elements connected in networks. The lecture series starts with the characterization of R,L,C-components as concentrated elements with parasitics and presents linear circuits based on L- and C-elements which are used to realize impedance transformers, reactive compensation and frequency filters. The most versatile component of RF- and Microwave circuits is covered in a chapter on transmission line characteristics. From an equivalent circuit representation the waves on transmission lines are derived and concepts of characteristic impedance, reflection coefficient and impedance transformation are presented. Transmission line circuits are analyzed employing the matrix representation describing port current and voltage as well as describing incident and emanent waves at the network ports. Various types of practically important transmission line are analyzed. Active circuits are discussed using RF amplifiers as an example; the principle characteristics of gain, noise, stability and impedance match are derived based on transistor equivalent circuit representation. The course is complemented by a series of lab experiments covering the major topics of the lectures.

kind of examination

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literature

·1 Lecture-manuscript: File available from http://www.uni-duisburg.de/FB9/HFT/home-ger.html or paper copy from Herr Küppers (Room BB1119)
·2 David M. Pozar, Microwave and RF Wireless Systems, John Wiley & Sons, Inc.,2001

remark

modul name	shorthand expression of module
Communications Engineering	
lecture name	**shorthand expression of lecture**
Mobile Communications or Transmission and Modulation	
lecturer	**department**

semester	cycle	language	requirements
6		German/English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	45	90	3

description
kind of examination
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literature
remark

modul name	shorthand expression of module
Natural Science	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Paul Josef Mauk Prof. Dr.-Ing. Klaus Solbach Prof. Dr. rer. nat. Jan-Dirk Herbell	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	General Chemistry	1	3	120	4
2	Mathematics 1	1	6	210	7
3	Mathematics 2	2	5	180	6
4	Physics	2	4	150	5
total			**18**	**660**	**22**

description:

Mathematics is taught in order to allow students to understand and follow courses in engineering theory and develop their ability to describe and solve engineering problems. Physics and Chemistry are taught in order to allow students to understand the fundamentals of many engineering disciplines and applications. The two courses in Mathematics cover the general fundamentals, while further mathematical fundamentals are added in later semesters depending on the requirements of the particular engineering discipline chosen by the individual student. The course in Chemistry covers introductory material for the understanding of basic principles used in engineering and lays the fundamentals for those students who continue with more specialized introductions to Chemistry in mechanical engineering and material technology. The course in Physics concentrates on those areas which are not covered by courses in mechanical engineering and electrical engineering of the first year in order to allow students a broader view of physical fundamentals and principles which are encountered in engineering sciences.

modul name	shorthand expression of module
Natural Science	
lecture name	**shorthand expression of lecture**
General Chemistry	
lecturer	**department**
Prof. Dr. rer. nat. Christian Mayer	

semester	cycle	language	requirements
1		English	keine

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

The lecture deals with the fundamentals of general chemistry (atomic models, periodic table, chemical bonds, chemical thermodynamics and kinetics) as well as with some aspects of the field of chemistry which are of special relevance for engineering applications (structural and functional materials).

kind of examination

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literature

1) General Chemistry (English) first choice!
by Peter W. Atkins (New York 1989)
accessible in the library under code: 32UNP2386
2) Chemie – einfach alles (German)
by Peter W. Atkins and J.A. Beran (Weinheim 1996)
accessible in the library under code: 32UNP2653
3) General Chemistry (English)
by Wendell H. Slabaugh and Theran D. Parsons (New York 1976)
accessible in the library under code: 31UNP1453
4) Prinzipien der Chemie (German)
by Dickerson, Gray and Haight (Berlin 1978)
accessible in the library under code: 31UNP1762
5) Basic Principles of Chemistry (English)
by Harry B. Gray and Gilbert P. Haight (New York 1967)
accessible in the library under code: 33UNP1259

remark

modul name	shorthand expression of module
Natural Science	
lecture name	**shorthand expression of lecture**
Mathematics 1	
lecturer	**department**
Prof. Dr. rer. nat. Johannes Gottschling	

semester	cycle	language	requirements
1		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
6	90	120	210	7

