Appendix B: Module catalogue

for the study programme Engineering Computer Sciences B.Eng.

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Theoretical Computer Science	
Elective Module	

 $[\]hbox{*Trans\,lations\,of\,these\,module\,descriptions\,are\,currently\,not\,available}.$

Algo	orithms an	d Data Structı	ıres							AUD	1
Ident numb	ification er:	Workload:		Credits:	Study	semest	ter:	Frequenc	y of the offer	Durat	ion:
1001		150 h		5	2nd s	em.		Annual (Summe	r)	1 sen	1.
1	Course:		Pl	anned group siz	es	Scop	e		contact classroom	Self-stu	ıdy
	Lecture		60) students		2	SCH	30	h	45	h
	Sem. less	ons	30) students		2	SCH	30	h	45	h
	Exercise		20) students		0	SCH	0	h	0	h
	Practical	or seminar	15	5 students		0	SCH	0	h	0	h
	Supervise	d self-study	60) students		0	SCH	0	h	0	h

- are familiar with the possibilities of formal description of algorithms and discuss interface agreements as a basis for the reusability of implemented functions.
- are able to name basic search and sorting algorithms as well as fast sorting algorithms, write them down as pseudo code and explain them.
- programme basic algorithms as functions in a scripting language (e.g. Python) and apply the implemented algorithms to given problems.
- write programme scripts for the numerical evaluation of the algorithm runtime and test their self-implemented algorithms with regard to their runtime as a function of the problem size.
- determine and compare the runtime complexity (efficiency) of different algorithms by analysing the algorithm structure and can thus classify the previously numerically determined runtime behaviour into runtime classes.
- develop and implement backtracking algorithms and fasts orting methods in a scripting language.
- implement their own data structures and data types and test them within the framework of given problems.

3 Contents:

- Basics and terms for the formal description of algorithms
- Formalisation of interface agreements (burdens, obligations, agreement on data formats, agreement on behaviour in case of rules and errors)
- hardware-independent evaluation of the complexity of algorithms (in particular runtime complexity, memory complexity, concept of the register machine [random access machine], Onotation)
- Simple search and sorting algorithms
- Divide-and-conquer strategies, backtracking problems
- Comparison of iterative and recursive programming methods for algorithm implementation
- Fast sorting algorithms
- Abstract and concrete data types
- Graphs and trees
- Hashing

4 Forms of teaching:

	Lecture, sem. le	essons and programming exercises
5	Participation requ	uirements:
	Formal:	None
	Content:	Basic programming knowledge
6	Forms of assessm	ent:
	Written examin	ation, combination examination or oral examination
7	Prerequisite for the	he award of credit points:
	Module examin	ation pass and course as sessment
8	Application of th	e module (in the following study programmes)
	Engineering Co	omputer Sciences B.Eng.
9	Importance of the	e grade for the final grade:
	according to BI	RPO
10	Module Coordina	itor:
	Prof. Dr. rer. na	t. Axel Schneider
11	Other informatio	n:
	Literature will b	be announced at the beginning of the course.
12	Language:	
	German	

Ass	istance Sys	stems							ASY	
Ident numb	ification er:	Workload:	Credits:	semest	er:	Frequency of the offer		Duration:		
3349)	150 h	5	6th s	sem.		Annual (Summe	r)	1 sen	nester
1	Course:		Planned grou	p sizes	Scope	;		contact classroom	Self-study	
	Lecture		60 students	60 students		SCH	0	h	56	h
	Sem. less	ons	30 students	30 students		SCH	0	h	0	h
	Exercise		20 students		1	SCH	8	h	46	h
	Practical	or seminar	15 students		1	SCH	16	h	0	h
	Supervise	ed self-study	60 students		1.5	SCH	24	h	0	h

2 Learning outcomes/competences:

- The students know the basics of human-machine systems.
- They explain the design rules of ergonomic human-machine interfaces.
- They know the basics of robotics both in the field of robot manipulators and in the field of mobile robotics.
- They calculate kinematic chains for robot manipulators and motion kinematics for mobile robots.
- They compare robotics applications from the fields of industry, service and care, especially from the point of view of interaction between as sistive robots and human operators/users.
- They know the basis of "Computer Vision" and can explain simple algorithms for threedimensional object recognition; they apply ready-made software implementations of such algorithms to simple visual scenes.
- They know the basics of computer graphics, especially for the presentation of threedimensional scenes and objects; they can use a 3D graphics API to programme the visualisation of simple 3D scenes.
- They explain the basics of augmented and virtual reality.
- They will implement the representation of 3D objects in a virtual reality environment and the representation of 2D and 3D objects in an augmented reality setup.
- They explain the basics of the voice control of technical systems.

3 Contents:

Human-machine systems:

- Human models
- Ergonomic design
- Design rules of human-machine interfaces

Robotics Basics:

- Robot manipulators (kinematics, elastic drives and manipulators)
- Mobile robotics (kinematics, sensor technology)
- Robotics applications (industrial robots, service and care robots)

Computer Vision: Principles Three-dimensional object recognition Computer graphics Basics of 3D representation Augmented Reality Virtual Reality Voice control of technical systems: Basics and application examples Forms of teaching: Learning units for self-study, classroomevents in the form of exercises and practicals 5 Participation requirements: Formal: Content: In-depth computer science knowledge Knowledge of machine learning incl. speech and image recognition Module "HMI and User Interfaces" 6 Forms of assessment: Written examination or oral examination Prerequisite for the award of credit points: Module examination pass and course as sessment Application of the module (in the following study programmes) 8 Digital Technologies (work-integrated) B.Eng. 9 Importance of the grade for the final grade: according to BRPO Module Coordinator: 10 Other information: 11 12 Language: German

Auto	omation Te	echnology							AT	
	ification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duratio	on:
numb 1015		150 h	5	3rd	sem.		Annual (Winter)	1 sem.	
1	Course:	L	Planned group s	sizes	Scop	e	actual of time / of teaching	lassroom	Self-stud	ły
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
3	- create - analy - desig - imple Contents - Basic - Produ - Introd - Engir - Type - Solut - Desc - Analy	e discrete ever se principles and act automation duction to proper seering view of sof control sy ion of automatic principles of discrete ever seering view of sof control sy ion of automatic principles of discrete ever seering view of sof control sy ion of discrete ever seering view of sof control sy ion of discrete ever seering view of sof control sy ion of discrete ever seering view of s	d controllers on the controllers on the controls and the controls and the control cont	the basis test then utomati mation contro esses an	iontech l(PLC) d signa	erministi eal-work nnology	leterminis c automat d system.	tic automata	and Petr	ri Nets.
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			anying seminare	ACTUISUS	anupi	acticals				
		tion requirement Non	its:	ACTOISCS	sanupi	acticals				
	Participa	tion requirement Non Mod	e lules:		sanupi	acticals				
	Participa Formal:	tion requirement Non Mod 1147	its: e lules: Mathematics A	•••	sanupi	acticals				
	Participa Formal:	Non Mod 1147 1153	tts: e lules: Mathematics A Mathematics B	.,	sanupi	acticals				
5	Participa Formal: Content:	Non Mod 1147 1153	its: e lules: Mathematics A	.,	sanupi	acticals				
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5 6	Participa Formal: Content: Forms of Written Prerequis	tion requirement Non Moo 1147 1153 1158 assessment: or oral examinite for the awar	e lules: Mathematics A Mathematics C Mation; in each card of credit points:	; ; asewith	ı prelim	inary ex	amination	performand	ce	
6	Participa Formal: Content: Forms of Written Prerequis Module	Non Non Noc 1147 1153 1158 assessment: or oral examir ite for the awar examination	tts: e lules: Mathematics A Mathematics B Mathematics C mation; in each ca	; ; asewith	ı prelim aminati	inary ex	amination	performand	ce	

9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Martin Kohlhase
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Bac	helor Thes	is							BA	
Iden	tification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Durati	on:
num1 1291		360 h	12	6th	or 7th se	em.	each se	mester	12 we	eks
1	Course:		Planned group	sizes	Scop	e		contact classroom	Self-stu	dy
	Lecture		60 students		0	SCH	0	h	360	h
	Sem. less	ons	30 students		0	SCH	0	h	0	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
		terdisciplina	ry contexts, work	king inde	ependen	itly and a	ecording	to scientific	method	S.
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4 5	The bac technological technolo	helor thesis is ogy task. d deal with to aper. teaching: tion requirement of the control of the	he subject matte	er in deta	niled de	scription	as and ex	planations ar		
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Opei	rating Sys	tems							BS	
Ident numb	ification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duratio	on:
1023		150 h	5	6th	sem.		Annual (Summe	r)	1 semo	ester
1	Course:		Planned group s	sizes	Scop	e		contact classroom	Self-stud	у
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
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3	•	General introd Practical hand Necessary had Process mana Memory mana Synchronisati	rdware support in gement and school agement (include on mechanisms distrategies for re ment	n procesteduling ing pag	ssors fo (incl. m e manag	r moderi ulti-thre gement a	n operatin cading) and virtua	g systems I memory)	у)	
5	Lecture, program	•	teaching with e		-			-		

	Formal:	None
	Content:	Basic computer science and programming skills (especially in C)
		Basic knowledge of computer architectures
		Modules:
		1105 Computer Science 1;
		1109 Computer Science 2;
		1231 Computer Architectures;
6	Forms of assessme	
6	1 011115 01 4650055111	
		ation or oral examination
7	-	ne award of credit points:
	Module examin	ation pass and course assessment
8	Application of the	e module (in the following study programmes)
	Engineering Co	mputer Sciences B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the	e grade for the final grade:
	according to BR	RPO
10	Module Coordina	tor:
	Prof. DrIng. W	VolframSchenck
11	Other information	n:
	Literature will b	e announced at the beginning of the course.
12	Language:	
	German	

Bus	iness Adm	inistration								BW	
	tification	Workloa	d:	Credits:	Study	semest	er:	Frequenc	y of the offer	Duratio	n:
numl 1024		150 h		5	3rd o	or 5th s	em.	Annual (Winter)	1 seme	ester
1	Course:		I	l Planned group s	sizes	Scop	e		contact lassroom	Self-stud	у
	Lecture		6	0 students		3	SCH	45	h	67.5	h
	Sem. less	ons	3	0 students		1	SCH	15	h	22.5	h
	Exercise		2	0 students		0	SCH	0	h	0	h
	Practical	or seminar	1	5 students		0	SCH	0	h	0	h
	Supervise	d self-study	y 6	0 students		0	SCH	0	h	0	h
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5 6 7	Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati Electrica	Basic condoverview and information forms of conference of the assessment examination of the mal Enginee	cepts of of the nation e goals cepts of corpor ons with ments:	of business ad entrepreneuri economy level and corporate of private and ate law the case studies of credit points: s n the following Eng., Engine	ministra al funct el e key fig commen s / case s minatio	tion/bional arures/kreial lav	asic prireas of the ey figur v	nciples of the goods of the systems	economic acconomy, fir	ction nancial ec	onomy
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	Literature will be announced at the beginning of the course.
12	Language:
	German

Course:	Digi	tal Image I	Processingan	d Pattern Matchin	ng					BVM	
Course: Planned group sizes Scope Actual contact time / classroom teaching			Workload:	Credits:	Study	semest	er:	Frequency	of the offer	Duration:	
Lecture 60 students 2 SCH 30 h 45 h Sem. lessons 30 students 1 SCH 15 h 22.5 h Exercise 20 students 0 SCH 0 h 0 h 0 h Practical or seminar 15 students 1 SCH 15 h 22.5 h Exercise 20 students 0 SCH 0 h 0 h 0 h Practical or seminar 15 students 1 SCH 15 h 22.5 h Supervised self-study 60 students 0 SCH 0 h 0 h 0 h Learning outcomes/competences: Students have basic technical knowledge of image acquisition, grey value operations, local fil operations (convolutions) as well as simple segmentation and classification procedures and apply the in a well-founded manner. They independently solve simple problems and applications in ima processing and pattern recognition. In doing so, they select suitable procedures, analyse the advanta and disadvantages of the procedures, apply them correctly and develop appropriate programs suitable programming languages, which they then test on practical examples. Simple problems fit the application are implemented and solved by the students independently and creatively. They p structure and develop their own simple procedures, programme them and justify, test and evaluatem. Students organise themselves effectively in working groups and take responsibility themselves and the group. They assess their own strengths and weaknesses appropriately and develop a picture of their development beyond their studies. Contents: Basic principle of image processing and pattern recognition, applications. Image capture: Rasterisation, quantisation Design of camera, lens, lighting for the application Elementary image processing: Grey value histogram, dot operators, edge operators, sharpness operators. Simple segmentation algorithms. Feature extraction and simple classification procedures. Applications of image processing/pattern recognition using practical examples Lab practicals: Image acquisition with different image acquisition units Programming of image processing operators according to the content of the event by means of suitable software Planning, structuring, developing, programming	1028		150 h	5	4th s	em.				1 semes	ster
Lecture		Course:		Planned group si	zes	Scope		time / classroom		Self-study	
Exercise 20 students 0 SCH 0 h 0 h 0 h Practical or seminar 15 students 1 SCH 15 h 22.5 h Supervised self-study 60 students 0 SCH 0 h 0 h 0 h Learning outcomes/competences: Students have basic technical knowledge of image acquisition, grey value operations, local fil operations (convolutions) as well as simple segmentation and classification procedures and apply th in a well-founded manner. They independently solve simple problems and applications in ima processing and pattern recognition. In doing so, they select suitable procedures, analyse the advantages of the procedures, apply them correctly and develop appropriate programs suitable programming languages, which they then test on practical examples. Simple problems fit the application are implemented and solved by the students independently and creatively. They p structure and develop their own simple procedures, programme them and justify, test and them. Students organise themselves effectively in working groups and take responsibility themselves and the group. They assess their own strengths and weaknesses appropriately and develop a picture of their development beyond their studies. Contents: - Bas ic principle of image processing and pattern recognition, applications. - Image capture: Rasterisation, quantisation - Design of camera, lens, lighting for the application - Elementary image processing: Grey value histogram, dot operators. - Local operations with greyscale images: Smoothing operators, edge operators, sharpness operators. - Simple segmentation algorithms. - Feature extraction and simple classification procedures. - Applications of image processing/pattern recognition using practical examples Lab practicals: - Image acquisition with different image acquisition units - Programming of image processing operators according to the content of the event by means of suitable software - Planning, structuring, developing, programming, testing and evaluating simple own procedur for solving application-oriented problems Image processing a		Lecture		60 students		2	SCH			45	h
Practical or seminar		Sem. less	ons	30 students		1	SCH	15	h	22.5	h
Supervised self-study 60 students 0 SCH 0 h 0 h 0 h Learning outcomes/competences: Students have basic technical knowledge of image acquisition, grey value operations, local fil operations (convolutions) as well as simple segmentation and classification procedures and apply the in a well-founded manner. They independently solve simple problems and applications in improcessing and pattern recognition. In doing so, they select suitable procedures, analyse the advanta and disadvantages of the procedures, apply them correctly and develop appropriate programs suitable programming languages, which they then test on practical examples. Simple problems if the application are implemented and solved by the students independently and creatively. They p structure and develop their own simple procedures, programme them and justify, test and evaluatem. Students organise themselves effectively in working groups and take responsibility themselves and the group. They assess their own strengths and weaknesses appropriately and develop a picture of their development beyond their studies. Contents: - Basic principle of image processing and pattern recognition, applications. - Image capture: Rasterisation, quantisation - Design of camera, lens, lighting for the application - Elementary image processing: Grey value histogram, dot operators. - Local operations with greyscale images: Smoothing operators, edge operators, sharpness operators. - Simple segmentation algorithms. - Feature extraction and simple classification procedures. - Applications of image processing/pattern recognition using practical examples Lab practicals: - Image acquisition with different image acquisition units - Programming of image processing operators according to the content of the event by means of suitable software - Planning, structuring, developing, programming, testing and evaluating simple own procedure for solving application-oriented problems Image processing and/or pattern recognition tasks		Exercise		20 students		0	SCH	0	h	0	h
Learning outcomes/competences: Students have basic technical knowledge of image acquisition, grey value operations, local fil operations (convolutions) as well as simple segmentation and classification procedures and apply the in a well-founded manner. They independently solve simple problems and applications in ima processing and pattern recognition. In doing so, they select suitable procedures, analyse the advanta and disadvantages of the procedures, apply them correctly and develop appropriate programs suitable programming languages, which they then test on practical examples. Simple problems fit the application are implemented and solved by the students independently and creatively. They p structure and develop their own simple procedures, programme them and justify, test and evaluatem. Students organise themselves effectively in working groups and take responsibility themselves and the group. They assess their own strengths and weaknesses appropriately and develop a picture of their development beyond their studies. Contents: - Basic principle of image processing and pattern recognition, applications. - Image capture: Rasterisation, quantisation - Design of camera, lens, lighting for the application - Elementary image processing: Grey value histogram, dot operators. - Local operations with greyscale images: Smoothing operators, edge operators, sharpness operators. - Simple segmentation algorithms. - Feature extraction and simple classification procedures. - Applications of image processing/pattern recognition using practical examples Lab practicals: - Image acquisition with different image acquisition units - Programming of image processing operators according to the content of the event by means of suitable software - Planning, structuring, developing, programming, testing and evaluating simple own procedure for solving application-oriented problems Image processing and/or pattern recognition tasks		Practical	or seminar	15 students		1	SCH	15	h	22.5	h
Students have basic technical knowledge of image acquisition, grey value operations, local fil operations (convolutions) as well as simple segmentation and classification procedures and apply the in a well-founded manner. They independently solve simple problems and applications in image processing and pattern recognition. In doing so, they select suitable procedures, analyse the advanta and disadvantages of the procedures, apply them correctly and develop appropriate programs suitable programming languages, which they then test on practical examples. Simple problems fit the application are implemented and solved by the students independently and creatively. They p structure and develop their own simple procedures, programme them and justify, test and evaluathem. Students organise themselves effectively in working groups and take responsibility themselves and the group. They assess their own strengths and weaknesses appropriately and develop a picture of their development beyond their studies. Contents: - Basic principle of image processing and pattern recognition, applications. - Image capture: Rasterisation, quantisation - Design of camera, lens, lighting for the application - Elementary image processing: Grey value histogram, dot operators. - Local operations with greyscale images: Smoothing operators, edge operators, sharpness operators. - Simple segmentation algorithms. - Feature extraction and simple classification procedures. - Applications of image processing/pattern recognition using practical examples Lab practicals: - Image acquisition with different image acquisition units - Programming of image processing operators according to the content of the event by means of suitable software - Planning, structuring, developing, programming, testing and evaluating simple own procedure for solving application-oriented problems Image processing and/or pattern recognition tasks		Supervise	d self-study	60 students		0	SCH	0	h	0	h
 Basic principle of image processing and pattern recognition, applications. Image capture: Rasterisation, quantisation Design of camera, lens, lighting for the application Elementary image processing: Grey value histogram, dot operators. Local operations with greyscale images: Smoothing operators, edge operators, sharpness operators. Simple segmentation algorithms. Feature extraction and simple classification procedures. Applications of image processing/pattern recognition using practical examples Lab practicals: Image acquisition with different image acquisition units Programming of image processing operators according to the content of the event by means of suitable software Planning, structuring, developing, programming, testing and evaluating simple own procedure for solving application-oriented problems Image processing and/or pattern recognition tasks 		them. S themsel They as develop	tudents organ ves and the grosess their own ment beyond t	nise themselves oup. In strengths and v	effectiv	ely in	workin	g groups	and take	responsib	ility f
Forms of teaching:		- Bas - Ima - Des - Eler - Loc ope - Sim - Fea - Ap Lab pra - Ima - Pro suit - Plat for	sic principle of ge capture: Rasign of camera mentary image al operations erators. uple segmenta ture extraction plications of iracticals: ge acquisition gramming of itable software uning, structus solving applications applications applications applications of iracticals:	asterisation, quart, lens, lighting for processing: Gre with greyscale in tion algorithms. In and simple class mage processing with different in mage processing ring, developing, eation-oriented pr	ntisation or the ap y value mages: S sification pattern mage acc g operator program oblems	oplication histogramooth on proceusitic presentations accomming,	on ram, do ing oper edures. ition usi on units ording t	t operators. rators, edge ing practica	operators, lexamples	ent by me	ans of
Lecture, sem. lessons, group work within the framework of the practical course		Forms of	teaching:								
		Lecture,	sem. lessons,	group work with	in the fr	amewo	orkofth	e practical	course		

Formal:

Content:

None

C programming skills

6	Forms of assessment:
	Written examination
7	Prerequisite for the award of credit points:
	Module examination pass and course as sessment
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. nat. Antje Ohlhoff
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Clus	ster Compu	iting							CLC		
	tification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Durat	Duration:	
number: 3344		150 h	5	3rd sem.			Annual (Winter)		1 semester		
1	Course:		Planned group s	Planned group sizes			Actual contact time / classroom teaching		Self-study		
	Lecture		60 students	2 SCH		0	h	56	h		
	Sem. less	ons	30 students	0	SCH	0	h	0	h		
	Exercise		20 students		1	SCH	8	h	54	h	
	Practical	or seminar	15 students		1	SCH	16	h	0	h	
	Supervise	d self-study	60 students		1	SCH	16	h	0	h	
	 architectures, Amdahl's law, race conditions, design patterns for para They design and implement distributed applications using MPI and C They explain the concept of Hadoop. They implement simple data analyses on a Hadoop cluster. They know the theoretical basics of cloud computing and compare the commercial platforms. They implement data analysis workflows in the cloud. 						-	0 h 0 h ting (parallel compute allel computing, etc.). OpenMP.			
3	Contents	commercial p They implem	latforms.	ics of cl	oud cor	mputing a	and comp				
	Contents	commercial p They implem Theoretical follow, race con Distributed comp Parallel comp	latforms. ent data analysis	arallel c atterns IPI ual SM	oud con ows in t omputi for para P s yster rs (Map	nputing a he cloud	and comp d. allel comp puting, et	outing archi			
3	Contents	commercial p They implem Theoretical follow, race con Distributed c Parallel comp Parallel comp Cloud computeaching:	ent data analysis oundations of pa ditions, design p omputing with M outing on individ	arallel c atterns IPI ual SM peluste	oud conows in to omputifor para	ng (para llel compose (e.g. v	and comp I. Illel comp puting, et with Oper	outing archi	tectures,		
	Contents: Forms of Learning	commercial p They implem Theoretical follow, race con Distributed c Parallel comp Parallel comp Cloud computeaching:	coundations of paditions, design pomputing with Mouting on Individuating in theory and f-study, classroom	arallel c atterns IPI ual SM peluste	oud conows in to omputifor para	ng (para llel compose (e.g. v	and comp I. Illel comp puting, et with Oper	outing archi	tectures,		
4	Contents: Forms of Learning	commercial p They implem Theoretical felaw, race con Distributed c Parallel comp Parallel comp Cloud computeaching: g units for sel	coundations of paditions, design pomputing with Mouting on Individuating in theory and f-study, classroom	arallel c atterns i fPI ual SMI p cluste id practi	omputifor para P system Sice Sin the	ng (parallel composer form of	and comp d. allel comp puting, et with Oper c, etc.)	outing archic.) nMP) and practic	tectures,	, Amdah	
4 5	Forms of Learning Participate Formal: Content:	commercial p They implem Theoretical felaw, race con Distributed comp Parallel comp Cloud computeaching: g units for sel	coundations of paditions, design pomputing with Mouting on individuating in theory and f-study, classroomts: Modules "F Programmin Basic knowledge and the country of the	arallel c atterns in IPI ual SM p cluster d praction mevent	omputifor para P system Sice Sin the	ng (parallel composer form of	and comp d. allel comp puting, et with Oper c, etc.)	outing archic.) nMP) and practic	tectures,	, Amdahl	
5	Forms of Learning Participal Formal: Content:	commercial p They implem Theoretical felaw, race con Distributed computer	coundations of paditions, design pomputing with Mouting on individuating in theory and f-study, classroomts: Modules "F Programming Basic knowledge or oral examination or oral examination of the study of the stud	arallel c atterns in IPI ual SM p cluste d praction mevent	omputifor para P system Sice Sin the	ng (parallel composer form of	and comp d. allel comp puting, et with Oper c, etc.)	outing archic.) nMP) and practic	tectures,	, Amdah	
5	Forms of Learning Participal Formal: Content: Forms of Written Prerequisi	They implem They implem Theoretical follow, race con Distributed computer of the computer of	coundations of paditions, design pomputing with Mouting on individuating in theory and f-study, classrooms: Modules "F Programmin Basic knowledge of credit points:	arallel c atterns in IPI ual SM p cluster d praction mevent	omputifor para P system (Mapace Es in the	ng (parallel composer form of	and comp d. allel comp puting, et with Oper c, etc.)	outing archic.) nMP) and practic	tectures,	, Amdah	
4 5 6	Forms of Learning Participal Formal: Content: Forms of Written Prerequisi Module Applicati	They implem They implem Theoretical follow, race con Distributed comp Parallel comp Cloud compute teaching: gunits for selution requirement assessment: examination on of the modulon of the module	coundations of partitions, design promputing with Mouting on individuating on Hadoop atting in theory and f-study, classroom ts: Modules "F Programming Basic knowledge of credit points: pass and course and co	arallel c atterns in fPI ual SMI p cluster ind praction mevent Foundating edge of	omputifor para P systemments (Maprice as in the control of the con	mputing a he cloud ng (para llel compose form of form of sees	and comp d. allel comp puting, et with Oper c, etc.)	outing archic.) nMP) and practic	tectures,	, Amdah	
4	Forms of Learning Participal Formal: Content: Forms of Written Prerequisi Module Applicati Digital T	commercial p They implem Theoretical follow, race con Distributed comp Parallel comp Cloud computeaching: g units for sel tion requirement assessment: examination of the awar examination on of the modu Cechnologies	ent data analysis oundations of paditions, design pomputing with Mouting on individuating in theory and f-study, classroots: Modules "F Programmin Basic knowledge of credit points: pass and course	arallel c atterns in fPI ual SMI p cluster id praction mevent Goundat g" edge of on	omputifor para P systemments (Maprice as in the control of the con	mputing a he cloud ng (para llel compose form of form of sees	and comp d. allel comp puting, et with Oper c, etc.)	outing archic.) nMP) and practic	tectures,	, Amdah	

