UNIVERSITÄT
DUISBURG
ESSEN

Syllabus Book

Bachelor of Science
Control and Information Systems

Version: 01.10.2005

				V	Ü	P	S	Cr
Bachelor of Science in Control and Information Systems				**71**	**37**	**20**	**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
			Summe:	**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
			Summe:	**14**	**7**	**3**	**0**	**30**

3.	**Electrical Engineering Lab**	Waldow	*e*	0	0	3	0	4
	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	2	0	6
	Non-Technical Subject 3	NN		2	0	0	0	2
	Thermodynamics 1	Atakan	*e*	2	1	0	0	4
			Summe:	**12**	**6**	**5**	**0**	**29**

4.	**Operating Systems and Computer Networks**	Hunger	*e*	2	1	0	0	4
	Computer Based Engineering Mathematics	Gottschling		1	1	1	0	4
	Introduction to Automation	Maier	*d*	2	1	1	0	5
	Fundamentals of Software Engineering 1 (Structured Analysis)	Hunger	*d*	2	0	2	0	5
	Fundamentals of Programming 2 (OO Programming in C++)	Kochs	*d*	2	1	0	0	4
	Materials Engineering	Fischer	*d*	2	0	0	0	3
	Thermodynamics 2	Atakan	*e*	2	2	0	0	5
			Summe:	**13**	**6**	**4**	**0**	**30**

5.	**Basic Electronic Devices**	Tegude	*d*	2	1	1	0	5
	Internet Technology	Kochs	*d*	2	1	0	0	4
	Modelling and Simulation of Dynamic Systems	Maier	*e*	2	1	1	0	5
	Non-Technical Subject 4	NN		2	0	0	0	2
	Non-Technical Subject 5	NN		2	0	0	0	2
	Process Control Engineering	Maier	*d*	2	1	0	0	4
	Process Control Engineering Lab	Maier	*d*	0	0	1	0	1
	Systems and Control 1	Ding Maier	*d*	2	1	0	0	4
			Summe:	**14**	**5**	**3**	**0**	**27**

6.	**Bachelor Thesis**	NN		0	0	0	0	15
	Non-Technical Subject 6	NN		2	0	0	0	2
	Project or 2 Electives			0	6	0	0	6
	Systems and Control 2	Ding	*d*	2	1	1	0	5
			Summe:	**4**	**7**	**1**	**0**	**28**

Description of the degree course

name of the degree course			shorthand expression of degree course
Bachelor of Science in Control and Information Systems			
type	**period of study**	**SWS**	**ECTS-Credits**
Bachelor	6	128	174

description

One special aim of the course in “Control and Information Systems” is preparing the graduates for careers as engineers in several occupation areas in technical applications which were normally carried out by electrical engineers or mechanical engineers or computer engineers. In addition, the course fulfils the requirements for technical automation practices to a particularly high degree, especially in the following areas:

- Development of systems and devices of automation technology in manufacturing companies;
- Engineering (conception, planning, project development) of automation tasks in all branches of application (e.g. process engineering, production engineering, central building control systems, traffic systems, medical technology) in user- or service provider-companies.
- Maintenance tasks in production.

Since automation technology engineers should not only be acquainted with methods of steering and controlling and the implementing in the form of computer based systems, but also with automation processes and information technical compounds in a company. This particularly requires broad training and basic knowledge, as well as in-depth knowledge of computer science and automation technology.

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
Computer Systems and Networks	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger Prof. Dr.-Ing. Uwe Maier	-
used in degree course	
• Bachelor of Science in Control and Information Systems	

nr	courses	semester	sws	workload	ECTS-credits
1	Microcomputer Systems	3	5	180	6
2	Operating Systems and Computer Networks	4	3	120	4
total			**8**	**300**	**10**

description:
Coming from the description of microcomputer systems, in addition in this module, the practical contact with computer networks will be taught and in the end, the general construction and the functional method of computer networks and the operating systems will be explained.