description

Propositional calculus, Predicate calculus, Real numbers, Mathematical Induction, Complex numbers, Sequences of real numbers, Series of real numbers, Complex exponential function, Logarithm and general exponential functions, Limits and continuity of functions, Trigonometric functions, Hyperbolic functions, Techniques of differentiation, Tangent lines and rates of change, Rules for finding derivatives, Higher order derivatives, Antiderivatives, Rules for finding antiderivatives, Definite integrals, Properties of definite Integrals, Techniques of indefinite integration, The first derivative test, The second derivative test, Convexity and Concavity, Applications of extrema, L'Hôpital's Rule, Solids of revolution, Centroids of plane regions, Taylor series

kind of examination

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literature

·1 Forster, Otto: Analysis 1, Differential- und Integralrechnung, 4. Auflage, Vieweg & Sohn, Braunschweig 1983, ISBN 3-528-37224-9
·2 Haußmann, Werner; Jetter, Kurt; Mohn, Karl-Heinz: Mathematik für Ingenieure, Teil I, Duisburg 1998
·3 Cronin-Scanlon, Jane: Advanced Calculus, A Start in Analysis, D. C. Heath and Company, Lexington, Massachusetts 1969
·4 Swokowski, Earl. W: Calculus with Analytic Geometry, Second Edition, Prindle, Weber & Schmidt, Boston, Massachusetts 1979, ISBN 0-87150-268-2
·5 Ash, Carol; Ash, Robert B.: The Calculus Tutoring Book, IEEE Press, University of Illinois at Urbana-Champaign, ISBN 0-87942-183-5
·6 Livesley, R. K.: Mathematical Methods for Engineers, Ellis Horwood Limited, Chichester, West Sussex, England 1989, ISBN 0-7458-0714-3
·7 Jordan, D. W.; Smith, P.: Mathematical Techniques, Second Edition, Oxford University Press, New York 1997, ISBN 0 19 856461 9
·8 Apostol, T.M.: Calculus I, II, Xerox College Publishing: Lexton-Mass., Toronto 1967

modul name	shorthand expression of module
Natural Science	
lecture name	**shorthand expression of lecture**
Mathematics 2	
lecturer	**department**
Prof. Dr. rer. nat. Johannes Gottschling	

semester	cycle	language	requirements
2			

SWS	presence hours	self-study hours	workload	ECTS-Credits
5	75	105	180	6

description

Vector space, Matrices, Determinats and their properties, System of linear equations, Eigenvalues, Eigenvectors, Vector-valued functions, Functions of several variables, Limits and Continuity, Partial Derivatives, Local extrema, Vectorfields, Line Integrals, Introduction to ODE, Laplace transforms, Fourier series and transform, Introduction to PDE

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 Forster, Otto: Analysis 2, Differentialrechnung im IR(n), Gewöhnliche Differentialgleichungen, Vieweg & Sohn, ISBN 3-499-27031-5
·2 Swokowski, Earl. W: Calculus with Analytic Geometry, Second Edition, Prindle, Weber & Schmidt, Boston, Massachusetts 1979, ISBN 0-87150-268-2
·3 Ash, Carol; Ash, Robert B.: The Calculus Tutoring Book, IEEE Press, University of Illinois at Urbana-Champaign, ISBN 0-87942-183-5
·4 Livesley, R. K.: Mathematical Methods for Engineers, Ellis Horwood Limited, Chichester, West Sussex, England 1989, ISBN 0-7458-0714-3
·5 Jordan, D. W.; Smith, P.: Mathematical Techniques, Second Edition, Oxford University Press, New York 1997, ISBN 0 19 856461 9
·6 Papula, Lothar: Mathematik für Ingenieure und Naturwissenschaftler, Band 1 und Band 2, 10. Auflage, Vieweg & Sohn, Braunschweig/Wiesbaden 2001, ISBN 3-528-94237-1
·7 Apostol, T.M.: Calculus I, II, Xerox College Publishing: Lexton-Mass., Toronto 1967

remark

modul name	shorthand expression of module
Natural Science	
lecture name	**shorthand expression of lecture**
Physics	
lecturer	**department**
Prof. Dr. rer. nat. Hilmar Franke	

semester	cycle	language	requirements
2		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description