11	Other information:
12	Language:
	German

Data	Mining								DM		
Ident numb	ification	Workload:	Credits:	Stud	y semest	ter:	Frequenc	y of the	Durat	Duration:	
3341		150 h	5	4th	sem.		Annual (Summe		1 semester		
1	Course:	L	Planned group s	roup sizes Scope				contact classroom	Self-stu	Self-study	
	Lecture		60 students		2	SCH	0	h	56	h	
	Sem. less	ons	30 students		0	SCH	0	h	0	h	
	Exercise		20 students	20 students		SCH	8	h	54	h	
	Practical	or seminar	15 students		1	SCH	16	h	0	h	
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h	
	•	They apply a interrelations They use conmultidimension They are profit They can find quality. They detect of They have bad in a targeted. They have a conshould be used.	lication possibility appropriate proceedings within them relation analysis conal data sets. ficient in commo d clusters of relation patterns sic knowledge of manner. comprehensive o ed in which appli data mining worl	eedures ain an in and re n dimen ted data in data ftime se verview cation s	structive gression as ional real points as sets and reries and v of data	ve way (n to determined uction in mult duse gra alysis an	"Visual A ect relation n techniquididimensi nph-based d apply si	nalytics"). onships bet ues. onal datas methods. mple proce	ween dat ets and a	a series in	
4 5	Forms of Learnin	Basics of data Visualisation "Visual Analy Correlation as Dimension re Clustering ma Frequent patt Graph-based Basics of time Data mining v	of data (especially tics") nalysis and regreduction ethods emmining methods e series analysis workflows elf-study, classrooms:	omever	nts in th	e form o	fexercise	s and prac		data;	
			~	1		•• •					
	Content:	1	 Content of t 	he "Ma	themati	cs''and '	"Statistics	" modules			

6	Forms of assessment:
	Written examination or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass and course as sessment
8	Application of the module (in the following study programmes)
	Digital Technologies (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	N. N.
11	Other information:
12	Language:
	German

	ıbase Appl	ications							DBA	
	ification	Workload:	Credits:	Study	semest	er:	Frequency	of the offer	Duration	n:
number: 1041		150 h	5	6th s	em.		Annual Summer		1 sem.	
1	Course:		time / class				assroom	Self-study	7	
	Lecture		60 students		2 SCH		teaching 30	h	45	h
	Sem. less	ons	30 students	1	SCH	15	h	22.5	h	
	Exercise		20 students		0	SCH	0	h	0	h
		or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
3	- Stude giver - The s in gr datab - Stude datab - The s be ab	ents insert never criteria and jour criteria and jour criteria and jour coup work according and to inserts will be a passeapplication tudents will let to classify the criteria and to classify the criteria and jour criteria and j	ly in an SQL daty data into a relative data into a relative tables according to the Nording to the Nording to compare, as and will be about the adherm.	ational d ding to c yeb serv Model-V yia a web , combin le to plan Ivantage	hosen i er prog fiew-Co interf ne and n and co so of ob	ntegrity gramming ontroller ace (Jav evaluat levelop o ject-baso	rules. g (e.g. Jaka -Software- ascript Fra e specific database tr ed, distribu	artaEE) and Pattern to mework). methods a ansactions. ted databas	l plan app modify d	olications ata of a
	- Basic - Intro- - Use c - Intro-	concepts of r duction to SQI of SQL to crea duction to pro	elational and ob L (Structured Qu te, delete, modif gramming dynar bases in web app	ject-rela ıery Lan fy and qı nic web	tional d guage) tery da pages	lata mod), .ta record (e.g. Jak	lels, ds, artaEE, JSI	F, Primefac	es),	
4	Forms of	_							1	
	Lecture,	sem. lessons,	project and grou						1	
4 5	Lecture,	sem. lessons,	project and grou						1	
	Lecture,	sem lessons, tion requirement None Good and d Mod 1001 1105 1109	project and grous: s: knowledge in tlata structures (g	he field generic p I Data Stace 1; ace 2;	within of obje	the fram	ework of tl	ne practica		rithms

7	Prerequisite for the award of credit points:
	Module examination pass and course as sessment
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences (B.Eng.) and Mechatronics (B.Sc.)
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Lutz Grünwoldt
11	Other information:
	Literature will be announced at the beginning of the course. A script will be provided.
12	Language:
	German

	oduction to	o Engineering	gComputer Scien	ices					EII	
dent	ification er	Workload:	Credits:	Stud	ly semes	ter:	Frequenc	y of the offer	Durati	on:
1052		150 h	5	1st	sem.		Annual (Winter)	1 sem	nester
	Course:		Planned group	sizes	Scop	e		contact	Self-stu	dy
	Lecture		60 students	dents		2 SCH		h	45	h
	Sem. less	sons	30 students				30	h	45	h
	Exercise		20 students				0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	d - le - re in	ifferent aspect earn the basic esearch and e an the field of t	e structure of the ets of their studies es of scientific wo evaluate sources of eechnological is su	s in a str ork of inforr	ructured	lway.				
	- u	tructured mar se current tex	nner. d typesetting syst	esults o	create s	pecialize	ed scientif			opics in
	Contents - E - C - P - R - P - S - Ir - P	s: Ingineering coverview of the resentation of the received and tructure and the roject and time troject and troje	nner.	comparers of an velopm fic sour work refic papersecting	ed to oth engine ent proj rces in e sults ers	her compering IT fects as p	outer scientispecialist	ic texts.	nes	
	Contents	s: Ingineering coordinates and tructure and tructure and the troject and time of teaching:	omputer science one day-to-day wo fresearch and de work with scientid presentation of writing of scientic professional type me management in	comparers of an velopm fic sour work refic papersecting	ed to oth engine ent proj rces in e sults ers	her compering IT fects as p	outer scientispecialist	ic texts.	nes	
	Contents - E - C - P - R - P - S - Ir - P	s: congineering congineering congineering congineering congineering congineering congineering congentation of the congineering and tructure and tructure and tructure and times of teaching: and seminar	omputer science one day-to-day wo fresearch and de work with scientid presentation of writing of scientic professional type me management in teaching	comparers of an velopm fic sour work refic papersecting	ed to oth engine ent proj rces in e sults ers	her compering IT fects as p	outer scientispecialist	ic texts.	nes	
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	Contents - E - C - P - R - P - S - Ir - P	s: Ingineering converview of the resentation of the resentation of the research and roces sing and tructure and the roject and time of teaching: and seminar ation requirements.	omputer science one day-to-day wo fresearch and de work with scientid presentation of writing of scientic professional typic me management in teaching ints:	comparers of an velopm fic sour work refic papersecting	ed to oth engine ent proj rces in e sults ers	her compering IT fects as p	outer scientispecialist	ic texts.	nes	
	Contents - E - C - P - R - P - S - Ir - P Forms of Lecture Participa Formal: Content:	s: Ingineering converview of the resentation of the resentation of the research and roces sing and tructure and roject and time of teaching: and seminar attion requirements and seminar requirements.	omputer science one day-to-day wo fresearch and de work with scientid presentation of writing of scientic professional typic me management in teaching ints:	comparers of an velopm fic sour work refic papersecting	ed to oth engine ent proj rces in e sults ers	her compering IT fects as p	outer scientispecialist	ic texts.	nes	
	Contents - E - C - P - R - P - S - Ir - P Forms of Lecture Participa Formal: Content:	s: Ingineering coverview of the resentation of the research and the roduction to roject and time of the resemble of the research and the roduction to roject and time of the research and the roduction to roject and time of the research and seminar at ion requirements. Note	omputer science one day-to-day wo fresearch and de work with scientid presentation of writing of scientic professional typic me management in teaching ints:	comparerk of an velopm fic sour work refic paper pesetting in studie	ed to oth engine ent proj rces in e sults ers	her compering IT fects as p	outer scientispecialist	ic texts.	nes	
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	Contents - E - C - P - R - P - S - Ir - P Forms of Lecture Participa Formal: Content: Forms of Term pa Prerequis Module	s: Ingineering coverview of the resentation of the search and the roces sing and tructure and the roject and time of teaching: In and seminary attion requirements of the season attions and seminary attions are combinated as examination.	omputer science one day-to-day wo fresearch and de work with scientid presentation of writing of scientific professional type me management in teaching nts: ne ne nation examination of credit points:	compared of tems to determs to determs to determs to determs to determs to determine the compared of the compa	ed to oth engine ent proj rees in e sults ers g s ysten es and at	her compering IT jects as progineering work	outer scientispecialist	ic texts.	nes	

9	Importance of the grade for the final grade:
10	Module Coordinator:
	Prof. Dr. rer. nat. Axel Schneider
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Emb	edded Sys	tems								ESYS		
Ident numb	ification er:	Workload:	Credits: Study semester: Frequency of the offer					Duration	:			
1079		150		5	6th s	emeste	r	Annual (Summer)		1 semester		
1	Course:		Pl	Planned group sizes		Scope		actual contact time / classroom teaching		Self-study		
	Lecture		60) students		2	SCH	30	h	45	h	
	Sem. less	ı. lessons		Sem. lessons 30 students			1	SCH	15	h	22.5	h
	Exercise		20) students		0	SCH	0	h	0	h	
	Practical or seminar		15	students		1	SCH	15	h	22.5	h	
	Supervise study	d self	60) students		0	SCH	0	h	0	h	

2 Learning outcomes/competences:

Students:

- name and explain the different hardware concepts on which common embedded systems are based.
- explain the underlying hardware technologies, name advantages and disadvantages and evaluate the applicability for various practical problems.
- implement combinatorial and sequential function blocks in a synthesis language (e.g. VHDL) and use common toolchains to bring the synthesised functions to a target hardware (e.g. FPGA).
- develop a complex logic component according to specifications based on the previously developed function modules.
- evaluate algorithms with regard to their implementability in hardware or software (hardware/software co-design).
- explain design concepts for the hardware-related processing of discrete and continuous signals.
- distinguish the parallel design of algorithms for the hardware synthesis from conventional programming.
- compare their synthesis results with those of the other students and discuss differences in small groups.

3 Contents:

- Introduction to the topic of embedded systems (reactive, transforming systems, etc.)
- Classification of embedded hardware (microcontrollers, microprocessors, FPGAs, SoCs, etc.)
- Hardware technologies for the implementation of digital logic (SPLDs, CPLDs, FPGAs, ASICs)
- Repetition of combinatorial and sequential logic (pipelining etc.)
- Concepts of reliability, efficiency, hard and soft real time
- Hardware description languages (synthesis languages such as VHDL, VERILOG) compared to programming languages
- Introduction to VHDL
- Implementation of combinatorial and sequential logic components such as adders, multiplexers, automata, etc. in VHDL and their synthesis for an FPGA
- Synchronisation of the communication of asynchronous systems (synchronisation, metastability)
- Implementation of simple bus systems

	1 Aspect	to of hardware/software as decian				
	 As pects of hardware/software co-design Control of mechatronic systems such as robots 					
4	Forms of teaching:					
4	g .					
_	Lecture, sem. lessons, practical course Participation requirements:					
5						
	Formal:	None				
	Content:	Basic knowledge in the fields of digital technology, programming and computer				
		architectures				
		Modules:				
		1045 Digital Electronics II;				
		1070 Digital Electronics I;				
		1104 Computer Science 1				
6	Forms of assess	sment:				
	Written examination, combination examination or oral examination					
7	Prerequisite for	r the award of credit points:				
	Module exam	nination pass and course as sessment				
8	Application of	the module (in the following study programmes)				
	Electrical Eng	gineering B.Eng., Engineering Computer Sciences B.Eng., Mechatronics B.Sc. and				
		gineering and Management B.Sc.				
9	Importance of	the grade for the final grade:				
	according to 1	BRPO				
10	Module Coordi	nator:				
	Prof. Dr. rer. 1	nat. Axel Schneider				
11	Other informat	tion:				
	Literature wil	l be announced at the beginning of the course.				
12	Language:					
	German					

Build	ding Auto	mation							GAT		
	ification	Workload:	Credits:	Study	semest	er:	Frequency of the offer		Durati	ion:	
umb .095		150 h	5	4th or 6th sem.			Annual (Summer)		1 sem	1 semester	
	Course:	1	Planned group s	Planned group sizes		e	Actual contact time / classroom teaching		Self-study		
	Lecture		60 students		2	SCH	30	h	45	h	
	Sem. less	sons	30 students		2	SCH	30	h	45	h	
	Exercise		20 students		0	SCH	0	h	0	h	
		or seminar	15 students		0	SCH	0	h	0	h	
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h	
			e appropriate for					odically ass	sess whi	ch hum	
	Contents Description of the contents of the c	g interfaces are definition and ossibilities are equirements leating, ventil hysical princil lese of sensors control, control us systems, p	structure of build nd limits of energ for human use: co lation, air condition iples, characterist and actuators; ul poller types, optime protocols, network	ding auto y efficie omfort, p oning: b cic curve biquitou is ation c king, cor	omation neythrollutar asic des s/perva fenerg mputer	n rough sm nts, etc. vices (als sive con gy use systems	on. nart buildi so for the nputing , building	ngs use of rene managemen	wable en	nergies). ns	
	Contents Poly R H CO B U A CO Forms of Lecture	g interfaces are definition and ossibilities are equirements leating, ventil hysical princil lese of sensors control, control us systems, p	structure of buildend limits of energe for human use: collation, air condition, and actuators; ula coller types, optimorotocols, networks, us ability ambient assisted optics: Standards,	ding auto y efficie omfort, p oning: b cic curve biquitou is ation c king, cor	omation neythrollutar asic des s/perva fenerg mputer	n rough sm nts, etc. vices (als sive con gy use systems	on. nart buildi so for the nputing , building	ngs use of rene managemen	wable en	nergies). ns	
	Contents Poly R H CO B U A CO Forms of Lecture	g interfaces are segments leading, ventile hysical principles of sensors control, control systems, place interfaces accessibility, abverarching to the feaching: Control cont	structure of builded limits of energy for human use: collation, air condition, and actuators; ulabler types, optime protocols, networks, us ability ambient assisted optics: Standards, and architectures are considered and actuators.	ding auto y efficie omfort, p oning: b cic curve biquitou is ation c king, cor	omation neythrollutar asic des s/perva fenerg mputer	n rough sm nts, etc. vices (als sive con gy use systems	on. nart buildi so for the nputing , building	ngs use of rene managemen	wable en	nergies) ns	
	Contents D P R H P C B U A C Forms of Lecture Participa	g interfaces are segments leading, ventily hysical principles of sensors control, control, control, ser interfaces accessibility, abverarching to the seminar	structure of builded limits of energy for human use: collation, air condition, and actuators; ulabler types, optime protocols, networks, us ability ambient assisted optics: Standards, and architectures are considered and actuators.	ding autry efficie omfort, poning: bic curve biquitou is ation oking, con living, s guidelin	omation neythrollutar asic des s/perva of energ mputer mart ho	n rough sm nts, etc. vices (als sive com gy use systems omes adard dia	on. nart building the so for the	ngs use of rene managemen	wable en	nergies) ns mentatio	
	Contents Property of the contents of the cont	g interfaces are segments leading, ventily hysical principles of sensors control, control, control, ser interfaces accessibility, abverarching to the seminar	structure of buildend limits of energy for human use: collation, air condition, a	ding autry efficie omfort, poning: bic curve biquitou is ation oking, con living, s guidelin	omation neythrollutar asic des s/perva of energ mputer mart ho	n rough sm nts, etc. vices (als sive com gy use systems omes adard dia	on. nart building the so for the	ngs use of rene managemen	wable en	nergies) ns mentatio	
	Contents Property of the contents of the cont	g interfaces are definition and ossibilities are equirements leating, ventility sical principles of sensors control, control systems, place interfaces accessibility, averarching to the control of the c	structure of buildend limits of energy for human use: collation, air condition ples, characterists and actuators; ultiples option of the policy of the polic	ding autive efficience omfort, poning: beie curve biquitou is ation of king, con living, siguidelin (1107), 1 (1097), 5	omation neythrollutar asic des s/perva of energ mputer mart ho	n rough sm nts, etc. vices (als sive com gy use systems omes adard dia	on. nart building the so for the	ngs use of rene managemen	wable en	nergies) ns mentatio	
	Contents Property of the contents of the cont	g interfaces are definition and ossibilities are equirements leating, ventily hysical principles of sensors control, con	structure of buildend limits of energy for human use: collation, air condition, a	ding autory efficies omfort, poning: beie curve biquitou is ation of king, con living, s guidelin (1107), 1 (1097), 5	omation neythrollutar asic des s/perva of energ mputer mart ho	n rough sm nts, etc. vices (als sive com gy use systems omes adard dia	on. nart building the so for the	ngs use of rene managemen	wable en	nergies).	

	Engineering Computer Sciences B.Eng. and Renewable Energies B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. nat. Jörn Loviscach
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Geno	der and Di	versity: Succ	ess Factors for Co	ompanie	es				GUD	
	Identification Worklo		Credits:	Credits: Study		ter:	Frequency of the offer		Durat	ion:
number: 3135		150 h	5 5th		sem.		Annual (Winter)		1 semester	
1	Course:		Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	sons	30 students		2	SCH	30	h	45	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
2	Learning	outcomes/com	petences:			1	I	1		
3	•	 Directive, General Equal Treatment Act) are sensitised to human heterogeneity in the corporate context. independently recognise stereotyping and can develop ideas for possible chabusiness environment. are able to independently collect relevant information on established concept gender mains treaming and diversity management and to assess their relevant professional practice. 				nanges in the person of the pe	n the			
	 Definitions and delimitation of gender and diversity Concepts and approaches to equal opportunities (e.g. diversity management, mainstreaming) Legal basis and political influences (e.g. EU Anti-Discrimination Directive, Discrimination Directive, General Equal Treatment Act (German abbreviation Subjective and social values, attitudes and prejudices in the context of diversity Possible approaches for taking diversity characteristics (e.g. gender and age) selected areas of business (marketing, product development, human resource) Concept for the sustainable introduction of holistic diversity management) Case studies and application examples from business practice 						e, Generation: A Corsity e) into a	ral Anti- GG))		
	•	-					-	C		
4	Forms of	Case studies		example	s from	ousiness	practice			
4	Forms of Lecture	Case studies	and application e	example	s from	ousiness	practice			

6	Forms of assessment:
	Term paper, written examination or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Applied Mathematics B.Sc., Biotechnology and Instrumentation Engineering B.Sc., Electrical Engineering B.Eng., Computer Engineering B.Eng., Mechanical Engineering B.Eng., Mechatronics B.Sc., Renewable Energies B.Eng. and Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Andrea Kaimann
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Busi	ness Proc	ess Modelling	g and IT Systems						GPM			
ldenti numb	ification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duration:			
3210		150 h	5	3rd	sem.		Annual (Winter))	1 semester			
l	Course:		Planned group	sizes	Scop	e		contact lassroom	Self-study			
	Lecture		60 students		2	SCH	0	h	64	h		
	Sem. less	ons	30 students		0	SCH	0	h	0	h		
	Exercise		20 students		1	SCH	8	h	46	h		
	Practical	or seminar	15 students		1	SCH	16	h	0	h		
	Supervise study	ed self	60 students		1	SCH	16	h	0	h		
	_	outcomes/com	npetences:			I						
	Student											
	 structure and evaluate the specific mode of operation of integrated standard software (ERF software). design and model with the help of modern software architectures (e.g. SOA and BPMS) the processes in the company. 											
	 processes in the company. analyse processes and requirements of companies for the use, operation and maintenance or 											
	integrated software systems (adaptation options, interfaces to other IT systems, etc.)											
3	Contents:											
,	Process modelling and data modelling using modelling tools such as ARIS											
ļ	 Evaluation of concepts of integrated data processing Drafting reference models for designing the data, process and function models (e.g. Aacher 											
	PPS model)											
	 Analysis of ERP systems (architecture, structuring, database models, HANA) Overview of the core modules and applications of ERP systems in the process: e.g. order to cash process) 											
	Application-oriented use cases are used to demonstrate how business processes can be implemented consistently and across software modules.											
4	Forms of	teaching:										
			lf-study, classroo	meven	ts in the	formof	exercises	and practic	als			
5		tion requireme	nts:									
	Formal:	-										
5	Content:	assessment:										
J			examination, proj	ect was	korom	1 evamin	ation					
7	Preremis	ite for the awa	rd of credit points:	cci woi	K OI OIG	ı caiiiii	atiOII					
′	_		pass and course a		ent							
8	Application of the module (in the following study programmes) Digital Logistics (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng. and											
8		on of the mod	ule (in the followin	g study p	rogramı		gies (work	-integrated)	B.Eng.	and		

	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Jörg Nottmeyer
11	Other information:
	-
12	Language:
	German

High	n Performa	nce Computi	ng								HPC	
Ident numl	ification per:	Workload:		Credits:	Study	semes	ter:	Frequ	ency of the o	ffer	Duratio	n:
number: 1006		150 h 5		6th s	6th sem.			Annual (Summer)			1 semester	
1	Course:		Pl	Planned group sizes		Scope		Actual contact time / classroom teaching			Self-stud	y
	Lecture		60	60 students		2	SCH	30	h		45	h
	Sem. lessons		30	30 students		0	SCH	0	h		0	h
	Exercise		20	20 students		1	SCH	15	h		22.5	h
	Practical	Practical or seminar		15 students		1	SCH	15	h		22.5	h
	Supervise	ed self-study	60	60 students		0	SCH	0	h		0	h

2 Learning outcomes/competences:

In addition to the theoretical basics, the common basic concepts of current architectures and strategies are presented. The internship focuses on practical work within a Beowulf teaching cluster. Students will be able to design and implement parallel algorithms. They will learn about frequently used libraries for parallelisation and know how to use them for given problems and apply them in practice.

Students:

- know the basic concepts of scientific and parallel (high-performance) computing,
- can select suitable parallelisation strategies and apply them,
- are also familiar with the essential characteristics of memory- or directionally-coupled parallel systems and their programming,
- are able to develop parallel algorithms to solve given problems,
- are proficient in the standard Message Passing Interface (MPI) for Distributed Computing,
- can convert given or self-developed parallel algorithms into efficient programs (MPI or OpenMP) on HPC systems,
- can identify and correct errors in an implementation, can compare and assess optimisation options and
- are proficient in the operation of high-performance computers and can adapt their self-written programmes to these and execute them there.

3 Contents:

Many questions in the natural sciences and engineering ultimately boil down to the solution of mathematical problems, such as solving systems of equations or minimising error functionals. For this purpose, parallelisation for distributed and shared memory architectures, such as HPC clusters and multi-core CPUs, is discussed.