modul name	shorthand expression of module
Computer Systems and Networks	
lecture name	**shorthand expression of lecture**
Microcomputer Systems	
lecturer	**department**
Prof. Dr.-Ing. Walter Geisselhardt	

semester	cycle	language	requirements
3		English	

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

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

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

remark

modul name	shorthand expression of module
Computer Systems and Networks	
lecture name	**shorthand expression of lecture**
Operating Systems and Computer Networks	
lecturer	**department**
Prof. Dr.-Ing. Axel Hunger	

semester	cycle	language	requirements
4		English	

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

description

This course covers two aspects of computer organization: Operating systems and management of resources on the one hand and fundamentals of computer networks on the other hand. The principles of operating systems are explained and illustrated by functions of UNIX and MS-DOS. Memory management systems are discussed concerning the hierarchy from mass storage to cache memories as well as principles like paging, segmenting, and virtual addresses. The second area is dedicated to the different aspects of computer communication. This includes interfaces and busses in computer systems as well as protocols and transport mechanisms in computer networks. Some common protocols and access methods are explained; on this basis, criteria for the design of networks with regard to transmission rate and error probability are 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 A. Tanenbaum (1994). Moderne Betriebssysteme, Wien: Hanser Verlag.
·2 Conrads, D. (1993). Datenkommunikation, Vieweg Verlag, Braunschweig.
·3 Kaderali, Firoz Digitale (1995). Kommunikationstechnik II, Vieweg Verlag, Braunschweig, Kapitel 12: Lokale Netze.
·4 Kaderali, F. (1995). Graphen, Algorithmen, Netze, Vieweg Verlag, Braunschweig, Kapitel 8: Wegeauswahl in Netzen

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
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
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
Control Engineering, Modelling and Simulation	
course coordinator	**faculty**
Prof. Dr.-Ing. Uwe Maier	-
used in degree course	
• Bachelor of Science in Control and Information Systems	

nr	courses	semester	sws	workload	ECTS-credits
1	Modelling and Simulation of Dynamic Systems	5	4	150	5
2	Process Control Engineering	5	3	120	4
3	Process Control Engineering Lab	5	1	30	1
total			**8**	**300**	**10**

description:

This module contains the more practical aspects of automation: · Process Control Engineering" deals, under aspects of application, partly also under aspects of development, with measurement, actuation, field busses, digital control systems, programmable logic controllers, real time software aspects, control methods for different process types, engineering of automation for process plants, safety and reliability. This will be illustrated by a lab. · "Modelling and Simulation of Dynamic Systems" deals, primarily for examples stemming from practice, theoretical modelling (from physical laws) and experimental modelling as prerequisite for a systematic controller design. For the following simulation, a fist survey on numerical methods with their advantages and disadvantages is given, and MATLAB/SIMULINK are used as an example of simulation software.

modul name	shorthand expression of module
Control Engineering, Modelling and Simulation	
lecture name	**shorthand expression of lecture**
Modelling and Simulation of Dynamic Systems	
lecturer	**department**
Prof. Dr.-Ing. Uwe Maier	

semester	cycle	language	requirements
5		English	Fundamentals of mechanics, thermodynamics, electrical engineering, Mathematics 3.

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

description
Mathematical modelling of dynamic systems as a prerequisite for their analysis, simulation and control: Summary of physical basics, theoretical modelling for some process industry devices as examples, experimental modelling (identification), simulation and numeric methods.
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: Lecture notes on "Modelling and Simulation" ·2 Thomas, Philip: Simulation of Industrial Processes for Control Engineers. Butterworth Heinemann, Oxford et.al. Remark: From [2] and further books only special parts are relevant.
remark

modul name	shorthand expression of module
Control Engineering, Modelling and Simulation	
lecture name	**shorthand expression of lecture**
Process Control Engineering	
lecturer	**department**
Prof. Dr.-Ing. Uwe Maier	

semester	cycle	language	requirements
5		German	

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

description
A survey on basic process control engineering for application and development: processes (continuous, batch & recipes, ...), description methods (P&I, Petri nets, function block diagrams,...), hardware and software for implementation (real time processing aspects, field busses), implementation of control systems, field devices (sensors, actuators, explosion hazard), basic and detail control engineering in process industry, safety and reliability.
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
• Maier, Uwe: Vorlesungsskript "Prozessautomatisierung". Remark: there exists no literature with this combination of subjects. For each subject other books are recommended in the lecture notes, but from these books only some parts are relevant.
remark

modul name	shorthand expression of module
Control Engineering, Modelling and Simulation	
lecture name	**shorthand expression of lecture**
Process Control Engineering Lab	
lecturer	**department**
Prof. Dr.-Ing. Uwe Maier	

semester	cycle	language	requirements
5		German	This lab runs parallel to the lecture "Prozessautomatisierung"