1)Introduction: vectors, units, equation of linear and circular motion, energy, elastic- and inelastic collision; 2)oscillations and waves: free-,damped-,enforced oscillations, waves, acoustic waves, what is sound?, intensity of sound, dB scale 3)optics: geometrical optics: prism, lenses, mirror, Snell´s law, light guiding, imaging with simple instruments 4)atomic physics: Bohr´s model, quantum numbers and their meaning, Franck-Hertz-experiment, X-rays, application of X-rays 5)nuclear physics: electrons, protons, neutrons, radiation, radioactive decay, radioactive clocks, nuclear energy from fusion and fission.

kind of examination

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literature

·1 U.Leute: Physik, Hanser Verlag, 1995
·2 Lindner: Physik für Ingenieure, Hanser Verlag, 2001
·3 H.J.Paus: Physik in Experimenten und Beispielen, Hanser Verlag, 2001
·4 Orear: Physik", Hanser Verlag, 2001
·5 Bohrmann, Pitka, Stöcker, Terlitzki: Physik für Ingenieure, Harri German,1993
·6 Übungsbuch: z.B.:Müller/Heinemann/Krämer/Zimmer: Übungsbuch Physik, Hanser Verlag, 2001

remark

modul name	shorthand expression of module
Non-Technical Subjects 1	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Paul Josef Mauk Prof. Dr.-Ing. Klaus Solbach Prof. Dr. rer. nat. Jan-Dirk Herbell	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Non-Technical Subject 1	1	2	60	2
2	Non-Technical Subject 2	2	2	60	2
total			**4**	**120**	**4**

description:

This module gives Bachelor-students the opportunity to demonstrate their participation in non-technical subjects. Students are free to choose from all offers of the University Duisburg-Essen, e.g. language courses or lectures on business administration and sociology and culture. From the catalogue at least one course of the field business administration has to be selected.

modul name	shorthand expression of module
Non-Technical Subjects 1	
lecture name	**shorthand expression of lecture**
Non-Technical Subject 1	
lecturer	**department**
NN	

semester	cycle	language	requirements
1			

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
remark

modul name	shorthand expression of module
Non-Technical Subjects 1	
lecture name	**shorthand expression of lecture**
Non-Technical Subject 2	
lecturer	**department**
NN	

semester	cycle	language	requirements
2			

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
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literature
remark

modul name	shorthand expression of module
Non-Technical Subjects 2	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Paul Josef Mauk Prof. Dr.-Ing. Klaus Solbach Prof. Dr. rer. nat. Jan-Dirk Herbell	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Non-Technical Subject 3	4	2	60	2
2	Non-Technical Subject 4	4	2	60	2
3	Non-Technical Subject 5	5	2	60	2
4	Non-Technical Subject 6	6	2	60	2
total			**8**	**240**	**8**

description:

This module gives Bachelor-students the opportunity to demonstrate their participation in non-technical subjects. Students are free to choose from all offers of the University Duisburg-Essen, e.g. language courses or lectures on business administration and sociology and culture. From the catalogue at least one course of the field business administration has to be selected.

modul name	shorthand expression of module
Non-Technical Subjects 2	
lecture name	**shorthand expression of lecture**
Non-Technical Subject 3	
lecturer	**department**
NN	

semester	cycle	language	requirements
4			

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
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literature
remark

modul name	shorthand expression of module
Non-Technical Subjects 2	
lecture name	**shorthand expression of lecture**
Non-Technical Subject 4	
lecturer	**department**
NN	

semester	cycle	language	requirements
4			

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
remark

modul name	shorthand expression of module
Non-Technical Subjects 2	
lecture name	**shorthand expression of lecture**
Non-Technical Subject 5	
lecturer	**department**
NN	

semester	cycle	language	requirements
5			

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
remark

modul name	shorthand expression of module
Non-Technical Subjects 2	
lecture name	**shorthand expression of lecture**
Non-Technical Subject 6	
lecturer	**department**
NN	

semester	cycle	language	requirements
6			

SWS	presence hours	self-study hours	workload	ECTS-Credits
2	30	30	60	2

description
kind of examination
According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.
literature
remark

modul name	shorthand expression of module
Control Engineering	
course coordinator	**faculty**
Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Introduction to Automation	4	4	150	5
2	Systems and Control 1	5	3	120	4
total			**7**	**270**	**9**

description:
After a survey on automation and after an introduction to event discrete systems and logic control, systems theory of linear systems and its application for analysis and design of control loops is considered.