General Introduction to High Performance Computing [https://hpc.ad.fh-bielefeld.de|HPC| (Tasks, basic architectures, history) Parallel computer and system architectures for HPC: Modern high-performance CPUs, symmetrical multiprocessor systems (SMPs), parallel computers with distributed memory, and clusters of PCs/workstations Programming parallel and distributed computer systems Practical handling of High Performance Computing Clusters Typical HPC applications Forms of teaching: Lecture, exercise, practical course, self-study Participation requirements: Formal: None Content: Sound computer science and programming skills (especially in C) Basic knowledge of operating systems Basic knowledge of networks and their architecture Basic knowledge of mathematics Modules: 1001 Algorithms and Data Structures; 1105 Computer Science 1; 1231 Computer architectures; Forms of assessment: Term paper, combination examination or project work Prerequisite for the award of credit points: Module examination pass Application of the module (in the following study programmes) Engineering Computer Sciences B.Eng. Importance of the grade for the final grade: according to BRPO Module Coordinator:

Literature will be announced in the course. Teaching language: German, original English literature

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Prof. Dr. rer. nat. Christian Schröder

Other information:

Language: German

High	n-Frequenc	cy Electronic	es						HFE		
dent	ification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duratio	Duration:	
101		150 h	5	5th	sem.		Annual (Winter)	1 semester		
-	Course:		Planned group	Planned group sizes			time / c	contact	Self-study		
	Lecture		60 students		2	SCH	teachin 30	h	45	h	
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h	
	Exercise		20 students		0	SCH SCH	0	h	0	h	
	-	or seminar	15 students		1		15	h	22.5	h	
	Supervise	d self-study	60 students		0	SCH	0	h	0	h	
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3	- ex sy - ex - Ti - W - So - Ti - Co	plain the started by stembound plain components of line cattering particular ponents of the components of the smith Champonents of the smith Champ	ate of wave match lary conditions, onents of high-fre ory for the descripes ng rameters	otion of	electron	nics and			_		
	- ex sy - ex - Ti - Co - La	plain the stratembound plain composite courpole the heory of line attering par he Smith Ch omponents of aboratory pro- freaching:	ory for the descripes art of high-frequency arcticals in small g	quency otion of electror	linearc	ircuits			_		
	- ex sy - ex - Ex - Ti - Cx - Lx - Forms of Lecture,	plain the stratembound plain composition composition cour-pole the heory of line ave matchine attering paths and components of aboratory profession teaching: sem.lessor	ate of wave match lary conditions, onents of high-fre ory for the descrip es ng rameters art of high-frequency racticals in small g	quency otion of electror	linearc	ircuits			_		
	- ex sy - ex - Ex - Ti - Cx - Lx - Forms of Lecture,	plain the stratembound plain composite courpole the heory of line attering par he Smith Ch omponents of aboratory pro- freaching:	ate of wave match lary conditions, onents of high-fre ory for the descrip es ng rameters art of high-frequency racticals in small g	quency otion of electror	linearc	ircuits			_		
	Contents - Forms of Lecture, Participa	plain the strategister bour-pole the heory of line vattering particular bourstory processed by the Smith Chomponents of aboratory processed by the sem lesson tion requirements of the sem lesson bourstory processed by the seminary processed by t	ory for the descripes art of high-frequency racticals in small grants: ne athematics 1 (1146)	otion of electroroups	linear c	ircuits	selectthe		_		
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	- ex sy - The sy - So - The sy - The	cour-pole the heory of line vattering pathe Smith Chomponents of aboratory provided in the semiles of the semil	ory for the descripes art of high-frequency racticals in small grants: ne athematics 1 (1146 ctrical Engineering ination; in each card of credit points:	electron of ticals in a se with	linear c small g 7) and 2 71 or 10	roups.	or 1153).	mforthesp	pecific ap		
·	Contents - Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module	correquirements or oral examination	ory for the descripes art of high-frequency racticals in small gas, laboratory pracents: ne athematics 1 (1146 ctrical Engineering in ation; in each card of credit points: ne pass with preliminations; in pass with preliminations.	otion of electrorroups ticals in assewith anary ex	electron linear c small g 7) and 2 71 or 10 a prelim aminat	roups. 2 (1152 con 272) and inary examinary	or 1153).	mforthesp	pecific ap		
·	- ex Sy - ex Contents - Fo - Ti - W - So - Ti - Co - La Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati	cororal examination on of the mood	ory for the descripes art of high-frequency racticals in small g as, laboratory pracents: ne athematics 1 (1146 ctrical Engineering the pass with prelimination; in each card of credit points: n pass with prelimination (in the following the pass with prelimination) and the following the pass with prelimination (in the following the pass with prelimination) and the following the pass with prelimination (in the following the pass with prelimination) and the following the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with prelimination) and the pass with prelimination (in the following the pass with pass	otion of electroroups ticals in as e with a g 1 (10) as e with a g study p	linear c small g 7) and 2 71 or 10 aminationograms	ircuits 2 (1152 con 272) and inary examinary	or 1153). 12 (1075) amination	m for the sp	ce	plicatio	
5	Contents - Forms of Lecture, Participar Formal: Content: Forms of Written Prerequis Module Applicati Electrica	cororal examination on of the model Engineering	ory for the descripes art of high-frequency racticals in small gas, laboratory pracents: ne athematics 1 (1146 ctrical Engineering in ation; in each card of credit points: ne pass with preliminations; in pass with preliminations.	electroroups ticals in or 114 ag 1 (10) as e with anary ex g study p	linear c small g 7) and 2 71 or 10 aminationograms	ircuits 2 (1152 con 272) and inary examinary	or 1153). 12 (1075) amination	m for the sp	ce	plicatio	

	Prof. DrIng. Rüdiger Schultheis
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

11 5	ecurity M	lanagen	nent							IT SM	
Ident numl	ification per:	Workl	oad:	Credits: Study ser		semeste	er:	Frequency of	of the offer	: Duration:	
1403		150		5	6th s	emester		Annual (Summer)			
1	Course:		Pl	Planned group sizes:		Scope	:	Actual contact ti	me/ nteaching	Self-study	
	Lecture		60) students		2	Weekly hours	30	h	45	h
	Sem. less	Sem. lessons) students		2	SCH	30	h	45	h
	Exercise		20) students			SCH		h		h
	Practical	or semina	ar 15	students		0	SCH	0	h	0	h
	Supervise	d self-stu	ady 60) students			SCH		h		h
3	Contents	27001, Based or dangers Students Students example They des environt They are organisa	the histor for informa know the nare able to ss, sign use case ments, e familiar wations.	g,	on of moon for an infity concepthe monited duties	formation formation formation oring of a of (Chief	puter arch n security lentify vul structures f) Informa	management management merabilities worthy of p	ney recogni nt system (l for various	se correspo ISMS), s scenarios in laboratory	nding n give
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	Forms of teaching:										
4	Lecture, sem. lessons including practical exercises										
	Participa		rements:								
	Participa Formal:	t ion requi		Rasio knowlo	dae of co	mnuter	science				
	Participa	t ion requi	•	Basic knowle Basic knowle	-	-	science				
5	Participa Formal:	tionrequi	•	Basic knowle Basic knowle	-	-	science				
5	Participa Formal: Content: Form of a	tionrequi	• •		-	-	science				
6	Participa Formal: Content: Form of a Written e	tion requi	• • it: ion or oral e	Basic knowle	-	-	science				
6	Participa Formal: Content: Form of a Written e	ussessmen examinati	e award of	Basic knowle	-	-	science				
45678	Participa Formal: Content: Form of a Written e Prerequis Module e Applicati	assessmen examinati ite for the examinati	on or oral e e award of on pass	Basic knowle examination credit points:	dge of an	alysis					
6	Participa Formal: Content: Form of a Written e Prerequis Module e Applicati Engineer	assessmen examinati ite for the examinati on of the ing Comp	on or oral e e award of on pass module (in	Basic knowle examination credit points:	dge of an	alysis					

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

10	Module coordinator:
	Prof. DrIng. Wolfram Schenck
11	Other information:
	 Eckert, C.: IT-Sicherheit: Konzepte – Verfahren – Protokolle, De Gruyter Oldenbourg; ISBN: 9783110551587, 10. Auflage 2018
	 Kersten u.a.: IT-Sicherheitsmanagement nach der neuen ISO 27001 - ISMS - Risiken - Kennziffern – Controls. Springer Vieweg: ISBN 978-3-658-27691-1, 2020
	Müller, KR.: Handbuch der Unternehmenssicherheit. Springer Vieweg: ISBN 978-3-658-40572-4, 2022
12	Language:

Com	puter Scie	ence 1							INF1	
Identi numb	ification	Workload:	Credits:	Study	y semes	ter:	Frequenc	y of the offer	Duration:	
1105		150 h	5	1st s	sem.		Annual (Winter)		1 semester	
1	Course:	L	Planned group s	sizes	Scop	e		contact classroom	Self-stud	dy
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
3	•	They define a They masters language, usi In particular, They havema editor, a comp	ne constructs of the constructs of the construct of the structured prograng functions from they apply funct astered the operabiler, a linker and	anctions amming mthe Ca tions fro	and ca and important standar mthe Conninteg	ll themir plement d library Sstandar	n a correct small algorithm a correct the dibrary to the dibrary t	tly paramete orithms in the ect and purp for reading a	erized for ne C prog oseful w and writin	rm. gramming ay. ng files.
	•	Overview of the Structure and Conversion be Encoding of a Designing algorization of the Encoding of the Structure of the Encoding and Encoding Important fur	he basics and hid functioning of a etween numbers and stringorithms (e.g. within Conctions from the ewriting files with	digital of systems of the structure of t	comput (binary ne computure dia	ter , octal, c outer grams ar	lecimal, h			
4		teaching: , sem. lessons	, practical progra	nming	tasks w	ithin the	e framewo	rk of the pra	ectical co	ourse
5	Dartioino	tion requirem on	te•							
5	Participa Formal:	tion requiremen								

	Written or oral examination; in each case with preliminary examination performance
7	Prerequisite for the award of credit points:
	Module examination pass with preliminary examination
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. WolframSchenck
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Com	puter Scie	ence 2							INF2			
	ification	Workload:	Credits:	Study	semester:		Frequenc	y of the offer	Duration:			
numb 1109		150 h	5	5 2nd s			Annual (Summe		1 semester			
1	Course:		Planned group s	sizes	Scop	e		contact classroom	Self-stud	ly		
	Lecture		60 students		2	SCH	30	h	45	h		
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h		
	Exercise		20 students		0	SCH	0	h	0	h		
		or seminar	15 students		1	SCH	15	h	22.5	h		
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h		
3	 They distinguish OOP from other programming paradigms. They create class diagrams with UML (Unified Modeling Language) and translate them into correct C++ code. They can explain the central concepts and constructs of the programming language C++ and use polymorphism, templates, operator overloading and exception handling in a purposeful and appropriate way when programming. They name the central classes of the C++ standard library and their purpose and apply them in programming. They design and implement small C++ programmes on their own and are able to evaluate different implementation approaches comparatively. They understand simple design patterns of OOP and use them in C++. They implement small applications with graphical user interfaces. 											
	•	Basic concer (Unified Mod Building elen Advanced to class templat Frequently us Simple OOP	ots of object-oried leling Language, the tary class relatives in OOP with the es, exception har sed classes from the design patterns (Programming of	and C+ ntionship n C++: 1 ndling the C++ such as	+ os and h Polymo standa Singlet	nierarchi orphism, rd librar on, Fact	es overload y ory or Ob	ling of opera	ators, fur	action and		
4		teaching: , sem. lessons	, practical progra	nming	tasks w	rith in the	e framewo	ork of the pra	nctical co	ourse		
5	Participation requirements:											
5	1											
J	Formal:	Non	e									
3	Formal: Content:	Mod	e dules: 5 Computer Scien	nce 1·								

	Written or oral examination; in each case with preliminary examination performance
7	Prerequisite for the award of credit points:
	Module examination pass with preliminary examination
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. WolframSchenck
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Inno	vationand	IPM									
Identi numb	ification er:	Workload:		Credits:	Study	semest	ter:	Frequenc	y of the offer	Duration:	
number: 3211		150 h		5	3rd/4th/5th/7th sem.			eachse	mester	1 semester	
1	Course:		Pl	anned group siz	Scope		Actual contact time / classroom teaching		Self-stu	idy	
	Lecture		60 students			2	SCH	0	h	56	h
	Sem. lesso	ons	30	30 students		0	SCH	0	h	0	h
	Exercise		20	20 students		2	SCH	16	h	62	h
	Practical	or seminar	15	15 students		0	SCH	0	h	0	h
	Supervised self-study			60 students		1	SCH	16	h	0	h

Students:

- are prepared to lead product development and innovation projects and teams to success in terms of holistic and strategically oriented project management (also including agile methods).
- understand the basics of project management and can use the elementary technical vocabulary.
- can explain the most important instruments of project management.
- are able to lead/manage a project in a given process-organisational project organisation.
- are able to develop and specifically use control options for different project phases (controlling of the degree of completion, cost controlling).
- can explain the specifics of teambuilding and project management.
- can carry out the moderation of teammeetings projects.
- know instruments of IT-supported project management.
- can explain the importance of corporate objectives and are able to distinguish between different management cultures.
- can name essential aspects of industrial property protection.

3 Contents:

- Basics of project management (terms/methods/instruments)
- Project phase models and planning systems (project preparation, project planning, project implementation, project completion)
- Agile project management Forms of project organisation
- Innovation and change management, self-management
- Project planning (project structure plan/cost plan/resource plan/schedule)
- Project documentation/project controlling Risk management
- Special features of use of methods in innovation projects

	 Leading projects Stakeho Method Trainin 	gic preparation / initiation, planning, monitoring and control of innovation projects) g project and innovation teams (social structures, special communication situations in s, real and virtual project work, problem analysis and concepts for action) older management (factors influencing the successful management of projects) ds of idea generation (creativity techniques etc.) gs and workshops on selected technical examples spects of industrial property protection
4	Forms of teaching	ŗ.
	Learning units f	For self-study, classrooms essions in the form of exercises
5	Participation requ	irements:
	Formal:	-
	Content:	-
6	Forms of assessme	
		tten examination, project work or oral examination
7	•	e award of credit points:
	Module examin	
8		e module (in the following study programmes)
		cs (work-integrated) B.Eng., Digital Technologies (work-integrated) B.Eng.,
		Automation (work-integrated) B.Eng., Product Service Engineering work-integrated
	_	astrial Engineering
9	(work-integrate	grade for the final grade:
9	according to BR	
10	Module Coordina	
10	Prof. DrIng. M	
11	Other information	
	-	
12	Language:	
	German	

	grated Pro	duct Developn	ment						IP		
[den	tification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	of the offer	Durati	on:	
1232		150 h	5	5 4th c		em.	Annual (Summer)		1 sem	1 semester	
1	Course:		Planned group s	izes Scope			Actual contact time / classroom teaching		Self-study		
	Lecture		60 students		2	SCH	30	h	45 h		
	Sem. less	ons	30 students		2	SCH	30	h	45	h	
	Exercise		20 students		0	SCH	0	h	0	h	
	Practical	or seminar	15 students		0	SCH	0	h	0	h	
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h	
<u> </u>	are able	to work meth rules for meth	s and tools. They odically, system odical developn	atically							
	Method	ıcai developm	ent of products (TOTA	206 226	1 2222	.1	`		
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ı	function Idea ge evaluati Selected stresses	g, tasks, specifies, functional sineration/creation of alternatified development	fications/required structure, ivity process -> ve solutions, eva t guidelines (e.g.	ments li Over- aluation cost-co	st, deve view of proced	elopment f methoures.	t structurii ds, discu	ng->Overa	ll function	method	
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	function Idea ge evaluati Selected stresses Forms of Lecture, Participa Formal:	g, tasks, specifies, functional sineration/creation of alternation development teaching: sem. lessons, tion requirement	fications/requirer structure, ivity process -> ve solutions, eva t guidelines (e.g.	ments li Over- aluation cost-co	st, deve view of proced	elopment f methoures.	t structurii ds, discu	ng->Overa	ll function	method	
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	function Idea ge evaluati Selected stresses Forms of Lecture, Participa Formal: Content: Forms of	g, tasks, specifies, functional sineration/creation of alternatified development teaching: sem. lessons, tion requirement None assessment:	fications/required structure, ivity process -> ve solutions, eva t guidelines (e.g.	ments li Overraluation cost-co	st, deve	elopment f metho- ures. s develop	t structurii ds, discu oment, des	ng->Overa	ll function	method	
	function Idea ge evaluati Selected stresses Forms of Lecture, Participa Formal: Content: Forms of Written	g, tasks, specifies, functional sineration/creation/creation of alternation development teaching: sem. lessons, tion requirement None assessment: examination,	fications/requirer structure, ivity process -> ve solutions, eva t guidelines (e.g.	ments li Overraluation cost-co	st, deve	elopment f metho- ures. s develop	t structurii ds, discu oment, des	ng->Overa	ll function	method	
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3	function Idea ge evaluati Selected stresses Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati Biotechi Mechan Importan accordir Module O Prof. Dr. Other inf	teaching: sem. lessons, tion requirement None assessment: examination proposition of the module nology and Institute of the grade in gto BRPO Coordinator: -Ing. Klaus Dormation: re will be annoted in specific proposition of the module nology and Institute of the grade in gto BRPO coordinator: rewill be annoted in the specific proposition of the module nology and Institute of the grade in gto BRPO coordinator: rewill be annoted in the specific proposition of the module nology and Institute of the grade in gto BRPO coordinator: rewill be annoted in the specific proposition of the module nology and Institute of the grade in gto BRPO coordinator:	fications/required structure, ivity process -> ve solutions, evaluations (e.g., practical exercise) ts: e combination exaluation exaluation for the final grade: burkopp	ments li Overraluation cost-co sees minatio g study p	n or ora	al examinates)	ds, discu	ng-> Overa	Il function tuitive rdance w	method	

Sens	sors and A	ctuators							ISS		
Ident numl	ification	Workload:	Credits:	Stud	y semest	ter:	Frequency	of the offer	Duratio	n:	
1311			5	6th	6th sem.		Annual (Summer)		1 seme	1 semester	
1	Course:		Planned group s	Planned group sizes		e	actual contact time / classroom teaching		Self-stud	у	
	Lecture		60 students		2	SCH	30	h	45	h	
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h	
	Exercise		20 students		0	SCH	0	h	0	h	
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h	
	Supervise	d self-study	60 students		0	SCH	0	h	0	h	
	Learning outcomes/competences: In relation to the contents listed below, the students can classify and assess sensors as esset components of mechatronic systems. They can select and configure sensors suitable for mechatronic production processes in a targeted manner, and design and develop sensors relevant for mechatronic products. They confidently apply the necessary means and methods of describing sensor systems are essential step in overall system design. The students use the basic knowledge of signal processing in field of sensor technology to design intelligent sensor systems. They analyse trends and current fit of application in the area of modern sensor technology and the associated development methodology applications, sensor characterisation (accuracy, resolution, sensitivity, linearity) Sensor signal chain: Signal processing and conditioning, design and realisation of analogue filters, ADU/DAU, samplin theorem Sensor signal processing: Sensor error correction, discrete-time processing of analogue signals, spectral analysis/FFT, windowing, design and implementation of digital filters										
3	Sensors Definition applicat Sensors Signal portheorem Sensors Sensors window Constru Integrat FPGA),	en of terms, ca ions, sensor ch signal chain: roces sing and signal procession error correction ing, design an ction of technicion levels, inte- connectivity/i	conditioning, defing: n, discrete-time p	esign and process nof dig	y, resolu d realis ing of an ital filte	ation, sea ation of nalogue ers	nsitivity, li analogue signals, s _l	es, categoris nearity) filters, ADU pectral anal	J/DAU, s ysis/FFT,	ampling	
4	Sensors Definition applicat Sensors Signal proportion theorem Sensors Sensors window Constru Integrat FPGA), Develop	on of terms, cations, sensor chains; sensor chain: roces sing and signal processions, design an ction of technicion levels, interconnectivity/oment methodof teaching:	conditioning, defing: n, discrete-time per dimplementation ical sensor systematical sensors, interwork connect cology and applic	esign and process n of dig ms: n direct/ion ations	y, resolud realis ing of an ital filte	ation, ser ation of nalogue ers	nsitivity, li analogue signals, sp aspects of	es, categoris nearity) filters, ADU pectral anal	J/DAU, s ysis/FFT,	ampling	
4	Sensors Definition applicat Sensors Signal proportion theorem Sensors Sensors window Constru Integrat FPGA), Develop Forms of Lecture,	con of terms, cations, sensor chains; sensor chain: roces sing and signal processions, designal processions, design an ction of technicion levels, interconnectivity/perment methodological sem. lessons	conditioning, defing: n, discrete-time produced sensor systemetry systemetry in the connect cology and applications with computer expressions.	esign and process n of dig ms: n direct/ion ations	y, resolud realis ing of an ital filte	ation, ser ation of nalogue ers	nsitivity, li analogue signals, sp aspects of	es, categoris nearity) filters, ADU pectral anal	J/DAU, s ysis/FFT,	ampling	
	Sensors Definition applicat Sensors Signal p theorem Sensors Sensors window Constru Integrat FPGA), Develop Forms of Lecture, Participa	on of terms, cations, sensor chains; sensor chain: roces sing and signal processions, design an ction of technicion levels, interconnectivity/oment methodof teaching:	conditioning, defing: n, discrete-time produced sensor systemetry systemetry in the connect cology and applications with computer expressions.	esign and process n of dig ms: n direct/ion ations	y, resolud realis ing of an ital filte	ation, ser ation of nalogue ers	nsitivity, li analogue signals, sp aspects of	es, categoris nearity) filters, ADU pectral anal	J/DAU, s ysis/FFT,	ampling	
4	Sensors Definition applicat Sensors Signal proportion theorem Sensors Sensors window Constru Integrat FPGA), Develop Forms of Lecture,	en of terms, cations, sensor chains and chain: roces sing and chain: rection of technical chain ch	conditioning, defing: n, discrete-time produced sensor systemetry systemetry in the connect cology and applications with computer expressions.	esign and process: n of dig ms: ndirect/ion ations	drealis ing of an ital filte virtual s and 10 dus trial and 1069	ation, set ation of nalogue ers sensors, cal cour Engine Engine	nsitivity, li analogue signals, sp aspects of se hatronics. ering and lering Con	es, categoris nearity) filters, ADU nectral analy embeddeds	J/DAU, s ysis/FFT, systems (r neering nt), Electr nces, 1065	ampling mC, DS	

7	Prerequisite for the award of credit points:
	Module examination pass and course as sessment
8	Application of the module (in the following study programmes)
	Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng., Mechatronics B.Sc. and
	Industrial Engineering and Management B.Sc.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Joachim Waßmuth
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Inte	rnational N	/Ianagement/N	Marketing						IMM	
	tification	Workload:	Credits:	Stud	ly semes	ter:	Frequenc	y of the offer	Durat	ion:
1115		150 h	5	6th	sem.		Annual (Summe		1 semester	
1	Course:		Planned group sizes		Scop	Scope		Actual contact time / classroom teaching		dy
	Lecture		60 students		2	2 SCH		h	43	h
	Sem. less	sons	30 students		2	SCH	32	h	43	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
2	•	apply the spe and case stud critically refle recapitulated Ideally, they	fmarketing basic scial features and lies and independ ect on the specia he course conten will form learnin	tasks of lently soldently leature tindepo	of intern olve the es and to endently	ational r associa asks of it and dec	marketing ted tasks a nternation epen their	to selected p and present t nal marketing knowledge t	oractica he resul g. hrough	ts. self-study
3	•	•	ational Marketin	_		1 . 1		n t		
4	Forms of	Environment Risk analysis Planning mar Market entry Marketing ins	al analysis keting objective decisions struments in inte	s rnation	al marke	eting		iit		
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4 5	Forms of Lecture	Environment Risk analysis Planning mar Market entry Marketing insteaching: , sem. lessons	al analysis keting objectives decisions struments in inte with exercises, c	s rnation	al marke	eting		int		
	Forms of Lecture	Environment Risk analysis Planning mar Market entry Marketing in: Teaching: sem. lessons tion requirement	al analysis keting objectives decisions struments in inte with exercises, c	rnation ease stu	al marke dies/ ca	eting se studio	es		vledgeo	f English
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	Module examination pass
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng., Mechatronics B.Sc. and Industrial Engineering B.Sc.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. oec. Klaus Rüdiger
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Inve	estment and	d Financing							FIN		
Ident numl	ification	Workload:	Credits:	Study	semest	er:	Frequency	of the offer	r Duratio	on:	
1118					2nd, 4th or 6th sem.		Annual (Summer)		1 sem	1 semester	
1	Course:		Planned group sizes		Scope		Actual contact time / classroom teaching		Self-stud	dy	
	Lecture		60 students		3	SCH	45	h	67.5	h	
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h	
	Exercise		20 students		0	SCH	0	h	0	h	
	Practical	or seminar	15 students		0	SCH	0	h	0	h	
	Supervise	d self-study	60 students		0	SCH	0	h	0	h	
	regurum	g tne suitabili	ty of the respecti	ve form	s of fin	ancing.	ang costs	and make	justinec	i decision	
3	Contents	:		ve form	ns of fin	ancing.		апи паке	justinec	i decision	
3	Contents	: Basic concep Methods of s Methods of d	ts of investment a tatic investment c ynamic investme	and fina	ncing ion	ancing.		and make	justinec	decision	
3	Contents	: Basic concep Methods of s Methods of d Forms of exte	ts of investment a	and fina	ncing ion	ancing.		and make	justinec	i decisión	
3	Contents: Forms of Lecture,	: Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons	ts of investment a tatic investment o ynamic investme ernal financing mal financing	and fina	ncing ion	ancing.		and make	justinec	- decision	
	Contents: Forms of Lecture,	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requiremen	ts of investment a tatic investment of ynamic investme ernal financing mal financing	and fina calculat nt calcu	ncing ion ulation	ancing.					
4	Forms of Lecture, Participal Formal: Content:	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requiremen Kno or 10 assessment:	ts of investment a tatic investment of ynamic investment ernal financing mal financing	and fina alculat nt calcu	neing ion alation	odule G	eneral Bus	iness Adm	inistratio	n (1002	
5	Forms of Lecture, Participal Formal: Content: Forms of Written Prerequising Module	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requirement Kno or 10 assessment: examination, ite for the awar examination	tts of investment a tatic investment of ynamic investment ynamic investment ernal financing mal financing mal financing otts: wledge of the control 224)	and fina calculat nt calcu	ncing ion ulation	odule G	eneral Bus	iness Adm	inistratio	n(1002	
4 5 6 7	Forms of Lecture, Participal Formal: Content: Forms of Written Prerequisi Module Applicati	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requirement Kno or 10 assessment: examination, ite for the awar examination on of the modu	ats of investment attacking investment of ynamic investment or ynamic investment or ynamic investment affinancing mal financing mal financing mal financing or ynamic investment (action of ynamic investment) with the control of the	and fina ealculat nt calcu	ncing ion lation	odule G	eneral Bus examinati	iness Adm	inistratio examinati	n(1002 on	
4 5 7 8	Forms of Lecture, Participal Formal: Content: Forms of Written Prerequising Module Application Enginee	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requirement Kno or 10 assessment: examination, ite for the awar examination on of the moduring Compute ce of the grade	ts of investment a tatic investment of ynamic investment or ynamic investme ernal financing mal financing mal financing where the constant of	and fina ealculat nt calcu	ncing ion lation	odule G	eneral Bus examinati	iness Adm	inistratio examinati	n(1002 on	
5	Forms of Lecture, Participal Formal: Content: Forms of Written Prerequisi Module Applicati Enginee Important accordination Module Contents	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requirement Kno or 10 assessment: examination, ite for the awar examination on of the moduring Compute tee of the grade ag to BRPO Coordinator:	tts of investment a tatic investment of ynamic investment emal financing mal financing mal financing of tts: wledge of the conduction examination exam	and fina ealculat nt calcu	ncing ion lation	odule G	eneral Bus examinati	iness Adm	inistratio examinati	n(1002 on	
4 5 7 7 8	Forms of Lecture, Participal Formal: Content: Forms of Written Prerequisi Module Applicati Enginee Importan accordin Module C Prof. Dr.	Basic concep Methods of s Methods of d Forms of exte Forms of inte teaching: sem. lessons tion requirement Kno or 10 assessment: examination, ite for the awar examination on of the moduring Compute tee of the grade ag to BRPO Coordinator:	ts of investment a tatic investment of ynamic investme ernal financing mal financing mal financing where the constant of combination examples of the following er Sciences B.Enger Sciences B.Eng	and fina ealculat nt calcu	ncing ion lation	odule G	eneral Bus examinati	iness Adm	inistratio examinati	n(1002 on	