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

description
3 experiments as a supplement to the lecture "process control engineering". Subjects: decentral digital control systems, field busses, implementation of control tasks with computers.
kind of examination
literature
·1 Maier, Uwe: Vorlesungsskript "Prozessautomatisierung". Remark: there exists no literature with this combination of subjects. For each subject other books are recommended in the lecture notes, but from these books only some parts are relevant.
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
Wird in der 1. Vorlesungsstunde bekanntgegeben
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
Fundamentals of Automation and Control	
course coordinator	**faculty**
Prof. Dr.-Ing. Uwe Maier	-
used in degree course	
• Bachelor of Science in Control and Information Systems	

nr	courses	semester	sws	workload	ECTS-credits
1	Introduction to Automation	4	4	150	5
2	Systems and Control 1	5	3	120	4
3	Systems and Control 2	6	4	150	5
total			**11**	**420**	**14**

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. Included are digital control, as well as the theory of state variable control. These are the theoretical fundamentals of automation.

modul name	shorthand expression of module
Fundamentals of Automation and Control	
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
Fundamentals of Automation and Control	
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
Fundamentals of Automation and Control	
lecture name	**shorthand expression of lecture**
Systems and Control 2	
lecturer	**department**
Prof. Dr.-Ing. Steven X. Ding	

semester	cycle	language	requirements
6		German	Systems and control 1 (RT1)

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

description
In this course, the state space description of dynamic systems is first introduced. It is followed by the study on system structural properties like controllability and observability. Moreover, different methods of designing state feedback controllers, observer based state feedback controllers are presented. The final part of this course is devoted to the design of state observers and unknown input observers.
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 Unbehauen, Heinz: Regelungstechnik 2. Vieweg, Braunschweig. ·2 Föllinger, Otto: Regelungstechnik. Hüthig, Heidelberg.
remark

modul name	shorthand expression of module
Fundamentals of Extended Software Engineering	
course coordinator	**faculty**
Prof. Dr.-Ing. Axel Hunger	-
used in degree course	
• Bachelor of Science in Control and Information Systems	

nr	courses	semester	sws	workload	ECTS-credits
1	Fundamentals of Programming 2 (OO Programming in C++)	4	3	120	4
2	Internet Technology	5	3	120	4
total			**6**	**240**	**8**

description:
In this module, the knowledge of programming is supposed to be broadened and expanded to the object-orientated area. . C++ as an application-related programming language will be brought nearer to the students. In addition, the technologies necessary for setting up Internet and for the use of the Internet will be imparted.

modul name	shorthand expression of module
Fundamentals of Extended Software Engineering	
lecture name	**shorthand expression of lecture**
Fundamentals of Programming 2 (OO Programming in C++)	
lecturer	**department**
Prof. Dr.-Ing. Hans-Dieter Kochs	

semester	cycle	language	requirements
4		German	Einführung in die Programmierung in C

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

description

Introduction to basic concepts and methods of object oriented programming (OOP). Example language is C++. Following basic components are treated in detail: concepts and methods of the object oriented software development process: abstraction, encapsulation, modularity, hierarchy and inheritance, typing, concurrency, and existence, C++ as extension of C, classes, objects, dynamical memory arrangement, overloading, polymorphism, simple and multi inheritance, virual functions, virtual basic classes, examples.