modul name	shorthand expression of module
Control Engineering	
lecture name	**shorthand expression of lecture**
Introduction to Automation	
lecturer	**department**
Prof. Dr.-Ing. Uwe Maier	

semester	cycle	language	requirements
4		German	lecture "Mathematics 3" (differential equations, Laplace transform)

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description

The introduction gives a survey on goals, functionality and device technology for industrial automation. For the description of event discrete systems, e.g. of sequential control and its controlled process, place transition nets, a subset of Petri nets, are introduced. Programmable logic controllers (PLC) and their textual and graphic programming according to the international standard IEC 61131-3 are considered. The fundamentals of systems theory deals with the description and analysis of dynamic systems, which can be described by ordinary linear differential equations with constant coefficients or by transfer functions or frequency responses. Then, systems theory is applied to simple feedback control loops, for analysing their dynamics and stability.

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 Maier, Uwe: Vorlesungsskript "Automatisierungs- Regelungstechnik".
·2 Unbehauen, Heinz: Regelungstechnik 1. Vieweg, Braunschweig u.a.
·3 John, Karl-Heinz; Tiegelkamp, M.: SPS-Programmierung mit IEC61131-3. Springer, Berlin.

remark

modul name	shorthand expression of module
Control Engineering	
lecture name	**shorthand expression of lecture**
Systems and Control 1	
lecturer	**department**
Prof. Dr.-Ing. Steven X. Ding Prof. Dr.-Ing. Uwe Maier	

semester	cycle	language	requirements
5		German	Lecture "Introduction to Automation" = "Einführung in die Automatisierungstechnik"

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	75	120	4

description

Continuation of classic closed loop control: Root locus method, closed loop controller design (empiric rules, criteria in time and frequency domain) and structural variants. In the second part of this course, essentials of digital control systems are introduced. The first sections are devoted to the mathematical tools for the description of discrete systems in the time and frequency domain. It is followed by the study on the dynamics of discrete systems and introduction of different digitalization methods. Finally, digital controller design methods are presented.

kind of examination

According to § 17 of the examination regulation the type and duration of the examination will be defined from the lecturer before the semester starts. Therefore an examination can be a written test with a length of 30 to 120 minutes or an oral examination with a length of 30 to 60 minutes. The language of the examination is the same as the language of the lecture.

literature

·1 Maier, Uwe: Vorlesungsskript "Automatisierungs-Regelungstechnik".
·2 Unbehauen, Heinz: Regelungstechnik 1 und 2. Vieweg, Braunschweig.
·3 Föllinger, Otto: Regelungstechnik. Hüthig, Heidelberg.
·4 Föllinger, Otto: Lineare Abtastsysteme. Oldenbourg, München.

remark

modul name	shorthand expression of module
Electronics	
course coordinator	**faculty**
Prof. Dr.-Ing. Klaus Solbach	-
used in degree course	
• Bachelor of Science in Electrical and Electronic Engineering	

nr	courses	semester	sws	workload	ECTS-credits
1	Basic Electronic Devices	5	4	150	5
2	Introduction to Solid State Electronics	4	4	150	5
3	Mikroelektronik	5	3	90	3
total			**11**	**390**	**13**

modul name	shorthand expression of module
Electronics	
lecture name	**shorthand expression of lecture**
Basic Electronic Devices	
lecturer	**department**
Prof. Dr. rer. nat. Franz-Josef Tegude	

semester	cycle	language	requirements
5		German	

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description

Starting with the basics concerning MOS-capacitors and charge-coupled devices, the fundamentals of field-effect transistors (MOSFET, MESFET, JFET) are treated. In the second part the basics of bipolar devices (pn-diode, zener-diode, bipolar transistor) are covered. The DC- and AC-behaviour of these devices are intensively studied resulting in a discussion of various small-signal equivalent circuits