	Renewable Energies study programme: Elective module
12	Language:
	German

Coll	oquium									KOL	
Iden	tification	Workl	oad:	Credits:	Study	semest	er:	Frequenc	y of the offer	Duratio	on:
num		00.1		2	(41	741		agah samastar			
1290)	90 h		3	otn o	r 7th s	em.	each semester			
1	Course:	Course:		lanned group siz	zes	Scope			contact	Self-study	
	Lecture		6	0 students		0	SCH	0	h	90	h
	Sem. lesso	ons	3	0 students		0	SCH	0	h	0	h
	Exercise		2	0 students		0	SCH	0	h	0	h
	Practical	or semin	ar 1	5 students		0	SCH	0	h	0	h
	Supervise	d self-st	udy 6	0 students		0	SCH	0	h	0	h
3	Contents	es, as w	ellas its s	d foundations, ignificance fo	r practi	calapp	plication	is.			
	- Dis ₁	putation		rocedure in the	-		of the th	esis and tl	ne questions	thataros	e in the
4	Forms of	teaching	;	s							
	Oral exa	minatio	n for the l	bachelorthesis	S						
5	Participat	tion requ	irements:								
	Formal:		None								
	Content:			ent of the bach	elorthe	esis					
6	Forms of										
	Oral exa			114							
7	Prerequisi	ite for th	e award of	credit points:							
8	Applied Engineer	Mathe	matics Eng., Con	n the following s.B.Sc., Biotech nputer Engine es B.Eng. and	nology ering E	and B.Eng.,	Instrun Mecha	anical Eng	ineering B.I	Ēng., Me	
9	Importan accordin		_	he final grade:							
10	Module C										
10	N.N.	or ama									
11	Other info	ormation	1:								
	Literatur	e will b	e announ	ced at the begi	nn ing o	of the c	ourse.				
12	Language	:									
	German										

Cos	t and Perfo	rmance Acco	unting						KUL	
	ification	Workload:	Credits:	Stud	y semest	er:	Frequenc	y of the offer	r Duratio	on:
number: 1130		150 h	5	3rd	or 5th s	em.	Annual (Winter)	1 sem	ester
1	Course:		Planned group s	Planned group sizes		Scope		Actual contact time / classroom teaching		ły
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		2	SCH	30	h	45	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	systems	againsteach	ent and weigh up other. Throughth	hetarge		. •	fanalytic	⁰ 1 1 '	1 1/1 '	ulrina th
	decision	n-making s itua	stawareness. The	ey are al	ole to de	notion o	nd presen	al and netw ttheir own s	orked thi olutions 1	for select
3	Contents - Basics - Cost u - Unit co - Cost u - Cost a	: s of cost and prype accounting osting anit time accouncing counting systems.	stawareness. The ations. Derformance according gunting stems	ey are al	ed prof	motion of the control	nd presen	al and netwitheir own s	orked thi olutions t	for select
3	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi	: s of cost and p ype accounting init accounting osting init time accounce counting system	stawareness. The tions. performance according gunting	ey are al	ed profole to do	motion of evelop a	nd presen	al and netwitheir own s	orked thi olutions i	for select
	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture,	: s of cost and prype accounting osting unit time accounting counting on-oriented contents.	stawareness. The ations. Derformance according gunting stems ost accounting	ey are al	ted prof	motion of evelop a	nd presen	al and netwitheir own s	orked thi olutions i	for select
	Contents - Basics - Cost u - Cost u - Cost u - Cost a - Decisi Forms of Lecture, Participa	: s of cost and prype accounting osting anit time accounting counting system or oriented conteaching: s em. lessons tion requirement	stawareness. The stions. Derformance according gunting stems ost accounting stems	ey are al	ted profole to do	motion of evelop a	nd presen	al and netwitheir own s	orked thi olutions i	For select
4	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal:	: s of cost and prype accounting osting init time accounting counting system on oriented counting; sem. lessons tion requirement Non	stawareness. The ations. Derformance according granting stems ost accounting stems ost accounting stems.	ounting	ble to do	evelopa	nd presen	ttheir own s	olutions	for select
4 5	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content:	s of cost and p ype accounting osting init time accounce counting system lessons tion requirement Non The	stawareness. The stions. Derformance according gunting stems ost accounting stems	ounting	ble to do	evelopa	nd presen	ttheir own s	olutions	for select
4 5	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content:	: s of cost and p ype accounting init accounting init time accounting counting system-oriented c teaching: sem. lessons tion requirement Non The	performance according stems ost accounting emodule General	ounting Busine	ss Adm	inistrati	on (1002)	should have	e been co	mpleted
4 5 6	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content: Forms of Written	: s of cost and prype accounting system in taccounting system in the accounting system. It is sons to requirement. Non The assessment: examination,	stawareness. The ations. Derformance according granting stems ost accounting ats: e module General combination exa	Busine minatio	ss Adm	inistrati	on (1002)	should have	e been co	mpleted
5	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis	s of cost and prype accounting system in the accounting system in the accounting system. It is sometimed to the accounting system in the accounting system. It is sometimed to the accounting system. It is sometimed to the accounting system. It is sometimed to the account in the accounting system. It is sometimed to the account in the a	overformance according stems ost accounting stems ost accounting stems do foredit points:	Busine minatio	ss Adm	inistrati	on (1002)	should have	e been co	mpleted
4 5 7	Contents - Basics - Cost u - Cost u - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module	s of cost and prype accounting system or counting s	stawareness. The ations. Derformance according granting stems ost accounting stems ost accounting according accounting combination exaled of credit points: pass	ounting Busine	ss Adm	inistration mance	on (1002)	should have	e been co	mpleted
4 5 6	Contents - Basics - Cost u - Unit co - Cost u - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati	s of cost and prype accounting situation in the accounting system of the account in the accounting system of the account in the acc	stawareness. The ations. Derformance according granting stems ost accounting ats: emodule General combination exadof credit points: pass le (in the following stems)	Busine minatio	ss Adm n, perfo	inistrationmance	on (1002)	should have	e been co	mpleted
4 5 7 8 8	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati Enginee	s of cost and prype accounting init accounting sting init time accounting system lessons tion requirement Non The assessment: examination, ite for the awar examination on of the moduring Computer in the accounting computer in the accounting computer in the accounting in the accounting in the accounting in the account in the accounting in the account in the accounting in the account in the accounting in t	stawareness. The ations. Derformance according granting stems ost accounting stems of accounting acts: Emodule General combination exard of credit points: pass le (in the following er Sciences B.Enger Science	Busine minatio	ss Adm n, perfo	inistrationmance	on (1002)	should have	e been co	mpleted
4 5 7	Contents - Basics - Cost u - Unit co - Cost u - Cost a - Decisi Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati Enginee Importan	s of cost and prype accounting unit time accounting unit time accounting system on-oriented criteaching: sem. lessons tion requirement Non The assessment: examination, ite for the awar examination of the modulating Computer of the grade	stawareness. The ations. Derformance according granting stems ost accounting ats: emodule General combination exadof credit points: pass le (in the following stems)	Busine minatio	ss Adm n, perfo	inistrationmance	on (1002)	should have	e been co	mpleted
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11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Cryp	otography									KRY		
Ident	ification	Work	load:	Credits:	Study	y semes	ter:	Frequenc	y of the offer	Durati	on:	
numb												
1133		240 h		8	5th	or 6th s	em.			1 sen	ester	
1	Course:		P	l lanned group s	sizes	Scon	Scope		contact	Self-study		
1			1	Trainied group sizes		Scope		Actual contact time / classroom		Self Sta	۵,	
								teachin				
	Lecture		6	0 students		0	SCH	0	h	0	h	
	Sem. less	ons	3	0 students		4	SCH	60	h	180	h	
	Exercise		2	0 students		0	SCH	0	h	0	h	
	Practical	or semin		5 students		0	SCH	0	h	0	h	
	Tractical	or semin	ui -	o bradelito			5011			O		
	Supervise	d self-st	udy 6	0 students		0	SCH	0	h	0	h	
<u> </u>	T ·	4 -	-/									
2			es/compete	ences: asic principle	c in nar	ticular	the nubl	ic key pro	cedures of	erzatoa	ranhy They	
	are able	to unde	rs tand an	dimplement	practica	ıl algori	thms fro	mnumbe	r theory	nypwgi	apily. They	
3	Contents	:										
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	•			stems for end	eryption							
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				pplications o		_		ations				
				ash functions		ic quau	ianc equ	iauons				
			signatur		,							
4	Forms of											
	Sem. les	sons										
5	Participa	tion requ	irements:									
	Formal:											
	Content:		Module									
			1003 A									
6	Forms of	assessma		near Algebra	ι,							
				xamination	combin	ation e	xaminat	ion. com	rse assessm	ent. ne	rformance	
	_	Term paper, written examination, combination examination, course assessment, performance examination, project work, oral examination or examination accompanying the course										
			-					1 .				
7	_			credit points:								
			ation pas									
8				n the followin						D.F.		
				Sc. and Engin		comput	er Scier	cesComp	uter Science	s B.Eng	•	
9	accordir			the final grade:								
10	Module C											
10				Bachmann								
11	Other inf	-										
	Literatu	e will b	e announ	ced at the be	ginning	ofthe	course.					
				mmarised in				es the lect	ure.			
12	Language	:										
	German											

	er Electror	nics							LE	
	ification	Workload:	Credits:	Study	y semest	er:	Frequenc	y of the offer	Durat	ion:
numb 3123		150 h	5	5th s	sem.		Annual (Winter		1 ser	nester
1	Course:		Planned group s	izes	Scope	;		contact	Self-stu	ıdy
	Lecture		60 students		2	SCH	0	h	56	h
	Sem. less	ons	30 students		0	SCH	0	h	0	h
	Exercise		20 students		1	SCH	8	h	46	h
	Practical	or seminar	15 students		1	SCH	16	h	0	h
	Supervise	d self-study	60 students		1.5	SCH	24	h	0	h
3		ing, controllii	in particular, to				icuns of	Semiconduc	tor con	verters i
	Introduce Thermal Switchin Convert Single-p Multi-pu Boost/b H-Bridg Three-p	ng of ohmic-iction to powe	ofpowersemicon r		S					
	Switchir Electron Electron	ng power sup tic switches tic actuators	n automation oplies apatibility (EMC)							
4	Switchir Electron Electron Electron	ng power sup tic switches tic actuators magnetic con	pplies upatibility (EMC)							
4	Switchir Electron Electron Forms of Learning	ng power sup tic switches tic actuators magnetic con teaching: g materials for	oplies apatibility (EMC) or self-study, class	sroome	vents in	the for	mof exerc	cises and pra	acticals	
4	Switchir Electron Electron Forms of Learning	ng power sup tic switches tic actuators magnetic con	oplies Apatibility (EMC) Or self-study, class	sroom e	vents in	the for	mof exerc	vises and pra	neticals	

6	Forms of assessment:
	Term paper, written examination, project work or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass and course as sessment
8	Application of the module (in the following study programmes)
	Mechatronics/Automation (work-integrated) B.Eng. and Industrial Engineering and Management
	(work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Michael Leuer
11	Other information:
	Supplementary literature will be announced at the beginning of the course.
12	Language:
	German

Mark	keting and	l Technical Sal	les						MUV	
	ification	Workload:	Credits:	Study	semest	ter:	Frequency	of the offer	Duratio	n:
numb 3355		150 h	5	6th s	sem.		Annual (Summer	r)	1 seme	ester
1	Course:		Planned group si	izes	Scop	e	Actual of time / ci	lassroom	Self-stud	у
	Lecture		60 students		2	SCH	0	h	56	h
	Sem. less	ons	30 students		0	SCH	0	h	0	h
	Exercise		20 students		2	SCH	16	h	62	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h
3	On succ	Explain the sand business Compare the Identify the sthe distribution Describe the evaluate there Classify currinternational Interpret the sustainable compared the sustainable compared to the sustain	tion of the modu specifics of mark to-consumer (B2 different method success factors are on channel decisi- tools of the man with a focus on trent market tre- isation and sustain essential concep- onsumer behavior arketing mix desi- out structures an utions and presen- talisation and su-	eting a a C) mar als of mand objetion; rketing a sustair ands againability ots of sour; gn optid concent there	nd the oketing; rket resectives of mix (chability gainst to aspect ustainal ons to septs in t sults.	search for ftechnical spects; the backs; ble marks selected on the sales trends in	or analysin calsales a duct, Price kground ceting and case studio of technic	ng B2C and nd review the, Promotion of increased basic modes; cal products	B2B mark the determ in and Pl ing digit els for ex	kets; ninants of ace) and alisation, splaining
4	• Forms of	 Cus Buy Mar Proc Stra Sale Basi 	tomer satisfaction ing behaviour in ket research and duct policy in the tegies of price and s forms and charic tools/metrics on and offline co	n and lo B2C an segmen individud cond and cond of sales	oyalty and B2B ontation dual productions positions controll	s markets markets oduct life olicy	ing target	S		
7		_	ssons, exercises,	casesti	udies					
5	Participa Formal:	tion requiremen Non	ts: e							
6	Content: Forms of	Non-								
•			work or oral exai	n						
7	Prerequis	ite for the awar	d of credit points:							
0	Module	examination	pass							
8	Digital 7		le (in the following (work-integrated)				Engineeri	ing and Mai	nagement	(work-
9			for the final grade:							

10	Module Coordinator:
	Prof. Dr. Adam-Alexander Manowicz
11	Other information:
	Literature will be announced before the start of the course.
12	Language:
	German

Mac	hine Lear	ning and Data	Mining						MLDN	M
Ident numb	ification	Workload:	Credits:	Study	semest	er:	Frequency	of the offer	Duratio	n:
1314		150 h	5	4th s	em.		Annual (Summer	·)	1 sem	ester
1	Course:	1	Planned group s	izes	Scope	e	Actual of time / contact teaching	lassroom	Self-stud	ly
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	sons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	•	to their practi They master practical appl They can find quality. They classify support vecto They useartit They have a assess which	lain the history a cal applications. the use of com- lication. d clusters of rela d data using class or machines) and ficial neural network comprehensive of methods should	ted data s sification from the vorks to l	points on met e field c earn m	in multi hods fro of artifici appings chine lea	i-dimension statist al neurali between a	feature seld onal data se ical learnin networks. orbitrary inp	ection mosts and as g theory	ethods is sess the (such a
3	•	Basics of des Data visualisa Correlation an Basics of mac Pre-processin Unsupervised Supervised le	criptive statistics ation halysis and regrechine learning and gof data (e.g. diarning I: Classificarning II: Learning II: Learning II: Learning III: Learning IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	ession addatam mension ustering	reduc () e.g. via	support			h artifici	al neur
4		networks) fteaching:								

	Formal:	
	Content:	 Content of all mathematics modules in the bachelor's degree study programme in Engineering Computer Sciences
		 Generaladvanced programming knowledge (from the Computer Science 1 and Computer Science 2 modules)
		 Advanced programming knowledge in Python (from the Algorithms and Data Structures module)
		Modules: 1001 Algorithms and Data Structures;
		1105 Computer Science 1; 1109 Computer science 2;
		1147 Mathematics A; 1153 Mathematics B;
		1158 Mathematics C
6	Forms of assessme	
		n or examination accompanying the course
7	•	ne award of credit points:
	Module examin	
8		e module (in the following study programmes)
		mputer Sciences B.Eng.
9	-	e grade for the final grade:
	according to BF	
10	Module Coordina	tor:
		VolframSchenck
11	Other information	···
	Literature will b	e announced in the course.
12	Language:	
	German	

Mat	hematics A	A							MA A	A
	tification	Workload:	Credits:	Study	semes	ter:	Frequency	of the offer	r Durati	ion:
num ¹		300 h	10	1st s	em.		Annual (Winter)		1 sem	nester
1	Course:		Planned group s	sizes	Scop	e	Actual time / c	lassroom	Self-stu	idy
	Lecture		60 students		4	SCH	60	h	90	h
	Sem. less	ons	30 students		4	SCH	60	h	90	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	Students confider Students of confidence Simple	s understand t nce. In doing s s understand t	ntary functions a the concept of lines, they select such they select such they select such they select such they select the select they select they select the select they select the select the select they select the sel	mit and itable prosofderiv suitable	l contii rocedur vativea	nuity and es with j and integ	d calculat ustification ral and ca	e both with on and apply culate both	a high y themed with a h	orrectly.
2	the reas knowled and dev	dently conversionableness of the definition of t	f the solution is to related tasks. of their own dev	s and so s check They a	olved by ed. Stu ppropr	ons fron y the stu idents re iately as	dents; log ecognise of sess their	and electrical conclusions	sions are s and tra	drawn and ansfer thei
3	Contents - Sets - Tra - Elen and - Lim - Diff - Nev - Hig - Inte	dently conversionableness of the and skills elop a picture s, union and a ns forming an mentary funct their propert value of seferential calculus wton's method ther derivative egral calculus egration method plications of differentials:	verage, numbers ds olving equations (power, rooties, inverse funct quences, series a alus, slope, derivities, extreme value, area and integrit	s and so s check. They a relopme sets ons and it, expon tions and func ative, ta	inequal ential a entions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng	sions are s and tra ths and	e drawn and ansfer thei weaknesses
4	Contents - Sets - Tra - Elen and - Lim - Diff - Nev - Hig - Inte	dently conversionableness of the and skills elop a picture s, union and a nsforming an mentary funct their propert it value of seferential calculus egral calculus egral calculus egration methoplications of decembers of the derivative egral calculus egration sof decembers of dec	verage, numbers d solving equations (power, roo ies, inverse funct quences, series a clus, slope, derivities, extreme value, area and integrods lifferential and in	s and so s check. They a relopme sets ons and it, expon tions and func ative, ta	inequal ential a entions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng	sions are s and tra ths and	e drawn and ansfer thei weaknesses
	Contents - Set: - Tra - Eler and - Lim - Diff - Nev - Hig - Inte inte - App Forms of Lecture, Participa	dently conversionableness of the and skills elop a picture s, union and a ns forming an mentary funct their propert it value of seferential calculuston's method ther derivative egration method plications of detaching: s, sem. lessons tion requirement	verage, numbers d solving equations (power, roo ies, inverse funct quences, series a clus, slope, derivides, extreme value, area and integrated in the control of the contr	s and so s check. They a relopme sets ons and it, expon tions and func ative, ta	inequal ential a entions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng	sions are s and tra ths and	e drawn and ansfer thei weaknesses functions)
4	Contents - Set: - Tra - Eler and - Lim - Diff - Nev - Hig - Inte inte - App Forms of Lecture, Participa Formal:	clently conversionableness of the and skills elop a picture is s, union and a nsforming an mentary funct their propert it value of seferential calculus egral calculus egral calculus egration method plications of differential calculus egration method is sem. lessons tion requirement is Non	verage, numbers d solving equations (power, roo ies, inverse funct quences, series a clus, slope, derivities, extreme value, area and integrods lifferential and integrods	s and so s check. They a relopme sets ons and it, expon tions and func ative, ta	inequal ential a entions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng	sions are s and tra ths and	e drawn and ansfer thei weaknesses functions)
4 5	Contents - Sets - Tra - Eler and - Lim - Diff - Nev - Hig - Inte inte - App Forms of Lecture, Participa Formal: Contents	clearly conversionableness of the applications of deferences of the clear th	verage, numbers d solving equations (power, roo ies, inverse funct quences, series a clus, slope, derivities, extreme value, area and integrods lifferential and integrods	s and so s check. They a relopme sets ons and it, expon tions and func ative, ta	inequal ential a entions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng	sions are s and tra ths and	e drawn and ansfer thei weaknesses
4	Contents - Sets - Tra - Eler and - Lim - Diff - Nev - Hig - Inte inte - App Forms of Lecture, Participa Formal: Content:	clearly conversionableness of the and skills elop a picture selection and a se	verage, numbers ds olving equations (power, rooties, inverse funct quences, series a alus, slope, derivities, extreme value, area and integrods differential and integrods	s and so so check. They a relopme: sets ons and it, expontions and func ative, ta e tasks ral, main	inequal aential artions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng tions, trigor y s al calculus	sions are s and tra ths and	e drawn and ansfer thei weaknesses
4 5	Contents - Sets - Tra - Elen and - Lim - Diff - Nev - Hig - Inte inte - App Forms of Lecture, Participa Formal: Content: Forms of Written	clently conversionableness of the applications of descriptions	verage, numbers d solving equations (power, roo ies, inverse funct quences, series a clus, slope, derivities, extreme value, area and integrods lifferential and integrods	s and so so check. They a relopme: sets ons and it, expontions and func ative, ta e tasks ral, main	inequal aential artions, a ngent, o	ons from y the stu idents re iately as eir studie ities and logar s well as different	dents; log ecognise of sess their es.	and electrical conclusionnections own streng tions, trigor y s al calculus	sions are s and tra ths and	drawn and ansfer the weaknesse functions)

8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. nat. Antje Ohlhoff
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Mat	hematics E	3							MAE	3
Ident	tification	Workload:	Credits:	Study	semest	ter:	Frequency	of the offer	Durati	on:
1153		150 h	5	2nd	sem.		Annual (Summe	r)	1 sem	ester
1	Course:	•	Planned group s	izes	Scop	e	actual c time / c teachin	lassroom	Self-stud	dy
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		2	SCH	30	h	45	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-Study	60 students		0	SCH	0	h	0	h
	They co Students represer correctly Mathem indepen drawn a analytic knowled	onfidently apply sunderstand that at ion. Comply. natical proble dently converted the meaning ally and logical ge and skills	ion on the basis of ly straight line and he concept of concept of concept of concept of concept of the straight lines of the cally to a large to related tasks. of their own dev	d plane mplexnu e calcul applica e and so e solutio extent, They as	equations attions attions to lived by on is correctly seems that	ons. and dea nd appli from pl y the stu hecked. nise con eir own	nysics an idents; log Students nnections strengths	e AC circu d electrical gical conclu are able to and creativ	engine sions are think a vely tran	calculated cering are correctly abstractly asfer their
3	- Line - Ma	ear algebra: V ear independe trix, scalar and	Vectors, matrices ence, rank of a ma d vector product, olution of linears	trix angle a	nd area	a calcula		culate them		
4	- Stra - Cor - Eul - Exp - Intr	night line and mplex number erian relation conentiation a coduction to co	plane equations, rs: arithmetic, trig nd radixing in the omplexalternatir	gonome e compl	eneous tric and	coordina l expone aplex fur	ntial form			
4	- Stra - Cor - Eule - Exp - Intr	night line and mplex number erian relation conentiation a coduction to continue to the coduction of the codu	rs: arithmetic, trig	gonome e compl	eneous tric and	coordina l expone aplex fur	ntial form			
4	- Stra - Cor - Eule - Exp - Intr	night line and mplex number erian relation conentiation a roduction to continue teaching:	rs: arithmetic, trig nd radixing in the omplexalternatir	gonome e compl	eneous tric and	coordina l expone aplex fur	ntial form			
	- Stra - Cor - Eule - Exp - Intr	night line and mplex number erian relation conentiation a coduction to continue to the coduction of the codu	rs: arithmetic, trig nd radixing in the omplexalternatir	gonome e compl	eneous tric and	coordina l expone aplex fur	ntial form			