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 Stroustrup, Bjarne: The C++ Programming Language. Addison Wesley, New York. 2. Edition. 1991.
·2 Stroustrup, Bjarne: The Design and Evolution of C++. Addison Wesley, New York. 1994.

remark

modul name	shorthand expression of module
Fundamentals of Extended Software Engineering	
lecture name	**shorthand expression of lecture**
Internet Technology	
lecturer	**department**
Prof. Dr.-Ing. Hans-Dieter Kochs	

semester	cycle	language	requirements
5		German	keine

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

description
Introduction to essential basic technologies of the internet. Following topics are outlined in detail: 1) Introduction to the world-wide-web (WWW). 2) Introduction to networking basics: ISO/OSI-Reference model, e.g. foundation, concepts. 3) Introduction to internetworking and application basics, e.g. IP, TCP, adresses and addressing, routing, basic applications. 4) Networking Services, e.g. Telnet, FTP, HTTP, Electronic mail, DNS. 5) Internet Security, e.g. authentification, encryption and digital signature, firewalls. 6) WWW and HTML programming, e.g. HTML, XML, PHP, Perl (CGI-Scripts). 7) Introduction to JAVA. 8) Database and Web server technologies. 9) Webservices.
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 A. Zenk. 2001. Lokale Netze - Planung, Aufbau und Wartung. Addison-Wesley. ISBN 3-8273-1829-7. ·2 Norbert Pohlmann, Firewall-Systeme, MITP-Verlag Bonn, ISBN 3-8266-0719-8 ·3 Marty Hall, Larry Brown, Core Web Programming, Sun Microsystems, Inc. ISBN 0-13-089793-0 (HTML, JAVA, XML) ·4 PHP www.php.net
remark

modul name	shorthand expression of module
Fundamentals of Software Engineering 1	
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

nr	courses	semester	sws	workload	ECTS-credits
1	Fundamentals of Programming 1 (Programming in C)	3	3	120	4
2	Fundamentals of Software Engineering 1 (Structured Analysis)	4	4	150	5
total			**7**	**270**	**9**

description:

In this module, basic knowledge of the program design and the programming is supposed to be supplied. Herewith the software will be developed with the structured analysis and fundamental knowledge in the software implementation will be taught by the examples of C programming language.

modul name	shorthand expression of module
Fundamentals of Software Engineering 1	
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
Fundamentals of Software Engineering 1	
lecture name	**shorthand expression of lecture**
Fundamentals of Software Engineering 1 (Structured Analysis)	
lecturer	**department**
Prof. Dr.-Ing. Axel Hunger	

semester	cycle	language	requirements
4		German	

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

description

Software is considered as a product with a life cycle from the first idea via specification, functional design, and implementation up to its use in a practical environment. A top down strategy based on the structured analysis (de Marco) is used to plan the overall structure of a software project; the method of Ward and Mellor is explained in more details. The lab, running in parallel to the lectures, gives a chance to try and apply the methods presented in the lecture to a practical problem. This problem is defined in a way that the students have to group in teams which solve the given problem within the frame of this course. Therefore, the lab allows to get experience with the different methods in software-engineering as explained in the lecture. In addition, it is intended to promote co-operation in a team.

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 D.Hatley, I.Pirbhai. Strategien für die Echtzeitprogrammierung. Hanser Verlag München. ISBN 3-446-16288-7.
·2 Jörg Raasch, Systementwicklung mit strukturierten Methoden, Hanser Verlag München. ISBN 3-446-17490-7. Signatur Uni-Duisburg: TWQ 3542.
·3 P.T.Ward, S.J.Mellor. Strukturierte Systemanalyse von Echtzeitsystemen. Hanser Verlag München. ISBN 3-446-16198-8. Signatur Uni-Duisburg TWT 2698.

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
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

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 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

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
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 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
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 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
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

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) 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

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 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

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 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
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	
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	3	2	60	2
2	Non-Technical Subject 4	5	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
3			

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 4	
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 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
Technological Fundamentals	
course coordinator	**faculty**
Prof. Dr.-Ing. Uwe Maier	-
used in degree course	
• Bachelor of Science in Control and Information Systems	

nr	courses	semester	sws	workload	ECTS-credits
1	Basic Electronic Devices	5	4	150	5
2	Materials Engineering	4	2	90	3
total			**6**	**240**	**8**

description:
This module teaches necessary technological fundamentals: · “Materials engineering “ deals with knowledge, needed in automation for the choice of suitable material in measurement and actuator devices, especially for parts coming in contact with the fluid. · “Basic Electronic Devices” deals with semiconductor devices and basic electronic circuits. Such fundamental knowledge is necessary when dealing with electric equipment, computers, and interface signals.

modul name	shorthand expression of module
Technological Fundamentals	
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

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 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
Technological Fundamentals	
lecture name	**shorthand expression of lecture**
Materials Engineering	
lecturer	**department**
Prof. Dr.-Ing. Alfons Fischer	

semester	cycle	language	requirements
4		German	

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

description

General : crystals, structures, relaxation and recrystallization, alloys, characteristics (strength, hardness, corrosion, erosion), special materials: iron and iron alloys, non-iron metals, synthetic materials, ceramics.