kind of examination

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literature

·1 K.-H. Rumpf, K.Pulvers, Elektronische Halbleiterbauelemente – Vom Transistor zur VLSI-Schaltung, Dr. Alfred Hüthig Verlag Heidelberg, ISBN 3-7785-1345-1, 1987
·2 R.Köstner, A.Möschwitzer, Elektronische Schaltungen, Carl Hanser Verlag, München Wien, Studienbücher, ISBN 3-446-16588-6, 1993
·3 K.Bystron, J.Borgmeyer, Grundlagen der Technischen Elektronik, Carl Hanser Verlag, München Wien, Studienbücher, ISBN 3-446-15869-3, 1990
·4 D. A. Neamen, Electronic Circuit Analysis and Design, Irwin Book Team, ISBN 0-256-11919-8, 1996
·5 A.S.Sedra, K.C.Smith, Microelectronic Circuits, Oxford University Press, 1991, ISBN 019-510369-6
·6 R.S. Muller, T.I.Kamins, Device Electronics for Integrated Circuits, John Wiley & Sons, 1986, ISBN 0-471-88758-7
·7 R.J.Baker, H.W.Li, D.E.Boyce, CMOS: Circuit Design, Layout, And Simulation, IEEE Press Series on Microelectronic Systems, IEEE Press, 1998, ISBN 0-7803-3416-7
·8 H.Tholl, Bauelemente der Halbleiterelektronik, B.G.Teubner, Stuttgart, 1978, II, Teil 2, ISBN 3-519-06419-7
·9 F.J.Tegude, Festkörperelektronik, Skript zur Vorlesung, Universität Duisburg - Essen

remark

modul name	shorthand expression of module
Electronics	
lecture name	**shorthand expression of lecture**
Introduction to Solid State Electronics	
lecturer	**department**
Prof. Dr. rer. nat. Franz-Josef Tegude	

semester	cycle	language	requirements
4		English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
4	60	90	150	5

description

Starting with basics of Quantum Physics, i.e. Heisenberg´s uncertainty relations, Schroedinger equation, atomic models, this course gives an introduction to the electronic properties of solid-state materials. Using Schroedinger´s equation the simple Kronig-Penney bandstructure model is developed to distinguish between isolators, metals and semiconductors. The carrier statistics and densities in these materails for electrons and holes is develoepd and, together with transport properties especially in semiconductors (microscopic model of the mobility), the electrical conductivity is evaluated. Poisson and continuity equations are derived ending up with the fundamentals of the pn-junction and MOS-system.

kind of examination

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literature

·1 S.Sze, "Physics of Semiconductor Devices", John Wiley and Sons, New York, 1982
·2 C.Kittel, "Intorduction to Solid-State Electronics", John Wiley and Sons, New York, 1995
·3 Schaumburg, "Halbleiter", Teubner-Verlag, Stuttgart, 1991
·4 R.Kassing, "Physikalische Grundlagen der elektronischen Halbleiterbauelemente, Aula Verlag, Wiesbaden
·5 A. Schlachetzki, "Halbleiter-Elektronik", Teubner Verlag, Stuttgart, 1990

remark

modul name	shorthand expression of module
Electronics	
lecture name	**shorthand expression of lecture**
Mikroelektronik	
lecturer	**department**

semester	cycle	language	requirements
5		German	

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	45	45	90	3

description
kind of examination
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literature
remark

modul name	shorthand expression of module
Elective, Thesis	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger Prof. Dr.-Ing. Uwe Maier Prof. Dr.-Ing. Paul Josef Mauk Prof. Dr.-Ing. Klaus Solbach Prof. Dr. rer. nat. Jan-Dirk Herbell	-

used in degree course

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science and Communications Engineering
- Bachelor of Science in Control and Information Systems
- Bachelor of Science in Electrical and Electronic Engineering
- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Material Technology

nr	courses	semester	sws	workload	ECTS-credits
1	Bachelor Thesis	6	0	0	15
2	Project or 2 Electives	4	6	180	6
total			**6**	**180**	**21**

description:

Candidates of BSc in Mech. Eng. need to do a project in teamwork, before they may finish their bachelor’s thesis.

modul name	shorthand expression of module
Elective, Thesis	
lecture name	**shorthand expression of lecture**
Bachelor Thesis	
lecturer	**department**
NN	

semester	cycle	language	requirements
6		German/English	

SWS	presence hours	self-study hours	workload	ECTS-Credits
0	0	0	0	15

description
With the final thesis the candidates finish their course; they should prove their ability to solve an engineering task by themselves.
kind of examination
literature
remark

modul name	shorthand expression of module
Elective, Thesis	
lecture name	**shorthand expression of lecture**
Project or 2 Electives	
lecturer	**department**

semester	cycle	language	requirements
4			

SWS	presence hours	self-study hours	workload	ECTS-Credits
6	90	90	180	6

description
kind of examination
literature
remark