	Written examination or oral examination; each with preliminary examination
7	Prerequisite for the award of credit points:
	Module examination pass with preliminary examination
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. nat. Antje Ohlhoff
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

	hematics (C							MAC	•
	tification ber:	Workload:	Credits:	Stud	y semest	ter:	Frequency	y of the offer	Duratio	on:
1158		150 h	5	2nd	sem.		Annual (Summe	r)	1 sem	ester
	Course:	1	Planned group s	sizes	Scop	e	time / c	contact	Self-stud	ły
	Lecture		60 students		2	SCH	teachin 30	h h	45	l h
	Sem. less	cone	30 students		2	SCH	30	h	45	h
	Sem. ress	50113	50500000			5011	30			
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	The stu They co correctly Taylor's Student doing so Mathen converte	onfidently calc y. series are safe is are largely co, they selects natical problemed into formu	and the basic conculate partial derived and confident in dealirs uitable procedures and applications and solved by	ivatives lapplied ng with res fortl ons from	, tanger l. ordinar ne solut n physi	y differe ion and a	es and to ential equa apply ther electrical e	tal different tions and th ncorrectly.	ial and ap	pply the cations.
·	checked transfer	1. Students car their knowled riately and dev	ogical conclusion think abstractly, dge and skills to relop a picture of	ns are co , analyti related	orrectly cally an tasks.	drawn a id logica Γhey as s	nd the really, recogn	asonablenes niseconnectown strengt	ss of the s	solution creative
	Contents - T - D to - A - A Forms of	d. Students care their knowled their knowled in their knowled in their knowled in their knowledge and developed in their knowledge in the knowledge	culus for functional and applications, hods for the solutorion for functional and applications, and and applications, and a fordinary differential equations, and a fordinary differential equations.	ons of season dynamic tion of of season of season dynamic tion of of season dynamic tion of of season dynamic tion of of season dynamic dynami	orrectly cally an tasks. The world was deveral value ic system or continuity and the world was a system of the world was a	drawn a ld logica They ass elopment ariables, ms	nd the rea illy, recogn sess their of t in their s	nsonablenes nise connect own strengt tudies.	ss of the stions and hs and w	solution creative eakness
	Contents - T - D to - A Forms of Lecture	d. Students care their knowled their knowled in their knowled in their knowled in their knowled in their knowledge in the knowledge in the knowledge in the knowledge in the knowledge in their knowledge in the knowledge	culus for functional and applications, hods for the solution for differential equations, and a fordinary differential equations, hods for the solution for differential equations, and applications, hods for the solution for differential equations, and a fordinary differential equations.	ons of season dynamic tion of of season of season dynamic tion of of season dynamic tion of of season dynamic tion of of season dynamic dynami	orrectly cally an tasks. The world was deveral value ic system or continuity and the world was a system of the world was a	drawn a ld logica They ass elopment ariables, ms	nd the rea illy, recogn sess their of t in their s	nsonablenes nise connect own strengt tudies.	ss of the stions and hs and w	solution creative eakness
	Contents - T - D to - A Forms of Lecture	d. Students care their knowled their knowled in their knowled in their knowled in their knowledge and developed in their knowledge in the knowledge	culus for functional and applications, hods for the solution for differential equations, hods for the solution for dinary differential.	ons of season dynamic tion of of season of season dynamic tion of of season dynamic tion of of season dynamic	orrectly cally an tasks. The world was deverally an ic system or continuity of the c	drawn a ld logica They ass elopment ariables, ms	nd the rea illy, recogn sess their of t in their s	nsonablenes nise connect own strengt tudies.	ss of the stions and hs and w	so lution creative eakness
	Contents - T - D to - A Forms of Lecture.	a. Students care their knowled their knowled in their knowledge in alytical metal pplications of teaching: "", sem. lessons in their knowledge in the knowledge in	culus for functional and applications the solution of the solu	ons of season dynamic tion of of season of season dynamic tion of of season dynamic tion of of season dynamic	orrectly cally an tasks. The world was deverally an ic system or continuity of the c	drawn a ld logica They ass elopment ariables, ms	nd the rea illy, recogn sess their of t in their s	nsonablenes nise connect own strengt tudies.	ss of the stions and hs and w	solution creative eakness
	Contents - T - D to - A - Forms of Lecture, Participal Formal: Contents:	a. Students care their knowled their knowled in their knowledge in the knowledge in th	culus for functional and applications the solution of the solu	ons of season dynamic tion of of season of season dynamic tion of of season dynamic tion of of season dynamic	orrectly cally an tasks. The world was deverally an ic system or continuity of the c	drawn a ld logica They ass elopment ariables, ms	nd the rea illy, recogn sess their of t in their s	nsonablenes nise connect own strengt tudies.	ss of the stions and hs and w	so lution creative eakness
	Contents - T - D to - A - Forms of Lecture. Participal Formal: Content:	a. Students care their knowled	culus for functional and applications applications applications applications applications.	ons of sense dynamiction of dential eq	everal valic syste	drawn a dologica They asselopment	partial de	rivatives, ta	ss of the stions and hs and w	so lution creative eakness
	Contents - T - D to - A - Forms of Lecture. Participa Formal: Content: Forms of Written	a. Students care their knowled their knowled their knowled their knowled their knowled their knowledge and	culus for functional and applications, hods for the solution for dinary differents:	ons of season; eac	everal valic syste	drawn a dologica They asselopment	partial de	rivatives, ta	ss of the stions and hs and w	so lution creative eakness
	Contents - T - D to - A Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis	at their knowled their knowled their knowled their knowled their knowled their knowled their knowledge their k	culus for function al and application application and application al and application al and application al and application and application and fordinary differential equations, hods for the solution of the	ons of season; eac	everal valic system or diversity and tasks. The system of	drawn and logica They ass Plopment ariables, ms y different orelimina	partial de	rivatives, ta	ss of the stions and hs and w	solution creative eakness
	Contents - T - D to - A - Forms of Lecture. Participa Formal: Content: Forms of Written Prerequis Module	a. Students care their knowled their knowled their knowled their knowled their knowled their knowledge and	culus for function al and application and applications, hods for the solution for dinary differents: The correct examination and of credit points: The correct examination and the	ons of season; eac	everal valic system or distributions. The with properties are arrived to the with properties of the with properties are arrived to the with properties of the wi	drawn and logica They asselopment ariables, ms y different	partial de	rivatives, ta	ss of the stions and hs and w	so lution creative eakness
	Contents - T - D to - A - Forms of Lecture: Participa Formal: Content: Forms of Written Prerequis Module Applicati	a. Students care their knowled their knowled their knowled their knowled their knowled their knowledge and	culus for function al and application and application al and application al and application al and application and applications, thousands for the solution for the solution and applications, and applications are the solution and applications are the solution and applications. The solution are	ons of season; eac	everal valic system or distributions. The with properties are arrived to the with properties of the with properties are arrived to the with properties of the wi	drawn and logica They asselopment ariables, ms y different	partial de	rivatives, ta	ss of the stions and hs and w	so lution creative eakness
	Contents - T - D to - A - Forms of Lecture Participa Formal: Content: Forms of Written Prerequis Module Applicati Enginee	a. Students care their knowled their knowled their knowled their knowled their knowled their knowledge and developed and differential callotal callotal differential callotal di	culus for function al and application and applications, hods for the solution for dinary differents: The correct examination and of credit points: The correct examination and the	ons of season; eacon; e	everal valic system or distributions. The with properties are arrived to the with properties of the with properties are arrived to the with properties of the wi	drawn and logica They asselopment ariables, ms y different	partial de	rivatives, ta	ss of the stions and hs and w	so lution creative eakness

10	Module Coordinator:
	Prof. Dr. rer. nat. Jörg Horst
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

	ology								MT		
Identi numbe	fication er:	Workload:	Credits:	Stud	y semest	er:	Frequency	y of the offer	Duratio	Duration:	
1169		150 h	5	3rd	or 5th sem.		Annual (Winter))	1 sem	ester	
1	Course:		Planned group s	izes	Scope	e		contact lassroom	Self-stud	ly	
ľ	Lecture		60 students		2	SCH	30	h h	45	h	
ļ	Sem. lessons		30 students		1	SCH	15	h	22.5	h	
-	Exercise		20 students		0	SCH	0	h	0	h	
ļ	Practical	or seminar	15 students		1	SCH	15	h	22.5	h	
	Supervise	d self-study	60 students		0	SCH	0	h	0	h	
	After co a measu	mpletingthe	e module, they will uit, perform the mea	truments work in principle and can handle mea Il be able to select a device suitable for a measu easurements, present the measurement results in						ask, desi	
3	DigitaError oMeas	s, basic circuland electro l and electro calculation a curement of e	uits omechanical measu and causes of measulectrical quantities namic behaviour o	sureme	nt devia	tions					
4	Forms of	teaching:									
			ıs and practical cot	ırse							
5	Participal Formal:	107	ents: modules: 75 Electrical Engir 75 Electrical Engir								
	Content:										
6		assessment: examinatior	n; each with prelim	inary e	xaminat	ion					
7	Prerequis	ite for the aw	ard of credit points:								
8	Module examination pass with preliminary examination Application of the module (in the following study programmes) Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng. and Renewal B.Eng.						able Ene	rgies			
9	Importan	_	le for the final grade:								
	according to BRPO Module Coordinator: Prof. Dr. rer. nat. Thomas Westerwalber										
10	Prof. Dr.		omas Westerwalb	esloh							

Micı	rosystems	Technology							MST	
	ification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duration:	
numb 1174		150 h	5	6th	sem.		Annual (Summer)		1 sem	nester
1	Course:		Planned group s	sizes	Scop	e	Actual contact time / classroom		Self-study	
	Lecture		60 students	2	SCH	teachin 30	h	45	h	
	Sem. less	ons	30 students		0	SCH	0	h	0	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		2	SCH	30	h	45	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
	 Knowledge of the materials and technologies of microelectronics and microsyster Knowledge of the main fields of application in sensor and actuator technology Capabilities for systematising data sheet information of micro-electromechanicals Knowledge of system integration of MEMS Knowledge and skills in the simulation techniques Practical competence in the realisation of sensor systems with MEMS 						system	s (MEMS)		
3	2. Sens - Accele - Rotati - Pressu 3. Syst 4. Actu	ors eration senso on rate senso tre sensors em integratio tators	n	osyster	ns engir	neering a	nd micro	electronics		
4	5. Simu Forms of	lation of ME	UMS							
•		practicals								
5		tion requiremen	nts:							
	Formal:	Non	ne							
	Content:	Non	ne							
6	Written examina	tion performa	, combination exa	minatio	on or ora	alexamir	nation; ea	ch with prel	iminary	
7	Prerequis	ite for the awa	rd of credit points: pass with prelimi	nary ex	aminati	on				
8	Applicati	on of the mod	ule (in the following er Sciences B.Eng	g study p						
9	Importan		for the final grade:							
10		Coordinator:								
-		Ing. Dirk Zi	elke							
	Other inf									
11	Literature will be announced at the beginning of the course. Language:									

Net	works and	Bus Systems							NBS	
	tification	Workload:	Credits:	Stud	ly semes	ter:	Frequenc	y of the offer	Duration:	
num 118	ber: 0	150 h	5	5th	sem.		Annual (Winter)		1 semester	
1	Course:		Planned group s	sizes	Scop	Scope		contact classroom	Self-stu	dy
	Lecture		60 students		2	SCH	teachin 30	h	45	h
	Sem. less	ons	30 students		2	SCH	30	h	45	h
	Examples		20 students		0	SCH	0	h	0	h
	Exercise	orcaminar	15 students		0	SCH	0	h h	0	h
	Practical	Practical or seminar 15 stud			0	SCII	0	11	U	111
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	•	Network topo Serial and par Transmission Real-time cap Classic fieldb Ethernet and	rallel bus system media, data bac	s kup and ecially (s, Ethe	d coding CANope rnet-bas	g, bus ac en, PROl ed fieldt	FIBUS and	d LON		
<u> </u>	Lectures	teaching: s, exercises, p								
	Formal:	Non								
5	Content:									
Ī	Content.	Non								
	Forms of	assessment:	e							
,	Forms of Term pa	assessment:	e xamination, com		n exami	nation o	r oral exai	nination		
·	Forms of Term pa Prerequis	assessment: per, written e	e xamination, com d of credit points:		n exami	nation o	r oral exa	nination		
,	Forms of Term pa Prerequis Module	assessment: per, written e ite for the awar examination	e xamination, com d of credit points: pass				roralexai	nination		
,	Forms of Term pa Prerequis Module Applicati	assessment: per, written edite for the awar examination on of the modu	e xamination, com d of credit points: pass le (in the followin	g study j	programi	nes)				
· ·	Forms of Term pa Prerequis Module Applicati Electrica	assessment: per, written e ite for the awar examination on of the modu al Engineering	e xamination, com d of credit points: pass	g study _I	programi	nes)				
3	Forms of Term pa Prerequis Module Applicati Electrica Importan accordin	assessment: per, written e ite for the awar examination on of the modu al Engineering ice of the grade igto BRPO on	e xamination, com d of credit points: pass le (in the following g B.Eng. and Eng	g study _I gineerir	orogrami 1g Comp	nes) outer Sci				
77	Forms of Term pa Prerequis Module Applicati Electrica Importan accordin Module C	assessment: per, written e ite for the awar examination p on of the modu al Engineering ice of the grade ing to BRPO on Coordinator:	examination, comed of credit points: pass le (in the following B.Eng. and Eng for the final grade: SPO if ungrade	g study _I gineerir	orogrami 1g Comp	nes) outer Sci				
3	Forms of Term pa Prerequis Module Applicati Electrica Importan accordir Module C Prof. Dr.	assessment: per, written e ite for the awar examination on of the modu al Engineering ice of the grade igto BRPO on	examination, comed of credit points: pass le (in the following B.Eng. and Eng for the final grade: SPO if ungrade	g study _I gineerir	orogrami 1g Comp	nes) outer Sci				
0	Forms of Term pa Prerequis Module Applicati Electrica Importan accordin Module O Prof. Dr. Other inf Literatur	assessment: per, written e ite for the awar examination p on of the modu al Engineering ace of the grade ng to BRPO or Coordinator: -Ing. Andrea ormation: re will be ann	examination, comed of credit points: pass le (in the following B.Eng. and Eng for the final grade: SPO if ungrade	g study _I gineerir	orogrami 1g Comp ive subj	nes) outer Sci				
3	Forms of Term pa Prerequis Module Applicati Electrica Importan accordin Module O Prof. Dr. Other inf	assessment: per, written e ite for the awar examination p on of the modu al Engineering ice of the grade ing to BRPO or Coordinator:Ing. Andrea formation: re will be annoted.	examination, comed of credit points: pass le (in the following g B.Eng. and Eng for the final grade: SPO if ungrade	g study _I gineerir	orogrami 1g Comp ive subj	nes) outer Sci				

Course: Planned group sizes Scope Actual contact time / classroom teaching Lecture 60 students 2 SCH 30 h 45 h Sem. lessons 30 students 1 SCH 15 h 22.5 h Exercise 20 students 0 SCH 0 h 0 h Practical or seminar 15 students 1 SCH 15 h 22.5 h	Net	work Tech	nology							NW		
Course:			Workload:	Credits:	Study	y semes	ter:	Frequenc	y of the offer	r Duratio	Duration: 1 semester	
Lecture 60 students 2 SCH 30 h 45 h 5 Scm. lessons 30 students 1 SCH 15 h 22.5 h 5 Scm. lessons 30 students 1 SCH 15 h 22.5 h 6 Scm. lessons 30 students 1 SCH 15 h 22.5 h 6 Scm. lessons 15 students 15 students 1 SCH 15 h 22.5 h 10 Scm. lessons 15 students 15 students 1 SCH 15 h 22.5 h 10 Scm. lessons 15 students 10 SCH 0 h 0 h 0 h 10 h 10 l 10 l 10 l 10 l 10			150 h	5	3rd	or 5th s	em.)	1 sem		
Lecture		Course:		Planned group s	Planned group sizes		Scope		lassroom	Self-stud	dy	
Exercise		Lecture		60 students		2	SCH			45	h	
Practical or seminar 15 students 1 SCH 15 h 22.5 h Supervised self-study 60 students 0 SCH 0 h 0 h 0 h Learning outcomes/competences: - Students explain the basics of setting up local area networks (LAN). - Students have a basic knowledge of the protocols used. They plan and simulate simple network set themup in the laboratory with a partner, configure the network devices used (router, sv PC) and discuss the results of their work. - The students assign the processes in an IP network to the layers of the OSI or the TCP/IP m They can detect and eliminate configuration errors in a LAN. - Students are familiar with the role of a switch and configure virtual LANs (VLAN). - The students are possibilities to protect a LAN from non-authorised attacks (e.g. hackers). - Media for data transmission, - Local networks and their characteristics, - Subnet formation also with variable subnet lengths (VLSM), - Protocols of data transmission in networks (network and transport layer), - Function of important network coupling devices (especially router, switch), - Configuration of active components for setting up networks, - Application level services and protocols, - Simulation and practical construction of computer networks. - Forms of teaching: Lecture, sem. lessons, project and group work within the framework of the internship - Participation requirements: - Formal: None Content: None - Forms of assessment: - Written examination, combination examination or oral examination; each with preliminary examination performance - Prerequisite for the award of credit points:		Sem. less	ons	30 students		1	1 SCH	15	h	22.5	h	
Practical or seminar 15 students 1 SCH 15 h 22.5 h Supervised self-study 60 students 0 SCH 0 h 0 h 0 h Learning outcomes/competences: - Students explain the basics of setting up local area networks (LAN). - Students have a basic knowledge of the protocols used. They plan and simulate simple network set themup in the laboratory with a partner, configure the network devices used (router, sv PC) and discuss the results of their work. - The students assign the processes in an IP network to the layers of the OSI or the TCP/IP m They can detect and eliminate configuration errors in a LAN. - Students are familiar with the role of a switch and configure virtual LANs (VLAN). - The students are possibilities to protect a LAN from non-authorised attacks (e.g. hackers). - Media for data transmission, - Local networks and their characteristics, - Subnet formation also with variable subnet lengths (VLSM), - Protocols of data transmission in networks (network and transport layer), - Function of important network coupling devices (especially router, switch), - Configuration of active components for setting up networks, - Application level services and protocols, - Simulation and practical construction of computer networks. - Forms of teaching: Lecture, sem. lessons, project and group work within the framework of the internship - Participation requirements: - Formal: None Content: None - Forms of assessment: - Written examination, combination examination or oral examination; each with preliminary examination performance - Prerequisite for the award of credit points:		Exercise		20 students		0	SCH	0	h	0	h	
Learning outcomes/competences: - Students explain the basics of setting up local area networks (LAN). - Students have a basic knowledge of the protocols used. They plan and simulate simple netw set themup in the laboratory with a partner, configure the network devices used (router, sw PC) and discuss the results of their work. - The students assign the processes in an IP network to the layers of the OSI or the TCP/IP means the processes in an IP network to the layers of the OSI or the TCP/IP means are familiar with the role of a switch and configure virtual LANs (VLAN). - Students are familiar with the role of a switch and configure virtual LANs (VLAN). - The students name possibilities to protect a LAN from non-authorised attacks (e.g. hackers). - Media for data transmission, - Local networks and their characteristics, - Subnet formation also with variable subnet lengths (VLSM), - Protocols of data transmission in networks (network and transport layer), - Function of important network coupling devices (especially router, switch), - Configuration of active components for setting up networks, - Application level services and protocols, - Simulation and practical construction of computer networks. - Forms of teaching: Lecture, sem less ons, project and group work within the framework of the internship - Participation requirements: - Formal: None - Content: None - Forms of assessment: - Written examination, combination examination or oral examination; each with preliminary examination performance - Prerequisite for the award of credit points:			or seminar								h	
- Students explain the basics of setting up local area networks (LAN) Students have a basic knowledge of the protocols used. They plan and simulates imple netw set themup in the laboratory with a partner, configure the network devices used (router, sv PC) and discuss the results of their work The students assign the processes in an IP network to the layers of the OSI or the TCP/IP means they can detect and eliminate configuration errors in a LAN Students are familiar with the role of a switch and configure virtual LANs (VLAN) The students name possibilities to protect a LAN from non-authorised attacks (e.g. hackers) Media for data transmission, - Local networks and their characteristics, - Subnet formation also with variable subnet lengths (VLSM), - Protocols of data transmission in networks (network and transport layer), - Function of important network coupling devices (especially router, switch), - Configuration of active components for setting up networks, - Application level services and protocols, - Simulation and practical construction of computer networks. Forms of teaching: Lecture, sem. lessons, project and group work within the framework of the internship Participation requirements: Formal: None Content: None Forms of assessment: Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:		Supervise	d self-study	60 students		0	SCH	0	h	0	h	
- Architecture and application of computer-aided communication systems, - Media for data transmission, - Local networks and their characteristics, - Subnet formation also with variable subnet lengths (VLSM), - Protocols of data transmission in networks (network and transport layer), - Function of important network coupling devices (especially router, switch), - Configuration of active components for setting up networks, - Application level services and protocols, - Simulation and practical construction of computer networks. Forms of teaching: Lecture, sem. lessons, project and group work within the framework of the internship Participation requirements: Formal: None Content: None Forms of assessment: Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:					ofa sw	vitch an	d config	gure virtua			kers).	
Lecture, sem. lessons, project and group work within the framework of the internship Participation requirements: Formal: None Content: None Forms of assessment: Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:					ofa sw	vitch an	d config	gure virtua			kers).	
Formal: None Content: None Forms of assessment: Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - App	e students nar chitecture and dia for data tr cal networks a onet formatio tocols of data action of impo	application of coransmission, and their character transmission in rotant network coractive componer l services and profession in profession in rotant network coractive componer l services and profession in profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive componer l services and profession in rotant network coractive coracti	e of a sw o protect	raided onet lengus (networks etting u	communaths (VLS) Vork and (especial p netwo	mication sy M), transportally router orks,	vstems,		kers).	
Content: None Forms of assessment: Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - App - Sim	e students nar chitecture and dia for data tr cal networks a onet formation tocols of data action of importiguration of plication leve pulation and p	application of coransmission, and their character transmission in rortant network coractive components ervices and propactical constructive and group of the construction of the construct	e of a sw o protect	ritch anta LAN -aided et leng ss (netwices etting u	communaths (VLS vork and (especia p netwo	mication sy M), transportally router orks,	estems,	(e.g. hac	kers).	
Forms of assessment: Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - Ap - Sim Forms of Lecture,	e students nar chitecture and dia for data tr cal networks a onet formatio tocols of data action of impo figuration of plication leve aulation and p	application of coransmission, and their character also with variable transmission in representative components active components are transmission in representative components.	e of a sw o protect	ritch anta LAN -aided et leng ss (netwices etting u	communaths (VLS vork and (especia p netwo	mication sy M), transportally router orks,	estems,	(e.g. hac	kers).	
Written examination, combination examination or oral examination; each with preliminary examination performance Prerequisite for the award of credit points:		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - App - Sim Forms of Lecture, Participa Formal:	e students nar chitecture and dia for data tr cal networks a onet formation tocols of data action of import figuration of plication leve aulation and p teaching: sem. lessons	application of coransmission, and their character also with variable transmission in representative components active components active and proposed active constructions and proposed active and proposed active and grounds.	e of a sw o protect	ritch anta LAN -aided et leng ss (netwices etting u	communaths (VLS vork and (especia p netwo	mication sy M), transportally router orks,	estems,	(e.g. hac	kers).	
		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - App - Sim Forms of Lecture, Participa Formal: Content:	e students nar chitecture and dia for data tr cal networks a onet formation tocols of data action of impor figuration of plication leve aulation and p teaching: sem. lessons tion requirement Non Non	application of coransmission, and their character also with variable transmission in representative components active components active and proposed active constructions and proposed active and proposed active and grounds.	e of a sw o protect	ritch anta LAN -aided et leng ss (netwices etting u	communaths (VLS vork and (especia p netwo	mication sy M), transportally router orks,	estems,	(e.g. hac	kers).	
I IVIOLUIC CAAHIIIALIOH DASS WILH DICHIIHIIIAIV CAAHIIIIAHON		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - App - Sim Forms of Lecture, Participa Formal: Content: Forms of Written examina	e students nar chitecture and dia for data treal networks a conet formation tocols of data action of important in the conet formation and pulation performance in the pulation and pulation performance in the pulation and pulation and pulation and pulation and pulation performance in the pulation and pul	application of coransmission, and their character ralso with variable transmission in rortant network coractive components ervices and proposed active and ground transmission in the coractical construction.	e of a sw o protect omputer eristics, ole subm network upling onts for so otocols, tion of co	reaided et lengus (networks etting under within	communaths (VLS vork and (especial postwork) network the frame of the	mication sy M), transportally routerorks, orks.	vstems, layer), r, switch),	hip	kers).	
Application of the module (in the following study programmes)		Contents - Arc - Me - Loc - Sub - Pro - Fur - Cor - App - Sim Forms of Lecture, Participa Formal: Content: Forms of Written examina Prerequis	e students nar chitecture and dia for data treal networks a conet formation tocols of data action of important in the formation and processes action equirement action equirement in the forthe awaite for the awaite for the awaite for the awaite for the awaite data and processes action performation, and processes action performation and processes action performatic for the awaite	application of coransmission, and their character also with variable transmission in representative components active components are transmission and productive and productive and grounds:	omputer eristics, ole subm network upling onts for so tocols, tion of co	retlengus (networks (networks)) within	communaths (VLS) vork and (especial p network the frame all examinations and examinations and examinations are second to the communations and examinations are second to the communations are second to the communations are second to the communations are second to the community and examinations are second to the community and examination	mication sy M), transportally routerorks, orks.	vstems, layer), r, switch),	hip	kers).	