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

• Bargel, Hans-Jürgen; Schulze, Günter (Hrsg.): Werkstoffkunde. Springer-Verlag, Berlin u.a., 8. Auflage 2004.
• Bergmann, Wolfgang: Werkstofftechnik, Teil 1: Grundlagen. Hanser-Verlag, München, 5. Auflage 2003.
• Domke, Wilhelm: Werkstoffkunde und Werkstoffprüfung. Cornelsen Verlag, Berlin.

remark

modul name	shorthand expression of module
Thermodynamics	
course coordinator	**faculty**
Prof. Dr. rer. nat. Burak Atakan Prof. Dr. rer. nat. Jan-Dirk Herbell	-
used in degree course	
• Bachelor of Science in Control and Information Systems • Bachelor of Science in Mechanical Engineering	

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

modul name	shorthand expression of module
Thermodynamics	
lecture name	**shorthand expression of lecture**
Thermodynamics 1	
lecturer	**department**
Prof. Dr. rer. nat. Burak Atakan	

semester	cycle	language	requirements
3		English	helpful: Mathematics (1+2), Physics, Chemistry

SWS	presence hours	self-study hours	workload	ECTS-Credits
3	60	90	150	5

description

The fundamentals of engineering thermodynamics will be introduced and applied to problems of energy conversion, chemical engineering and materials science. (Power cycles, refrigeration, and combustion will be covered in the second part of the lecture: "Thermodynamics 2" Contents: Introduction/Motivation, Concepts/Definitions, Properties of a pure substance , Work and Heat, The first Law of Thermodynamics (Cycles, closed systems, open Systems, internal energy and enthalpy) The second law of Thermodynamics(Carnot-Cycle, closed systems) Entropy and related properties (Gibbs and Helmholtz function, the chemical potential) The properties of simple mixtures Phase diagrams Chemical Equilibrium

kind of examination

According to ï¿½ 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

ï¿½1 Fundamentals of Thermodynamics, Richard E. Sonntag, Claus Borgnakke, Gordon J. Van Wylen, 5.Aufl., John Wiley & Sons .
ï¿½2 Fundamentals of Engineering Thermodynamics von Michael J. Moran, Howard N. Shapiro, 3. Aufl., John Wiley & Sons .
ï¿½3 Chemical and Engineering Thermodynamics, Sandler, Stanley I., John Wiley & Sons
ï¿½4 Physical Chemistry, P.W. Atkins, Oxford University Press

remark

modul name	shorthand expression of module
Thermodynamics	
lecture name	**shorthand expression of lecture**
Thermodynamics 2	
lecturer	**department**
Prof. Dr. rer. nat. Burak Atakan	

semester	cycle	language	requirements
4		English	Thermodynamics 1

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

description
The fundamentals of thermodynamics, introduced in the first part of this lecture, will be applied more extensively to idealized technical systems and an introduction to chemical thermodynamics and heat transfer will be given. Contents: Recapitulation of the first course Mixtures of ideal gases and vapors (humid air) Second law control volume analysis Exergy and availability Idealized power and refrigeration cycles Combustion thermodynamics Basic heat transfer
kind of examination
According to ï¿½ 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
ï¿½1 Fundamentals of Thermodynamics, Richard E. Sonntag, Claus Borgnakke, Gordon J. Van Wylen, 5.Aufl., John Wiley & Sons . ï¿½2 Fundamentals of Engineering Thermodynamics von Michael J. Moran, Howard N. Shapiro, 3. Aufl., John Wiley & Sons . ï¿½3 Chemical and Engineering Thermodynamics, Sandler, Stanley I., John Wiley & Sons ï¿½4 Fundamentals of heat and mass transfer / Frank P. Incropera ; David P. DeWitt : Wiley
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	6	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
6			

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

description
kind of examination
literature
remark