9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Lutz Grünwoldt
11	Other information:
	Literature will be announced at the beginning of the course. Lecture notes will be provided. Each student will be a member of a Cisco class and will have access to a simulation environment and extensive online curricula. Certificates can be issued for successful participation in Cisco final exams.
12	Language:
	German

Nun	nerical Ma	thematics							NM		
Ident numl	ification per:	Workload:	Credits:	Stud	y semest	er:	Frequenc	y of the offer	Durati	Duration:	
1007	7	150 h	5	4th	sem.		Annual (Summe		1 sem	nester	
1	Course:		Planned group s	izes	Scop	e		contact	Self-stu	dy	
	Lecture		60 students		2	SCH	30	h	45	h	
	Sem. less	ons	30 students		0	SCH	0	h	0	h	
	Exercise		20 students		2	SCH	30	h	45	h	
	Practical	or seminar	15 students		0	SCH	0	h	0	h	
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h	
3	Contents The cou enginee - Root-	: rseteaches th ring sciences finding algor r algebra (so		ımerica	ltreatm	ent of pr	roblems t	hat occur fre	quently	in	
	- Numer - Regres - Applie	rical different ssion cations from	tiation and integra								
4	Forms of										
_		exercise									
5	·	tion requiremen									
	Formal: Content:		thematics 1 (1147) (88), Mathematics	, -	ematic	s 2 (1153), Mathe	matics 3			
6		assessment:	examination or co		ion exai	n					
7	Prerequis		rd of credit points:	110 1100							
8	Applicati	on of the mod	ale (in the following er Sciences B.Eng		rogramı	nes)					
9	Importan		for the final grade:								
10	Module C	Coordinator:	istian Schröder								
11	Other inf	ormation:		~i i ~	of the o	01180					
	Literature will be announced at the beginning of the course. Language:										

Nun	nerical Sim	ulation							NSI	
Ident	tification	Workload:	Credits:	Study	Study semester: Frequency of the off			of the offer	Duratio	on:
1008		150 h	5	5th s	sem.		Annual (Winter)		1 sem	ester
1	Course:		Planned group s	sizes	Scope	e	Actual c time / cl teaching	assroom	Self-stud	ły
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		0	SCH	0	h	0	h
	Exercise		20 students		1	SCH	15	h	22.5	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h
	use them to solve scientific and technical problems. The critical examination of the against the background of solving practical problems is conveyed in the discussions a through practical implementation with the support of simulation tools.						as wella	s acepent		
3	Contents	:								
3	- Mathe - Funda - Metho	ematical tools amentals and o	classification of p merical solution of atural science an	fpartia	ldiffere					
3	- Mathe - Funda - Methe - Applie	ematical tools amentals and o	merical solution o	fpartia	ldiffere					
	- Mather - Fundar - Methor - Applicar - Forms of	ematical tools amentals and cods for the nur cations from n	merical solution c atural science an	fpartia	ldiffere					
	- Mathe - Funda - Methe - Applie Forms of Lecture,	ematical tools amentals and cods for the nu- cations from n	merical solution of atural science an	fpartia	ldiffere					
4	- Mathe - Funda - Methe - Applie Forms of Lecture,	ematical tools amentals and cods for the nur cations from reaching: , exercise, pra-	merical solution of a tural science an etical course etics:	of partia ad techn	l differe ology	ential eq	uations	athematics	(1007 or	1186)
4	- Mather - Fundary - Mether - Applied - Applied - Applied - Applied - Forms of Lecture, Participary - Formal: Content:	ematical tools amentals and o ods for the nur cations from Teaching: , exercise, pra- tion requirement Non Line Cassessment:	nerical solution of atural science and ctical course ats: e ar Algebra (1139)	of partia nd technology O), Anal	l differe ology	003), Nu	uations	athematics	(1007 or	1186)
5	- Mather - Fundary - Methor - Applied - Applied - Applied - Forms of Lecture, Participary - Formal: Content: Forms of Term participary - Prerequis	ematical tools amentals and o ods for the nur cations from Teaching: , exercise, pra- tion requirement Non Line Cassessment: uper, written e	merical solution of atural science and etical course hts: e ar Algebra (1139) xamination or cod of credit points:	of partia nd technology O), Anal	l differe ology	003), Nu	uations	athematics	(1007 or	1186)
4 5 7	- Mather - Fundary - Methor - Applied - Application - Forms of Term participal - Prerequisied - Application - Forms of Term participal - Forms of T	ematical tools amentals and cods for the nur cations from teaching: , exercise, praction requirement Non Line assessment: per, written examination ion of the modules.	merical solution of atural science and etical course hts: e ar Algebra (1139) xamination or cod of credit points:	of partia nd technology, Analy mbinati	l differe ology ysis (10 on exar	003), Nu	uations	athematics	(1007 or	1186)
4 5	- Mather - Fundary - Methor - Applied - Application -	ematical tools amentals and o ods for the nur cations from Teaching: , exercise, pra- tion requirement Non Line assessment: per, written e ite for the awar examination ion of the mode ering Compute	ctical course ats: e ar Algebra (1139 xamination or co d of credit points: pass le (in the following	of partia nd technology, Analy mbinati	l differe ology ysis (10 on exar	003), Nu	uations	athematics	(1007 or	1186)
6 7 8	- Mather - Fundary - Methor - Applied - Applie	ematical tools amentals and ods for the nurcations from not be actions from not be action	ctical course ats: e ar Algebra (1139 examination or co d of credit points: pass ale (in the following for the final grade:	of partia nd technology, Analy mbinati	l differe ology ysis (10 on exar	003), Nu	uations	athematics	(1007 or	1186)
4 5 6 7 8	- Mather - Fundary - Methor - Fundary - Methor - Applied - Applied - Forms of Lecture, Participary - Formal: Content: Forms of Term participary - Forms of Term participar	ematical tools amentals and cods for the numerations from more actions from more actions from more actions from more actions from Line assessment: Apper, written examination from of the modularing Computer actions of the grade and to BRPO accordinator: The remaining to the grade and the grade	ctical course ats: e ar Algebra (1139 xamination or co d of credit points: pass le (in the following er Sciences B.Eng	of partia nd technology, Analy mbinati	differed ology ysis (10) on exart	003), Num	uations	athematics	(1007 or	1186)

	ical Syster	ns Engine	eering	_						OST	
	tification	Worklo	ad:	Credits:	Study	semes	ter:	Frequency	y of the offer	Duration:	
num ¹ 1300		150 h		5 61		sem.		Annual (Summer)		1 sem	ester
1	Course:	Course:		Planned group sizes		Scope		Actual contact time / classroom		Self-study	
	Lecture			60 students		2	SCH	teachin 30	g h	45	h
	Sem. less	ion a		30 students		1	SCH	15	h	22.5	h
	Sciii. iess	0115		o students		1	SCII	13	11	22.5	11
	Exercise		2	20 students		0	SCH	0	h	0	h
	Practical	or semina	r	5 students		1	SCH	15	h	22.5	h
	Supervise	ed self-stu	dy (50 students		0	SCH	0	h	0	h
2		outcomes									
3	- Funda - Phys - Smart - Lighti - Mach - Select - Colou - Interfa - Select - Two-	ence betwarmentals of ical proper sensors a right and of ine vision and filters are machinaces for ced real-literals.	of optice erties of and cam ptics in softwa and spe e vision ommun fe applinal cod		gineerin of applic tools copy nachine les of th	g ation o contro e vario	foptical ls ussenso	or classes		inction b	etween
		teaching:	sons, pr	actical course	;						
4		tion requir									
4	Participa										
	Participa Formal:		None								
	•		None None								
5	Formal: Content: Forms of	assessmer	None nt:								
6	Formal: Content: Forms of Combin	assessmer ation exa	None nt: minatio	n, performan	ce exam	ination	or oral e	examinatio	on		
6	Formal: Content: Forms of Combin Prerequise	assessmer ation exa	None nt: minatio award o	n, performand f credit points: ss and course a			or oral e	examinatio	on		
	Formal: Content: Forms of Combin Prerequis Module	assessmer ation exa site for the examina	None nt: minatio award o tion pas	f credit points:	ıssessm	ent		examinatio	on		
5 6 7	Formal: Content: Forms of Combin Prerequis Module Applicat:	assessmer ation exa site for the examination of the	None nt: minatio award o tion pas module (f credit points: s and course	ıssessm g study p	ent rogramı	nes)			nt B.Sc.	
5 6 7	Formal: Content: Forms of Combin Prerequis Module Applicat: Enginee Importar	Cassessmer ation exa hite for the examina- tion of the r ering Con- nce of the g	None nt: minatio award o tion pas module (puter S grade for	f credit points: s and course a in the followin	ns sessm g study p g. and Ir	ent rogramı	nes)			nt B.Sc.	
5 6 7 8	Formal: Content: Forms of Combin Prerequis Module Applicat: Enginee Importar accordin	assessmer ation exa ite for the examination of the ering Con ace of the g	None nt: minatio award o tion pas module (nputer S grade for	f credit points: s and course a in the followin ciences B.Eng	ns sessm g study p g. and Ir	ent rogramı	nes)			nt B.Sc.	
5 6 7 8	Formal: Content: Forms of Combin Prerequis Module Applicat: Enginee Importar accordin Module (Fassessmer ation exa- site for the examina- tion of the rering Con- nee of the g	None nt: minatio award o tion pas module (puter S grade for O or:	f credit points: s and course a in the followin ciences B.Eng	assessm g study p g. and Ir	ent rogramı	nes)			nt B.Sc.	

	Literature will be announced at the beginning of the course.
12	Language:
	German

Opto	electronic	S							OPT	
Ident numb	ification	Workload:	Credits:	Study	semest	er:	Frequency	y of the offer	Duration:	
1190		150 h	5	5th s	5th sem.		Annual (Winter)		1 seme	ester
1	Course:		Planned group s	izes	Scop	e	Actual of time / c	lassroom	Self-stud	y
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise study	d self	60 students		0	SCH	0	h	0	h
3	They had electrical operation and use Students optical contents - Phy - Sen - Rado pho - Rado	tve gained known to signals into a signals into a signals into a signal signal signal to them for pract as a signal to the signal principle in the signal principle in the signal principle in the signal principle in the signal	on using electron owledge of the optical signals gained an overvier ical applications practical skills it well as tabular a set of the propertiectronics: Fundators: thermal detotransistors, CC g devices: Lumir ion technology was a set of the propertiectronics of the properties of the proper	e most and vew of the control of the	timportation version to the option of the op	propaga teraction (OS send, laser di	ading the cation of the cation of the cation of electron of electrons (e.g. sors, etc.)	ir manufact nese compon n and in de rement resul	ure and lents and aling withts	mode of can select h special
4	Forms of Lecture,		and practical trai	iningin	smallg	roups (2	2-4 partic	ipants)		
5		t ion requiremen	ts:							
	Formal:	D .	l	. a.fu! - 1		i.a -	ماروا	*** 11 c = 41	. 1:a4 - 11	-1
	Content:	Mod 1066 1068 1071	e physics and ele ules: Electronics 1; Electronics 2; Electrical Engin Electrical Engin	neering	1;	a ing mo	auies, as v	wen as those	tiisted de	EIOW:

	1169 Metrology;
	1195 Physics 1;
	1200 Physics 2;
6	Forms of assessment:
0	T OTHER OF MESOSCIALATION
L_	Oral examination; in each case with preliminary examination
7	Prerequisite for the award of credit points:
	Module examination pass with preliminary examination
8	Application of the module (in the following study programmes)
	Electrical Engineering B.Eng. and Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. nat. Sonja Schöning
11	Other information:
	Literature will be announced at the beginning of the course.
	Students must have sufficient knowledge and experience in the use and safety of electrical equipment
	zamenne zamen z
12	Language:
	German
	Content

15	onneland	Organisation							PUO	
	ification	Workload:	Credits:	Study semester: Frequency of the offer				Duratio	Duration:	
numb 1192		150 h	5	or 6th s	em.	Annual (Summer		1 semester		
1	Course:		Planned group s	izes	Scope	e		contact lassroom	Self-stud	у
	Lecture		60 students		3	SCH	45	h h	67.5	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
	with ess during the They ur success They ca practica They are entrepre They ha	ential theorethe communicated the communicated the full earning. In explain the lexamples. The familiar with eneurial activitate basic know trated this with	essential theore ical concepts on ation process and importance of lease principles of organized can use organized important topic y. vledge about the n examples, e.g. 1	commu I have p arning f ganisati nisation es of org charact	nicatio ractised or char onal th al form anisatio	n; they on the process with reconstruction and signary	understante solution esses and dhave chagard to the nge and conficience	d the probles. can design ecked their deir applicate an assess the	the cond significations cility.	litions for nee using icance for and have
3		ance, goals an	dtasks of humar	resour	ces mar	nagemen	t			
4 5	Fundam Fundam Environ Organis Organis Personn Forms of Lecture,	ational and op ational change tel managemen teaching:	munication ning Theory ions, learning co erational structure nt and conflict re- with exercises ar	re, form	s of pri		ong learn	•	tion	

	Written examination, combination examination, performance examination or oral examination
7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng., Renewable Energies B.Eng. and Industrial Engineering B.Sc.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. oec. Thomas Süße
11	Other information:
	Literature will be announced at the beginning of the course. Renewable Energies study
	programme: Possible elective subject
12	Language:
	German

	sics 1									PH1		
Ident num!	tification Workload:			Credits:	Study	semest	ter:	Frequency	y of the offer	Duratio	Duration:	
1195				5	1st s	em.		Annual (Winter))	1 seme	ester	
1	Course:			lanned group	sizes	Scope	e		contact lassroom	Self-study	y	
	Lecture		6	0 students		2	SCH	30	h	45	h	
	Sem. lesso	ons	3	0 students		1	SCH	15	h	22.5	h	
	Exercise		2	0 students		0	SCH	0	h	0	h	
	Practical	or semina	r 1	5 students		1	SCH	15	h	22.5	h	
	Supervise	d self-stu	dy 6	0 students		0	SCH	0	h	0	h	
3	The students know the structure and methodology of physics and have basic knowledge of the fundamental laws of nature of classical mechanics. They can analyse and mathematically describe motion sequences of mass points and simple bodies. They recognise problem contexts and can solve technical questions independently. Students can carry out experiments, evaluate measurements and present the results clearly. They know the methods of error estimation of measurement results and can independently produce reports on laboratory experiments during the practical course.											
	- Physical quantities and units - Measurement accuracy and measurement errors - Basic concepts of classical mechanics - Kinematics: Description of motion - Dynamics: Newton's laws of motion - Work and energy, conservation of energy - Momentum and collisions - Rotations and angular momentum - Basic concepts of fluid mechanics											
4	- Measu - Basic o - Kinem - Dynan - Worka - Mome - Rotatio - Basic o	cal quant arement a concepts natics: De mics: Nev and ener antuman ons and a concepts	s of class escriptio wton's la gy, cons d collisio angular r	and measur ical mechan n of motion ws of motion ervation of e ons momentum	ics n	rors						
4	- Measu - Basic o - Kinem - Dynam - Works - Mome - Rotatio - Basic o Forms of Lecture, experime	cal quant urement a concepts natics: De mics: New and ener entumandons and a concepts teaching: seminar ents)	of class of class escription wton's largy, considering angular resoffluid	and measur ical mechan n of motion ws of motion ervation of e ons momentum	ics n energy		sic physi	ies practic	al course - I	Part 1 (3		
4	- Measu - Basic of - Kinem - Dynam - Works - Mome - Rotation - Basic of Forms of Lecture, experimed Participal	cal quant arement a concepts natics: Devand ener entumandons and a concepts teaching: seminar ents)	s of class escription wton's largy, considered collision angular resoffluid with practices. None	and measur ical mechan n of motion ws of motion ervation of e ons momentum mechanics	ics n energy		sic physi	ies practic	al course - I	Part 1 (3		
	- Measu - Basic of - Kinem - Dynam - Work of - Mome - Rotation - Basic of Forms of Lecture, experiment - Participal Formal: Content:	cal quant arement a concepts natics: Devand ener entumandons and a concepts teaching: seminar ents)	s of class escription wton's largy, considered collision angular resoffluid with practices. None None nt:	and measur ical mechan n of motion ws of motion ervation of e ons momentum mechanics	ics n energy ed exercis	ses, bas		ics practic	al course - I	Part 1 (3		
5	- Measu - Basic of - Kinem - Dynam - Work of - Mome - Rotation - Basic of Forms of Lecture, experime Participat Formal: Content: Forms of Written Prerequisi	cal quant prement a concepts natics: Devand ener entumandons and a concepts teaching: seminar ents) tion requir	s of class escription wton's largy, considered collision angular resoffluid with praction; None None at:	and measur ical mechan n of motion ws of motion ervation of e ons momentum mechanics actice-oriente th with prelir credit points	ics n energy ed exercis	ses, bas	tion	ics practic	al course - I	Part 1 (3		
6	- Measu - Basic of - Kinem - Dynam - Worka - Mome - Rotation - Basic of Forms of Lecture, experimed Formal: Content: Forms of Written Prerequisit module of Application	cal quant arement a concepts natics: Devand ener entumand ons and a concepts teaching: seminar ents) tion requir	s of class escription wton's largy, considered collision angular resoffluid with praction; each award of ion passimodule (i	and measur ical mechan n of motion ws of motion ervation of e ons momentum mechanics actice-oriente credit points with prelim n the followir	minary exang study p	ses, bas caminat camination	on mes)			Part 1 (3		
5 6 7 8	- Measure - Basic of - Kinem - Dynam - Works - Mome - Rotation - Basic of Forms of Lecture, experimed Participal Formal: Content: Forms of Written of Prerequisis module of Application - Basic of Forms of Written of Written of Forms of Forms of Written of Forms of Forms of Written of Forms of	cal quant arement a concepts natics: Devand ener entumandons and a concepts teaching: seminar ents) tion requir	s of class escription wton's languar resort fluid with praction; each eaward of ion pass module (i eering B.	and measur ical mechan n of motion ws of motion ervation of e ons momentum mechanics actice-oriente th with prelir credit points with prelim	minary exang study p	ses, bas caminat camination	on mes)			Part 1 (3		
5 6 7 8	- Measure - Basic of - Kinem - Dynam - Works - Mome - Rotation - Basic of Forms of Lecture, experimed Participal Formal: Content: Forms of Written of Prerequisis module of Application - Basic of Forms of Written of Written of Forms of Forms of Written of Forms of Forms of Written of Forms of	cal quant arement a concepts natics: Devand ener on tumandons and a concepts teaching: seminar ents) tion require examinat ite for the examinat on of the all Engine ce of the general concepts the seminate on the sexaminate on the sexaminate ce of the general ce of the general concepts the sexaminate on the sexaminate on the sexaminate ce of the general	s of class escription wton's la regy, considered collision angular resoffluid with praction; exements: None None nt: tion; eace award of ion pass module (ion grade for the contraction).	and measur ical mechan n of motion ws of motion ervation of e ons momentum mechanics actice-oriente credit points with prelim redit points with prelim n the followir Eng. and En	minary exang study p	ses, bas caminat camination	on mes)			Part 1 (3		
5 6 7	- Measu - Basic of - Kinem - Dynam - Worka - Mome - Rotation - Basic of Forms of Lecture, experime Formal: Content: Forms of Written of Written of Application Electrica	cal quant arement a concepts atics: Devand ener entumandons and a concepts teaching: seminar ents) tion requires examinat ite for the examination of the sing to BRF Coordinator	s of class escription wton's la regy, considered collision angular resoffluid with praction; each eaward of ion pass module (i reging B. grade for the collision).	and measur ical mechan n of motion ws of motion ws of motion ervation of e ons momentum mechanics actice-oriente credit points with prelim n the followir Eng. and Eng.	minary exang study p	ses, bas caminat camination	on mes)			Part 1 (3		

12	Language:
	German

Phy	sics 2								PH2	
	ification	Workload:	Credits:	Stud	Study semester: Frequency of the offer			Duration:		
num1 1200			5	5 2nd se			Annual (Summer)		1 semester	
1	Course:		Planned group s	sizes	Scop	e		contact classroom	Self-stu	dy
	Lecture		60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
	The students have basic knowledge of the fundamental physical laws of nature, especially in the areas of thermodynamics, oscillations and waves and optics. They can systematically apply basic physical principles to technical problems and work out solutions independently. The students know the scientific working method with the alternating effect of experiment and theory and can apply it. They have skills to prepare and conduct their own experiments, as well as documen and critically assess the results.									
3	processor - Oscill - Wav waves	nodynamics: Tes es ations: simple es: Wave prop	Temperature, ide harmonic motic pagation, interfer optics, optical s	on, dan ence, r	nped and eflection	l driven (n, transm	oscillation	ns, resonance fraction, diff	e	
4			practice-oriente	dexerc	ises, bas	sic physi	ics practic	al course - P	eart 2 (3	
5		tion requiremen	ts:							
	Formal: Content:	Mod	eents of the mod lules: Physics 1	ule Phy	rsics 1 (1	195)				
6		assessment:	each with prelim	ninary e	xaminat	ion				
7	Prerequis	ite for the awar	d of credit points:							
8			ass with preliming the (in the following							
					ıg Comp	uter Sci	ences B.E	ing.		
	Electrical Engineering B.Eng. and Engineering Computer Sciences B.Eng. Importance of the grade for the final grade:									
9	according to BRPO									
9	accordin Module (Coordinator:	_							
	Module O Prof. Dr		Fromme							

12	Language:
	German

	tical Proje	ct / Internship	,						PRA	
Ident numl	ification er:	Workload:	Credits:	Study	semest	er:	Frequency	of the offer	Duration	n:
1292		450 h	15	7th s	em.		each sem	ester	12 wee	eks
1	Course:		Planned group si	zes	Scope	e	/	ontact time	Self-study	y
	T4		(0 -t1t		0	CCII	0	m teaching h	450	T 1.
	Sem. less	ons	60 students 30 students		0	SCH SCH	0	h	0	h
	Exercise		20 students		0	SCH	0	h	0	h
		or seminar	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
2	_	outcomes/com	petences: ct, the activities a							
	applied in a practice-oriented manner. To this end, students should work independently on engineering projects and develop suitable solution strategies. The main aim is to develop and expand integration analysis and problems olving, presentation and communication skills.									
	Contents: The contents result from the field of activity of the respective chosen company or enterprise and should include an engineering task. At the end of the practical project, the supervising company is to prepar an activity report and the students a final report. During the practical project, the students should receive individual and professional advising from the supervising university lecturers.									
4	Forms of	'taaahina								
4		teaching:	roises as accomp	anvin a	guidan	re				
•	Sem. les	sons with exe	rcises as accompa	anying	guidan	ce				
4 5	Sem. les	sons with exe	its:	anying	guidan	ce				
	Sem. les Participa Formal:	sons with exe tion requiremen Non	e e	anying	guidan	ce				
	Sem. les Participa Formal: Content:	sons with exe	e e	anying	guidan	ce				
5	Sem. les Participa Formal: Content:	sons with exetion requirement Non Non assessment:	e e	anying	guidan	ce				
5	Sem. les Participa Formal: Content: Forms of Term pa	sons with exetion requirement Non Non assessment:	e e	anying	guidan	ce				
5	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module	sons with exetion requirement Non Non assessment: per ite for the awar examination	d of credit points:							
5	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati	sons with exetion requirement Non Non assessment: per ite for the awar examination pon of the modu	e e d of credit points: bass le (in the following	study pı	rogramn	nes)				
5 6 7	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica	sons with exetion requirement Non Non assessment: per ite for the awar examination pon of the modulal Engineerin	d of credit points: bass le (in the following g B.Eng., Engine	study preering (rogramn Compu	nes) ter Scie				
5 6 7	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng.,	sons with exetion requirement Non Non assessment: per ite for the awar examination pon of the modulal Engineerin	e e d of credit points: bass le (in the following	study preering (rogramn Compu	nes) ter Scie				
5 7 8	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc.	sons with exetion requirement Non Non assessment: per ite for the awar examination of the modulal Engineerin Mechatronics	d of credit points: bass le (in the following g B.Eng., Engine B.Sc., Renewable	study preering (rogramn Compu	nes) ter Scie				
5 6 7	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc. Importan	sons with exetion requirement Non Non assessment: per ite for the awar examination of the modulal Engineerin Mechatronics are of the grade	d of credit points: bass le (in the following g B.Eng., Engine	study preering (rogramn Compu	nes) ter Scie				
5 7 8	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc. Importan accordin	sons with exetion requirement Non Non Sassessment: per site for the awar examination plan of the modulal Engineerin Mechatronics are of the gradeing to BRPO	d of credit points: bass le (in the following g B.Eng., Engine B.Sc., Renewable	study preering (rogramn Compu	nes) ter Scie				
5 5 6 7 8 8	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc. Importan accordin	sons with exetion requirement Non Non assessment: per ite for the awar examination of the modulal Engineerin Mechatronics are of the grade	d of credit points: bass le (in the following g B.Eng., Engine B.Sc., Renewable	study preering (rogramn Compu	nes) ter Scie				
5 5 6 7 8 8	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc. Importan accordir Module C N.N.	sons with exetion requirement Non Non Sassessment: per site for the awar examination plan of the modulal Engineerin Mechatronics are of the gradeing to BRPO	d of credit points: bass le (in the following g B.Eng., Engine B.Sc., Renewable	study preering (rogramn Compu	nes) ter Scie				
5 6 7 8	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc. Importan accordin Module C N.N. Other inf	sons with exection requirement Non Non Non assessment: per ite for the awar examination on of the modulal Engineerin Mechatronics are of the gradeing to BRPO Coordinator:	d of credit points: bass le (in the following g B.Eng., Engine B.Sc., Renewable	study preering (e Energ	rogramn Compu ies B.E	nes) ter Scie				
5 6 7 8	Sem. les Participa Formal: Content: Forms of Term pa Prerequis Module Applicati Electrica B.Eng., B.Sc. Importan accordin Module C N.N. Other inf	sons with exection requirements Non Non Non assessment: per ite for the awar examination of the modulal Engineerin Mechatronics are of the gradeing to BRPO Coordinator: formation: re will be annoted to require the proper of the gradeing to the gradein	d of credit points: bass le (in the following g B.Eng., Engine B.Sc., Renewable for the final grade:	study preering (e Energ	rogramn Compu ies B.E	nes) ter Scie				

Qual	lity Manag	gement								QM	
Ident numb	ification er:	Workload: Credits:		Credits:	Study	semest	er:	Frequency	of the offer	Duration	:
1229		150 h	5		4th or 6th sem.			Annual (Summer)		1 semester	
1	1 Course:		Pl	Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study	
	Lecture		60	60 students		2	SCH	30	h	45	h
	Sem. less	ons	30 students			2	SCH	30	h	45	h
	Exercise		20) students		0	SCH	0	h	0	h
	Practical or seminar		15	15 students		0	SCH	0	h	0	h
	Supervise	d self-study	60	60 students		0	SCH	0	h	0	h

2 Learning outcomes/competences:

The students are able to

- Define the basic concepts of quality theory.
- Explain the basics of building a quality management system.
- Implement standard requirements for a quality management system in a familiar field of work by being able to identify requirements, formulate goals and describe processes based on the defined terms and principles of quality management.
- Make important business decisions based on basic, relevant statistical methods.
- Classify the industrial application of quality methods and techniques in the product creation process.
- Master the essential quality methods and techniques, such as FMEA, QFD, Poka Yoke, SPC, test planning.
- Understand the systematic and structured application of basic methods from the scope of quality management in the context of improvement projects.
- Systematically identify, eliminate and avoid the causes of errors by selecting and applying the appropriate methods for data collection, data analysis and root cause identification for the intended purpose in order to subsequently react and preventively solve quality problems.
- Assess the role of quality management in development, procurement and production.
- Analyse significant variables and risks with regard to the quality level of a production.
- Evaluate and analyse quality data from production and derive measures for production process optimisation.
- Highlight legal aspects of warranty and product liability.

3 Contents:

1 Understanding quality

- The term quality
- Quality and its characteristics
- Quality management

2 Quality management systems

- Standards and models for QM systems
- ISO 9000 series of standards
- Process orientation

3 Quality tools

- Data collection tools
- Tools for data analysis

4 Management and creativity tools

- Management tools (M7)
- Creativity tools (K7)

5 Quality management in development

- Kano model
- Quality Function Deployment
- FMEA

6 Statistical design of experiments

- Classical design of experiments
- Optimum search procedure
- Robust processes according to Taguchi

- Improvement strategies according to Shainin
- 7 Quality controlling
 - Quality cost models
 - Quality cost accounting

8 Quality management in procurement

- Definition of procurement strategies
- Factors of supplier selection
- Negotiate quality management contracts
- Initial sample testing
- Incoming goods inspection

9 Statistical methods in quality management

- Sampling and population
- Distributions
- Visualisation of data
- Correlations
- Linear regression analysis

10 Six Sigma

- Introduction to Six Sigma
- DMAIC cycle as a systemic approach

11 Quality management in production

- Quality testing
- Test equipment management
- Proof of suitability of measuring systems
- Statistical process control

12 Quality management during field use

- Field data management
- Isochronous diagram

Prof. Dr.-Ing. Magnus Horstmann

- Weibull analysis

	- W CIDU	ili alialy sis					
4	Forms of teachin	g:					
	Lecture, semina	ar less ons, supplemented by guest lectures					
5	Participation requirements:						
	Formal:	None					
	Content:	None					
6	Forms of assessm	ent:					
	Written examin	ation, combination examination or oral examination					
7	Prerequisite for t	he award of credit points:					
	Module examin	ation pass					
8	Application of th	e module (in the following study programmes)					
	Biotechnology	and Instrumentation Engineering B.Sc., Engineering Computer Science B.Eng. and					
	Mechatronics E	3.Sc.					
9	1	e grade for the final grade:					
	according to Bl	RPO					
10	Module Coording	itor:					

11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Com	puter Arcl	hitectures							RA	
	ification	Workload:	Credits:	Credits: Study semester: Frequency of the offer				Durati	Duration:	
numb 1231		150 h	5	sem.		Annual (Winter)		1 sem	mester	
1	Course:		Planned group s	Planned group sizes			Actual contact time / classroom		Self-stu	dy
	Lecture		60 students		2	SCH	teachin 30	h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
	•	The students of They converted They explain the encodings. They know many they explain they explain they explain they explain they solves of they solves they solves they solves they solves they explain they solves they solve they solves they solve the solve they solve they solve the solve the solve they solve the solve they solve the solve they solve the solve	exture concepts. explain how Vor number representation the representation emory hierarchic the computer arc computer arc computer archite mall programmin small programm	es and behitectures.	s between tegers a bus system of grant ausing L	en any poind floating terms and aphics point. A-32 ass	osition sys ng point n advanced rocessors tembler.	tems. umbers in d architectur and analyse	ifferent econcep	binary ots. mparison to
3		Historical over Von Neuman Design of dig Basic function machine instr Computer arit Memory hiera Bus systems Advanced arc Computer arc Programming	hmetic (ALUs, I	nd theirs at the FPUs, e ots (pipe	e registe encoding elines, o	nents er transfe g of num ut-of-ord s Prograi	abers and of derexecut mming in 1	characters)		essing of
4		sem. lessons	(exercises if nece				amming ta	nsks in IA32	assemb	ler,
	practical tasks for the programming of graphics processors Participation requirements:									

	Content:	Basic computer science and programming knowledge						
		Basic knowledge of digital technology						
		Modules:						
	1045 Digital Electronics II;							
		1070 Digital Electronics I;						
		1105 Computer Science 1;						
6	Forms of assessment:							
	Written examina	tion or oral examination						
7	Prerequisite for the award of credit points:							
	Module examina	ation pass						
8	Application of the	module (in the following study programmes)						
	Electrical Engine	eering B.Eng., Engineering Computer Sciences B.Eng. and Mechatronics B.Sc.						
9	Importance of the	grade for the final grade:						
	according to BR	PO						
10	Module Coordinat	or:						
	Prof. DrIng. W	olframSchenck						
11	Other information	:						
	Literature will be	e announced at the beginning of the course.						
12	Language:							
	German							

Feedback Control Engineering										RT	
Identii	fication er:	Workload:		Credits: Stud		semes	ter:	Frequenc	y of the offer	Duration:	
1233		150 h		5	sem.		Annual Summer		1 sem.		
1	Course:		Pl	Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study	
Ī	Lecture		60	60 students		2	SCH	30	h	45	h
	Sem. lessons		30	30 students		1	SCH	15	h	22.5	h
ľ	Exercise		20	20 students		0	SCH	0	h	0	h
	Practical	or seminar	eminar 15 students			1	SCH	15	h	22.5	h
F	Supervised self-study		60	60 students		0	SCH	0	h	0	h

- have basic knowledge in the field of system theory.
- can create models for simple physical systems.
- can transform differential equations into the state space. They investigate and evaluate the dynamic behaviour of linear time-invariant systems.
- can recognise and explain connections between the time domain representation and the frequency domain.
- explain the standard control loop and name the variables in the loop.
- can systematically analyse control engineering problems.
- examine single-loop feedback systems for stability.
- assess the properties of a control loop with regard to dynamics and disturbance behaviour.
- design single-loop control loops on real-world systems in the laboratory. They can discuss the results and derive measures.

Contents: 3

- Structural description of dynamic systems
- Description of linear systems in the time domain (differential equations, state space representation, linearisation of non-linear systems)
- Behaviour of linear systems (input/output behaviour, impulse response, canonical form, controller canonical form, determination of characteristic values of LTI systems)
- Description and analysis of linear systems in the frequency domain, integral transforms (Fourier, Laplace)
- Frequency response and transfer function
- Standard control loop and controller design
- Command response and disturbance rejection of closed-loop control
- Stability of feedback systems (Nyquist stability criterion).
- Design of single-loop feedback systems (frequency characteristics, root locus)
- Practical course in control engineering

4	Forms of teaching:						
	Lecture, sem. le	s sons with exercises, practical course					
5	Participation requirements:						
	Formal:	None					
	Content:	Modules:					
		1147 Mathematics A;					
		1153 Mathematics B;					
		1158 Mathematics C;					

6	Forms of assessment:
	Written or oral examination; in each case with preliminary examination performance
7	Prerequisite for the award of credit points:
	Module examination pass with preliminary examination
8	Application of the module (in the following study programmes)
	Engineering Computer Sciences B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Martin Kohlhase
11	Other information:
	Literature will be announced at the beginning of the course. Notes in the course
12	Language:
	German

KUU	otics									ROB			
	ification	Workle	oad:	Credits: Stud		tudy semester:		Frequency of the offer		Durati	Duration:		
num1 1240		150 h		5	5th s	sem.		Annual (Winter)	1 semester			
1	Course:			Planned group sizes		Scope			contact lassroom	Self-study			
	Lecture			60 students		2	SCH	30	h	45	h		
	Sem. less	ons		30 students		1	SCH	15	h	22.5	h		
	Exercise			20 students		0	SCH	0	h	0	h		
	Practical	or semina	ar	15 students		1	SCH	15	h	22.5	h		
	Supervise	ed self-stu	ıdy	60 students		0	SCH	0	h	0	h		
	different approaches to robot development. They will thus become capable of independent engineering thinking and working in robotics and related areas of application.												
3	Contents	:											
3	Teachin - Manip - Robot - Forwa - Mobil - Senso	g content oulators t kinemand and in the robots ars for mo- cial intellation- viour-base	tics (indexes of the control of the	and robotics	al found	lations)							
3	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni	g content oulators t kinematerd and in the robots ors for mo- cial intellations viour-bassing robo- fteaching:	tics (inconverse labele robotics)	kinematics bots and robotics		,							
	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni	g content oulators t kinemat and ind e robots ors for mo cial intell viour-bas ing robo teaching sem. les tion requi	tics (indexerse labeled robots) sons were ments None Mathe	kinematics bots and robotics otics with exercises, parameters ematics 1 and 2	oractical	course uter Sci	;	ngineerin	g Mechanics	s, Electric	cal		
4	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni Forms of Lecture, Participa Formal: Content:	g content oulators t kinemat and intelled robots ors for mo- cial intelled riour-basing robo- teachings sem. less tion requi	tics (inconverse labele role) bbile role ligence sed robots sons were ments None Mathe Enginent:	kinematics bots and robotics otics with exercises, parentics 1 and 2 eering 1 and 2,	oractical c, Compu Physics	course uter Sci	ence, Er						
5	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni Forms of Lecture, Participa Formal: Content:	g content oulators t kinemant and and in the robots ars for mo- cial intellation-basing robo- teachings as sem. less tion requi	tics (inconverse labeled robots) sons wrements None Mathe Enginent: tion, co	bots and robotics otics with exercises, possesses 1 and 2 eering 1 and 2, combination exa	oractical , Compu Physics minatio	course uter Sci	ence, Er						
5	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis	g content oulators t kineman and and ir de robots ars for mo cial intell viour-basing robo teachings as sem. less tion requi	tics (inconverse labeled robots sons were ments None Enginent:	bots and robotics otics with exercises, ps: ematics 1 and 2, ombination exa of credit points:	cractical 2, Compu Physics minatio	uter Sci s	ence, Er						
4 5 6	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati	g contention of the examination of the nology a	bile rolligence sed robots Sons werements None Mathe Enginent: tion, coe award attion par module nd Inst	bots and robotics otics with exercises, parentics 1 and 2 eering 1 and 2, ombination exactor credit points: ass and course a (in the following rumentation En	Physics minations sessing g study p	uter Sciss n, performing B.Sc	ence, Er ormance nes)	examinat	ion or orale	xaminati ng., Engi	neering		
4 5	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati Biotech Comput	eg contention of the content of the	tics (inconverse labeled robots sons were ments None Mathe Engine nt: tion, cce e award attion par module nd Inst cces B.E. grade fo	bots and robotics otics with exercises, possesses 1 and 2, combination exactor of credit points: ass and course a (in the following	nactical Physics minations assessmant g study programmerianics B.S	uter Sciss n, performing B.Sc	ence, Er ormance nes)	examinat	ion or orale	xaminati ng., Engi	neering		
5 6 7 8	Teachin - Manip - Robot - Forwa - Mobil - Senso - Artific - Behav - Learni Forms of Lecture, Participa Formal: Content: Forms of Written Prerequis Module Applicati Biotech Comput	ag contention of the examination of the nology a er Science of the ng to BR Coordinat	tics (inconverse labeled robots seed robot	combination exaction for the following rumentation Eng., Mechatron rune final grade:	nactical Physics minations assessmant g study programmerianics B.S	uter Sciss n, performing B.Sc	ence, Er ormance nes)	examinat	ion or orale	xaminati ng., Engi	neering		

	Literature and other sources will be announced at the beginning of the course.
12	Language:
	German

Sens	ors								SEN	
	tification Workload:		Credits: S		y semest	er:	Frequency	y of the offer	Duration: 1 semester	
numb 1242		150 h	5	4th	4th or 6th sem.			r)		
1	Course:		Planned group s	Planned group sizes		e		contact lassroom	Self-study	
	Lecture		60 students		2	SCH	30	h h	45	h
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h
	Exercise		20 students		0	SCH	0	h	0	h
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60 students		0	SCH	0	h	0	h
	amplifyi tasks an	ng the senso:	ofaction. They routput. The stud as uring circuit. T ork.	lents car	select	a suitabl	le sensor f	or the most	common	measuri
4	ADcoMeasuInducTempo	erature meas al sensors	s veandresistives	ensors						
			and laboratory e	xercises	S					
5	Participal Formal:	1068	nts: dules: 8 Electronics 2; 9 Metrology							
	Content:									
6		assessment: examination;	each with prelim	inary e	xaminat	ion				
7	Prerequis	ite for the awa	rd of credit points: pass with prelimi	-						
8	Applicati	on of the mod	puss with preminate (in the following B.Eng. and Eng.	g study p	rogramı	nes)	ences R F	ng.		
9	Importan		for the final grade:		<u>5 </u>	ater ber	C.11000 D.12	b.		
10	Module C	Coordinator:	s Westerwalbeslo	.1.						
	Prot. Dr.	-ing Thoma	c M actarwolhack	n.						

12	Language:
	German

	nals and Sy	stems							SigSy	'S	
Ident	ification Workload:		Credits: St		Study semester:			y of the offer	Durati	Duration:	
1121		150 h	5	4th	4th or 6th sem.			er)	1 sem	1 semester	
1	Course:		Planned group s	Scop	e		contact classroom	Self-study			
	Lecture		60 students		2	SCH	30	h	45	h	
	Sem. less	sons	30 students		1	SCH	15	h	22.5	h	
	Exercise		20 students		0	SCH	0	h	0	h	
	Practical	or seminar	15 students		1	SCH	15	h	22.5	h	
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h	
3	Practical or seminar 15 students 1 SCH 15 h 22.5 h							erties,			
	- C Li - D tr - Fi - Li - Li - T	evel calculation on time aplace transform on time invaluation of the sampling the s	ne signals and the orm), signals and the of spectral analysariant systems -linear distortion	eir func sis ns	tional t	rans for	mations (:				
4	- C L: - D tr - Fi - L: - T - T	evel calculation on tinuous-time aplace transform on tansform) undamentals continear time invalues ampling the thods of anathree laborator of teaching:	e signals and the orm), signals and the of spectral analystariant systems -linear distortion heorem alogue and digitary practicals in signals.	eir func sis ns nl modul mall gro	ational t	rans for	mations (:				
	- C L - D tr - Fi - L - T - M - T	evel calculation on tinuous-time aplace trans for piscrete-time strans form) undamentals of inear time invitinear and non the sampling the sampling the laborator of teaching: Sem. lessons tion requirement	e signals and the orm), signals and the of spectral analys ariant systems -linear distortion heorem alogue and digitary practicals in suggestions.	eir func sis ns nl modul mall gro	ational t	rans for	mations (:				
4	- C L - D tr - F - L - T - M - T	evel calculation on tinuous-time aplace transform) undamentals of inear time invitinear and non the sampling the sampling the sampling the laborator of teaching: Seem. lessons attion requirement Non	ne signals and the form), signals and the form), signals and the of spectral analyst ariant systems -linear distortion heorem alogue and digitary practicals in support of the form of the	eir func sis ns al modul mall gro	ation prups	rans for	mations (z-trans form	, discret		
45	- C Li - D tr - Fi - Li - T - M - T Forms of Lecture. Participa Formal: Content:	evel calculation on tinuous-time aplace transform) undamentals of inear time invitinear and non the sampling the fethods of an athree laborator of teaching: Sem. lessons. tion requirement Non Mathematical And 2 Mathematical And 2	e signals and the orm), signals and the of spectral analys ariant systems -linear distortion heorem alogue and digitary practicals in suggestions.	eir func sis ns al modul mall gro	ation prups	rans for	mations (z-trans form	, discret		
4	- C Li - D tr - Fi - Li - T - M - T Forms of Lecture. Participa Formal: Content:	evel calculation on tinuous-time aplace trans for piscrete-time seans form) undamentals or inear time invinear and non the sampling the fethods of an athree laborator of teaching: Sem. lessons of the sampling the sampling the sampling the fethods of an athree laborator of teaching: Sem. lessons of the sampling	es signals and the orm), signals and the orm), signals and the of spectral analyst ariant systems -linear distortion heorem alogue and digitary practicals in substantials in substantials (1146 2 (1075)	sis al modul mall gro	ation prups small g	rocesses	mations (z-trans form	, discret		
4 5 6	- C L: - D tr - Fi - L: - T - M - T Forms of Lecture, Participa Formal: Content:	evel calculation on tinuous-time aplace trans for place transform place transf	es signals and the form), signals and the form), signals and the of spectral analyst ariant systems -linear distortion heorem alogue and digitary practicals in surplementary practical pr	eir func sis as al modul mall gro ticals in as e with	ation prups small g	rocesses	mations (z-trans form	, discret		
45	- C La - D tr - Fi - La - T - M - T Forms of Lecture. Participa Formal: Content: Forms of Written Prerequis	evel calculation on tinuous-time aplace trans for piscrete-time seans form) undamentals of inear time invinear and non the sampling the fethods of anathree laborator. Steaching: Sem. lessons, tion requirement. Non-Mattand 2 Sassessment: or oral examinate for the awar.	es signals and the orm), signals and the orm), signals and the of spectral analyst ariant systems -linear distortion heorem alogue and digitary practicals in substantials in substantials (1146 2 (1075)	eir func sis ns nl modul mall gro ticals in n) and 2	ation prups small g (1152).	rocesses roups. Electric	mations (z-trans form	, discret		
4 5	- C Li - D tr - Fi - Li - T - M - T Forms of Lecture: Participa Formal: Content: Forms of Written Prerequis Module Applicati	evel calculation on tinuous-time aplace transform) undamentals of inear time invinear and non the sampling th	es signals and the orm), signals and the orm), signals and the of spectral analyst ariant systems -linear distortion heorem alogue and digitary practicals in substantials in substantials (1146) (1075)	eir functisis al modul mall gro ticals in as e with inary ex g study p	ation prups small g (1152). prelim aminati	rocesses roups. Electric inary ex	cal Engine	eering 1 (107	, discret		

	according to BRPO
10	Module Coordinator:
	Prof. DrIng. Rüdiger Schultheis
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Simulation Technology										SIM	
Ident numb	ification er:	Workload:		Credits: Stu		semest	er:	Frequenc	y of the offer	Duration:	
1244		150 h 5		5	5th s	5th sem.		Annual Winter		1 sem.	
1	Course:		Pl	Planned group sizes		Scope		Actual contact time / classroom teaching		Self-stud	y
	Lecture		60	60 students		2	SCH	30	h	45	h
	Sem. lessons		30	30 students		1	SCH	15	h	22.5	h
	Exercise	Exercise 2		20 students		0	SCH	0	h	0	h
	Practical	Practical or seminar 1		15 students		1	SCH	15	h	22.5	h
	Supervise	d self-study	60) students		0	SCH	0	h	0	h

2 Learning outcomes/competences:

Students:

- have an overview of different approaches to model-based development.
- create mechanical and electrical models and implement them in graphical form (as block diagrams, for example) in a simulation environment (such as MATLAB/Simulink).
- calculate simulation parameters from models and configure the simulation software accordingly.
- simulate mechanical and electrical models on a computer and evaluate the simulation results.
- compare simulated time response of modelled systems with measured signals of real-world systems and assess the model quality and simulation accuracy.
- can discretise continuous time models and implement them on an embedded system in form of difference equations (z-transforms).
- understand the principles of (first-order) numerical procedures for solving ordinary differential equations (ODEs) and evaluate the different procedures in terms of efficiency, stability and accuracy.
- outline and explain numerical methods (e.g. in direction fields).

3 Contents:

- Introduction to simulation technology.
- Model-based development (software-in-the-loop, model-in-the-loop, hardware-in-the-loop and rapid control prototyping).
- Methods of modelling (state space form, descriptor model and representation in the form of block diagrams).
- Modelling of mechanical systems and electrical circuits.
- Ordinary differential equations (ODEs), state space models, extended state space models and introduction in descriptor equation.
- Structural singularities and algebraic loops.
- Introduction in sampled data systems and discrete-time systems (difference equations and z-transforms)
- Numerical methods for ordinary differential equations (Euler procedure, Heun procedure, family of Runge-Kutta procedures).
- Stability and accuracy of numerical methods.
- Introduction in linear multistep methods.
- Practical course in simulation
- 4 Forms of teaching:

	Lecture, sem. le	Lecture, sem. les sons with exercises, practical course					
5	Participation requirements:						
	Formal: None						
	Content:	Modules:					
		1233 Feedback Control Engineering;					
6	Forms of assessm	ent:					
	Written or oral	examination; in each case with preliminary examination performance					
7	Prerequisite for the	he award of credit points:					
		nation pass with preliminary examination					
8	* *	e module (in the following study programmes)					
	Electrical Engir	neering B.Eng., Engineering Computer Sciences B.Eng. and Mechatronics B.Sc.					
9	•	e grade for the final grade:					
	according to BI	RPO					
10	Module Coordina	ator:					
	Prof. DrIng. N	Martin Kohlhase					
11	Other informatio	n:					
	Literature will b	be announced at the beginning of the course.					
12	Language:						
	German						

Soc	ial Media a	ınd Natural La	anguage Process	ing					SMN	LP	
Iden num	tification ber	Workload:	Credits:	Study	semest	ter:	Frequency	y of the	Durat	ion:	
335		150 h 5		5th sem.			Annual (Winter)		1 Se	1 Semester	
1	Course:	l	Planned group s	Planned group sizes		e	Actual contact time / classroom teaching		Self-stu	ıdy	
	Lecture		60 students		2	SCH	0	h h	56	h	
	Sem. less	sons	30 students		0	SCH	0	h	0	h	
	Exercise		20 students		2	SCH	16	h	62	h	
	Practical	or seminar	15 students		0	SCH	0	h	0	h	
	Supervise	ed self-study	60 students		1	SCH	16	h	0	h	
2	_	outcomes/com	-		L	<u> </u>				L	
			line the history ar			delofso	cial media	1.			
		• •	the technologies			. 1 1	. 1.0	1	1' (
			scripts to retrieve or newspaper art		omsoc	cial med	ia and for	web craw	vling (e.g.	. to extra	
		•		-	natural	Hangua	ne nrocess	in a and ale	accify the	technique	
								ing and Ci	assiny the	teennqu	
	• They describe the application areas of natural language processing and classify the techniques used there in the field of machine learning and data mining.										
		They apply N	JLP methods for	the synt	-		ntic analys	sis of text of	lata.		
		They implen	NLP methods for ment toolchains inswertypical que	n which	actic ar data fr	nd semai om soci	al media i	s analysed	using N	LP metho	
		They implen	nent toolchains i	n which	actic ar data fr	nd semai om soci	al media i	s analysed	using N	LP metho	
3		They implen in order to ar	nent toolchains i	n which	actic ar data fr	nd semai om soci	al media i	s analysed	using N	LP methoces.	
3	Contents	They implen in order to an	nent toolchains i	n which	actic ar data fr romma	nd semai rom soci rketing :	al media i and sales	s analysec	using N	LP methoces.	
3	Contents	They implen in order to an	nent toolchains i nswer typical quo	n which estions f	actic ar data fr romma	nd semai rom soci rketing :	al media i and sales	s analysec	using N	LP methoces.	
3	Contents	They implen in order to an in order	nent toolchains inswer typical quo	n which estions f	actic ardata fromma	nd seman rom soci rketing :	al media i and sales	s analysec	using N	LP methoces.	
3	Contents	They implen in order to an in order to an in order to an introduction are retrieving da Retrieving da Introduction	nent toolchains in swer typical quot to social media (lata from social mata from websites to natural langua	history, edia (Al	data fromma busines PIs) ogs (welessing)	nd seman com soci rketing a ss model b crawlin	al media i and sales l, technolo ng) istory, mo	s analysed or from so gies)	l using Ni cial scien	ces.	
3	Contents	They implen in order to an in order to an in order to an introduction. Retrieving date and introduction relation to other the introduction of the introduction of the introduction of the introduction to other introduction in the intr	to social media (lata from social mata from websites to natural langua her techniques of	n which estions f history, edia (Al s and blo	busines PIs) ogs (we'essing (ning ar	om soci rketing : ss model b crawling NLP) (h	al media i and sales l, technolo ng) istory, mo	gies)	l using Ni cial scien	pplicatio	
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3	Contents	They implen in order to an in order to an in order to an in order to an introduction. Retrieving da Introduction relation to oth NLP method. NLP method.	to social media (Inta from social mata from websites to natural langua her techniques of s for the syntactics for the semantic	history, edia (Al s and blo age proc f data mi c analys c analys	busines PIs) ogs (we'essing (ning ar is ofter	om soci rketing a ss model b crawling NLP) (h and mach et data (e	al media i and sales l, technolo ng) istory, mo ine learnir e.g. for pa	gies) tivation, fing) rsing or sentiment an	l using Ni cial scien	pplicatio	
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3	Contents	They implen in order to an in order to an in order to an in order to an introduction. Retrieving da Introduction relation to oth NLP method. NLP method.	to social media (Inta from social mata from websites to natural langua her techniques of s for the syntactics for the semantic	history, edia (Al s and blo age proc f data mi c analys c analys	busines PIs) ogs (we'essing (ning ar is ofter	om soci rketing a ss model b crawling NLP) (h and mach et data (e	al media i and sales l, technolo ng) istory, mo ine learnir e.g. for pa	gies) tivation, fing) rsing or sentiment an	l using Ni cial scien	pplicatio	
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3 4	Forms of Self-stu	They implen in order to an in order	to social media (Inta from social matta from websites to natural languate her techniques of soforthe syntactics for the semantic from market results. Mathematic	history, edia (Al s and blo age proc f data mi c analys c analys earch an	busines PIs) ogs (we' esssing (ning ar is of tex is of	ss model b crawlin NLP) (h nd mach st data (c) the soci	al media i and sales l, technolo ng) istory, mo ine learning e.g. for sen ial science	gies) ptivation, for any or sentiment any series	l using Ni cial scien	pplicatio	
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	Written exam, project work or oral exam
7	Prerequisite for the award of credit points:
	Module examination pass
8	Application of the module (in the following study programmes)
	Digital Technologies (work-integrated) B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	N. N.
11	Other information:
12	Language:
	German

Soft	ware Engir	neering							SWE			
	ification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duratio	on:		
numt 1245		150 h	5	3rd	or 5th sem.		Annual (Winter		1 semester			
1	Course:		Planned group s	Planned group sizes		Scope		Actual contact time / classroom teaching		dy		
	Lecture		60 students		2	SCH	30	h	45	h		
	Sem. less	ons	30 students		1	SCH	15	h	22.5	h		
	Exercise		20 students		0	SCH	0	h	0	h		
		or seminar	15 students		1	SCH	15	h	22.5	h		
2	Supervise Study-	d self	60 students		0	SCH	0	h	0	h		
3	Contents		technology and b			rr**		1				
	- Softwa - Use of - Config - Testin	are design FUML as a r guration mar g technique	_									
4	- Proces	s models										
4			s with exercises, p	raction	Laguraa							
5		tion requirem		racuca	icourse	<u>, </u>						
J	Formal:	No										
	Content:	Kn Mc 110	owledge of object odules: 05 Computer Scier 09 Computer Scier	nce 1;	edprog	ramming))					
6		assessment:	or oral examination									
	Prerequis	ite for the awa	ard of credit points:		ent							
7	Module examination pass and course as sessment Application of the module (in the following study programmes)							134				
			` `	and I	Engineering Computer Sciences B.Eng. and Industrial Engineering and Management B.Sc. Importance of the grade for the final grade:							
8	Enginee Importan	ring Compu ce of the grad	ter Sciences B.Eng		<u>ndustria</u>	ıı Engine	cernigane	1 Manageme	nt B.Sc.			
7 8 9	Enginee Importan accordir Module C	ring Compuce of the grad ag to BRPO Coordinator:	ter Sciences B.Eng e for the final grade:		ndustria	II EII gille	Comigano	i Manageme	nt B.Sc.			
8	Enginee Importan accordir Module C Prof. Dr. Other inf	ring Compu ce of the grad ag to BRPO coordinator: rer. nat. Ge ormation:	ter Sciences B.Eng				cerning and	i Manageme	nt B.Sc.			

									STA	1	
Identi numbe	fication	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Durat	ion:	
numbe 3224	er:	150 h	5	3rd	or 4th s	or4th sem.		each semester		1 semester	
1	Course:		Planned group s	Planned group sizes		Scope		contact	Self-stu	ıdy	
ŀ	Lecture		60 students		2	SCH	teachin 0	h	56	h	
Ì	Sem. less	ons	30 students		0	SCH	0	h	0	h	
ŀ	Exercise		20 students		2	SCH	16	h	62	h	
	Practical	or seminar	15 students		0	SCH	0	h	0	h	
•	Supervise	d self-study	60 students		1	SCH	16	h	0	h	
	• ;	can apply the are able to an correlations.	e basic methods a halyse economic colve tasks with the	ndproo questio	cedures ns and p	oroblems	with stat	istical metho			
4	• • • • Forms of	Descriptive s statistics, reg Probability tl Statistical int Use of Excel/ teaching:		dcont	inuous d	listributio	ons)		multiva	riate	
			-								
5	Participa Formal:	tion requirement	nts:								
ŀ	Content:	 									
6	Forms of Term pa examina	tion accompa	examination, com		xamina	tion, pro	ject work	, oral examir	ation o	r	
7	•	ite for the aware	rd of credit points:								
8	Applicati Digital Mechatr	on of the mode Logistics (conics/Autom	ule (in the following work-integrated) nation (work-integ l Engineering and	B.Eng grated)	g., Dig B.Eng.,	gital Te Produc	t-Service	Engineerin	itegrate g (work	ed) B.En -integrate	
9		ce of the grade	for the final grade:								
10	Module C	Coordinator:									
	Module Coordinator: Dr. rer. nat. Sabrina Proß										

12	Language:
	German

Stu	dentResea	iciii iojeci (i	roject2)						STA		
	dentification Work		Credits:	Stud	ly semest	ter:	Frequency	of the offer	Duratio	n:	
num 121		150 h	5	5th	sem.		Annual (Winter)		1 sem	1 semester	
1	Course:	1	Planned group s	Planned group sizes		Scope		Actual contact time / classroom		ly	
	Lecture		60 students		0	SCH	teachin 0	h	0	h	
	Sem. less	sons	30 students		0	SCH	0	h	0	h	
			20 1 1			CCII			0	-	
	Exercise		20 students		0	SCH	0	h	0	h	
	Practical	or seminar	15 students		2	SCH	30	h	120	h	
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h	
	- T - T - T	y an examine ithin the university the students in gineering so the students in	have sufficient le eience to solve a coindependently ob	urer) of knowle omplex otain all	the studge and atopic.	dy prog	ramme. Tl	the metho	ng is to t	ake plac	
3	- T cr	he students uritically reflective. Information programmering processing of solumplementation	roject planning (n ition strategies in of project goals of all available sou in	their we eved sta	esegoals orkstep te of the	s can be s and so eir work.	achieved	and how.		sent ther	
3	- T cr	he students uritically reflective information programmering processing of solumplementation trategic used communication resentation quality assurates tracking:	rocurement roject planning (nution strategies on of project goals of all available south	their we eved sta	ese goals ork step te of the nes)	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
4	Contents In En Contents In Contents In Contents Contents In Contents Contents Participa	tinically reflective information programmering programmering programmering in the programmer in the pr	rocurement roject planning (n ation strategies on of project goals of all available sou	their we eved sta	ese goals ork step te of the nes)	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
4	Contents - Ir - D - Ir - Si - C - Pi - Q Forms of Term paguidance Participa Formal:	he students uritically reflective information programmering processing of solumplementation trategic used communication resentation quality assurateaching: aper with place by an example into requirementation r	rocurement roject planning (n ation strategies on of project goals of all available sou	their we eved sta	ese goals ork step te of the nes)	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
4	Contents Contents In En D In Si C Pi Q Forms of Term pa guidance Participa Formal: Content:	he students unitically reflective information programmering processing of solumplementation trategic used communication resentation quality assuration requirementation with placeby an example in the programmer	rocurement roject planning (n ation strategies on of project goals of all available sou	their we eved sta	ese goals ork step te of the nes)	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
4	Contents - Ir - D - Ir - D - Ir - Si - C - Pi - Q Forms of Term paguidance Participa Formal: Content: Forms of	he students unitically reflective information programmering programmering programmering in the programmer in the program	rocurement roject planning (n ation strategies on of project goals of all available soon ance anning "mileston iner.	milestor s urces of	ese goals ork step te of the nes)	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
5	Contents - Ir - D - Ir - Si - C - Pr - Q Forms of Term paguidance Participa Formal: Content: Forms of Homewood	information programmer in gineering programmer in grammer in gramm	rocurement roject planning (n ation strategies on of project goals of all available soon ance anning "mileston iner. ne	milestor s urces of	ese goals ork step te of the nes)	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
4	Contents - Ir - D - Ir - Sr - C - Pr - Q Forms of Term paguidance Participa Formal: Content: Forms of Homework Prerequise	information programmering programmering programmering programmering programmering in the prog	rocurement roject planning (n ation strategies on of project goals of all available sou anning "mileston iner. ne ne nation examination rd of credit points:	milestor surces of	ese goals ork step te of the	s can be s and so cir work.	achieved a	andhow. vritten form	nand pres		
5	Contents - Ir - Er - D - Ir - Sr - C - Pr - Q Forms of Term paguidance Participa Formal: Content: Forms of Homewood Prerequisi Module	information programmering programmering programmering programmering programmering in the prog	rocurement roject planning (n ation strategies on of project goals of all available soon ance anning "mileston iner. ne	milestor surces of	ese goals ork step te of the	s can be s and so beir work.	achieved a	andhow. vritten form	nand pres		
4 5 7	Contents - Ir - Er - D - Ir - Si - C - Pr - Q Forms of Term paguidance Participa Formal: Content: Forms of Homeway Prerequis Module Application	he students unitically reflective information programmering processing of solumplementation trategic used communication resentation quality as sural teaching: aper with place by an example interpretation programmer in Normal	rocurement roject planning (n roin strategies ro of project goals of all available sou rince rin	milestor surces of nes" an assessm g study p	ese goals ork step te of the	s can be s and so beir work.	achieved a	andhow. vritten form	nand pres		
4 5 7	Contents In Contents In Contents In Contents Price Contents Contents Participa Formal: Content: Forms of Homework Prerequis Module Application Enginee Important	he students uritically reflective information programmering processing of solumplementation trategic used communication resentation reality assuration requiremed. Non Non Sassessment: Ork or combinate for the aware examination of the modering Computation of the grade of the gr	rocurement roject planning (n ation strategies on of project goals of all available sou ance anning "mileston iner. nts: ne ne nation examination rd of credit points: pass and course a ule (in the following	milestor surces of nes" an assessm g study p	ese goals ork step te of the	s can be s and so beir work.	achieved a	andhow. vritten form	nand pres		
4 5 7 8	Contents - Ir - Er - D - Ir - Sr - C - Pr - Q Forms of Term paguidance Participal Formal: Content: Forms of Homework Prerequise Module Application Engineer Importar according	he students unitically reflective information programmering processing of solumplementation trategic used communication resentation quality as sural teaching: aper with place by an example interpretation programmer in Normal	rocurement roject planning (n roin strategies ro of project goals of all available sou rince rin	milestor surces of nes" an assessm g study p	ese goals ork step te of the	s can be s and so beir work.	achieved a	andhow. vritten form	nand pres		

11 Other information:

Faculty tutoring is provided in each case by an examiner from the study programme, whom the student can select himself or herself according to the topic. All lecturers in the programme should each provide several topics in time for the winter semester.

If, at the proposal of the examiner, the course work is carried out as a joint project by several students, the examiner is responsible for ensuring that a clearly defined, significant and assessable share of the work is determined in advance for each student in the group.

In a discussion with the examiner, the expected scope and form of the work is determined at the beginning of the student research phase.

12 Language:

German

Tea	m Project:	Engineering (Computer Scienc	es					PINI		
	tification	Workload:	Credits:	Stud	y semes	ter:	Frequenc	y of the offer	Duratio	on:	
num 1218		150 h	5	5 3rd s			Annual (Winter)	1 sem	1 semester	
1	Course:		Planned group s	Planned group sizes		Scope		Actual contact time / classroom teaching		ły	
	Lecture		60 students		0	SCH	0	h h	0	h	
	Sem. less	ons	30 students		0	SCH	0	h	0	h	
	Exercise		20 students		0	SCH	0	h	0	h	
	Practical	or seminar	15 students		2	SCH	30	h	120	h	
	Supervise	ed self-study	60 students		0	SCH	0	h	0	h	
2	Learning	outcomes/com	petences:								
3	- bu re re si - ca si - di te - so - ju - jo - lo - Pi - Di - Mi - Ai - Iri - Di - Pi - Pi - Pi - Pi - Pi - Pi - P	reak down the sponsible for arry out project planning development of the sponsible for arry out project planning development of the sponsible for a sponsible	a specific project e project into sub the content and to the content and to the content and to the content and to the content and present respondent and present respondent and imple, kinematics, pand and identificate in into subproblemaning at team and terfaces between nofthe necessary and decision-rand documentation and documentation	tasks, d timely in her, def plement derstan sults. tation. lementa th plan ion of re is and th subgro the sub y softwa from dei naking b	ation of hing and equirem neir disupleve agroups are com	a given l control lords and their rol	anage delaware con e in the te project in level) Itarget sp	imited tasks aponents and amand take a team(e.g. ecifications pups of the te	independent indebugt. respons	dently in hemin the	
4		teaching:									
_		roject in the l									
5		tion requiremen									
	Formal:	Non		1		1 1	1				
<i>(</i>	Content:		ic electronics and	1 progra	mming	knowle	age				
6		assessment:	tion oversies - ti	om o 1	O.V.C :	otic -					
7			tion examination	or oral	examın	ation					
7		examination	rd of credit points:								
	would	CAMBINIALION	11488								
8	Applicati		ale (in the following	o study n	roorami	nes)					

9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Prof. Dr. rer. nat. Axel Schneider
11	Other information:
	Literature will be announced at the beginning of the course.
12	Language:
	German

Тес	hnical Eng	lish 1							FSE1	
	tification	Workload:	Credits:	Study	y semest	er:	Frequency	of the offer	Duratio	n:
num 1083		150 h	5	5 1sts sem		er3 rd	Annual (Winter)		1 semester	
1	Course:		Planned group s	Planned group sizes		<u>.</u>	Actual contact time / classroom		Self-study	
	Lecture				0	SCH	teaching 0	h	0	h
	Sem. less	ons	30 students		4	SCH	60	h	90	h
	Exercise				0	SCH	0	h	0	h
	Practical	or seminar			0	SCH	0	h	0	h
	Supervise	ed self-study	30 students		0	SCH	0	h	0	h
3	- Se pro- Pro- Pro- Pro- Pro- Pro- Pro- Pro- P	ocial compet resentations, t lethodologica nalysis of tech way that is ap ersonal comp esearch and st	etail in English bence: They try eamwork and pro il competence: The inical texts and for propriate for the etence: They are ructure authentic	out an ojectwo hey use or solvin target ge able t	d consork. e targete ng conte group. o take al, organ	olidate of strate extual tast responsise work	gies for co sks. They sibility for kloads and	ontent acquican present	nisition ar technica	nd critica lissues in
	- T di m tr - T di	hey master the imensions and aterials; manuansmission). They possess iscussing diag	ne core termino d shapes; math afacturing and au interdisciplinary	logy of ematica itomatic	the teal opera on; ener	chnical tions; fo gy and e	topic (e.gorces and electricity;	mechanis logistics; d	ms; prop	perties of essing and
4	Sem. les	teaching: sons, individer project (Ass	ual and group wo	ork, etc.						
5	Participa	t ion requiremer	nts:							
-	Formal:	Non	e							
	Content:		lish language con nework for Langu		e: B1.2	(accord	ing to the	European F	Reference	;
	F			6-5)						
5		assessment:								

7	Prerequisite for the award of credit points:
	70% attendance and active participation; passed semester project and written exam
8	Application of the module (in the following study programmes)
	Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng. and Renewable Energies
	B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Dr. phil. Anna Trebits
11	Other information:
	Literature will be announced at the beginning of the course. Textbook, additional
	materials, intranet self-study courses
12	Language:
	English

	nnical Eng	lish 2							FSE2	
	ification	Workload:	Credits:	Study	y semest	er:	Frequenc	y of the offer	Duration	on:
numb 1086		150 h	5		semeste emeste		Annual (Summer)		1 semester	
1	Course:		Planned group s	Planned group sizes		Scope		contact lassroom	Self-study	
	Lecture				0	SCH	teachin 0	h	0	h
	Sem. less	sons	30 students		4	SCH	60	h	90	h
	Exercise				0	SCH	0	h	0	h
	Practical	or seminar			0	SCH	0	h	0	h
	Supervise	ed self-study	30 students		0	SCH	0	h	0	h
	 Business English. Social competence: they develop sensitivity to differences in intercultural communicative specially in English-speaking business environments. Methodological competence: They are able to skim technical texts for essential informative. They present themshortly and concisely, both in speaking and in writing. They establish with contexts and make a critical assessment. Personal competence: They show English fluency and a pro-active approach to managina authentic English sources. 									
3		uthentic Engli				ency ar	nd a pro-	active appr	oach to	managing
3	Contents - Stude - They automat - They econom	ents can active master the con ted systems; di possess intentic sectors, ma		enternat or dealings and tr lls (e.g.	ional cong with rends).	onference problem et manag	es. -oriented	case studies	s (e.g. Inc	lustry 4.0;
3	Contents - Stude - They automat - They econom academi	ents can active master the con ted systems; di possess intendic sectors, ma ic writing; per	ly participate in ite terminology for iscussing reading redisciplinary skill anufacturing prosuasion strategie	internator dealings and trills (e.g. o- cesses).	ional cong with rends).	onference problem et manag	es. -oriented	case studies	s (e.g. Inc	lustry 4.0;
4	Contents - Stude - They automat - They econom academi Forms of Sem. les Seminar	ents can active master the conted systems; di possess intenic sectors, maic writing; per feaching:	ly participate in it reterminology for iscussing reading redisciplinary skill anufacturing prosuasion strategies uasion strategies ual and group words gnment)	internator dealings and trills (e.g. o- cesses).	ional cong with rends).	onference problem et manag	es. -oriented	case studies	s (e.g. Inc	lustry 4.0;
	Contents - Stude - They automat - They econom academi	ents can active master the conted systems; di possess intenic sectors, maic writing; per sons, individu project (Assistion requirement	ly participate in it re terminology for iscussing reading redisciplinary skill and facturing prosuasion strategies uasion strategies and group words and group words gnment)	enternator dealings and trills (e.g. o- cesses).	ional cong with rends).	onference problem et manag	es. -oriented	case studies	s (e.g. Inc	lustry 4.0;
4	Contents - Stude - They automat - They econom academi Forms of Sem. les Seminar	ents can active master the conted systems; dipossess interior sectors, maic writing; per sectors, individual project (Assistion requirement Modulo85 Engl	ly participate in ite terminology for iscussing reading redisciplinary skil anufacturing prosuasion strategies uasion strategies uasion strategies. Its: Italiand group words and group words and group words and group words and group words. Its: Italiand group words and	internator dealings and trills (e.g. o-cesses).	ional cong with ends). projectes; pitc	onference problement manag hing a t	esoriented gement; beechnical	case studies usiness pla product; co	s (e.g. Inc	dustry 4.0; narketing; e posters;
4	Contents - Stude - They automat - They econom academi Forms of Sem. les Seminar Participa Formal:	ents can active master the conted systems; dipossess interior sectors, maic writing; per sectors, individual project (Assistion requirement Modulo85 Engl	ly participate in it the terminology for iscussing reading redisciplinary skill and facturing prosuasion strategies uasion strategies and group words and group words and group words. It is: It is: It is: Technical Engli	internator dealings and trills (e.g. o-cesses).	ional cong with ends). projectes; pitc	onference problement manag hing a t	esoriented gement; beechnical	case studies usiness pla product; co	s (e.g. Inc	dustry 4.0; narketing; e posters;

	70% attendance and active participation, passed semester project and written exam
8	Application of the module (in the following study programmes)
	Electrical Engineering B.Eng., Engineering Computer Sciences B.Eng. and Renewable Energies
	B.Eng.
9	Importance of the grade for the final grade:
	according to BRPO
10	Module Coordinator:
	Dr. phil. Anna Trebits
11	Other information:
	Literature will be announced at the beginning of the course. Textbook, course
	supplementary materials, self-study courses
	Study programmes in Electrical Engineering, Engineering Computer Sciences, Renewable Energies:
	Elective subject
12	Language:
	English

	oretical Co	mputer Scien	ce						THINF		
	Identification Workload:		Credits:	Study	semest	er:	Frequency	of the offer	Duration	Duration:	
number: 1404		150 h	5	5th s	sem.		Annual (Winter)		1 semester		
1	Course:		Planned group sizes		Scope		Actual contact time / classroom teaching		Self-study		
	Lecture		60 students	2 SCH		30 h		45 h			
	Sem. lessons		30 students		2	SCH	30	h	45	h	
	Exercise		20 students		0	SCH	0	h	0	h	
		or seminar	15 students		0	SCH	0	h	0	h	
	Supervised self-study		60 students petences:		0	SCH	0	h	0	h	
3	 They are able to classify formal languages and place them in the Chomsky hierarchy Students are able to explore the various types of automata, including DFAs, NFAs, pushdown automata, LBAs and Turing machines, including various forms of representation They are able to analyse the relationships between the different types of formal languages, grammars and automata Students are able to explain the basics of O-notation, space and time complexity, and reducibility They are familiar with worst-case complexity classes and their relationships and can use abstract analysis and examples to understand themup to the millennium problem P-NP Selected proofs are familiar to students; in case of constructive proofs, they can carry out the related constructions independently Students are able to use the acquired knowledge to evaluate algorithms Contents: Alphabets, words, languages, grammars Regular expressions Chomsky hierarchy DFAs, NFAs, PDAs, DPDAs, LBAs, DTMs, NTMs O-notation Space and time complexity Worst-case complexity classes Many-one reductions The millennium P-NP problem 										
		teaching: practical exer	rcises								
4		tion requiremen									
5			113.								
	Formal: Content:		Basic knowleBasic knowleBasic knowle	edge of	fanalys	is		s and Data	Structure	s"	
	Formal: Content: Forms of	assessment:	Basic knowleBasic knowle	edge of edge fr	fanalys	is		s and Data	Structure	s"	
5	Formal: Content: Forms of Written Prerequis	assessment: examination of	Basic knowle Basic knowle Basic knowle or oral examinatio d of credit points:	edge of edge fr	fanalys	is		s and Data	Structure	s"	
6	Forms of Written Prerequis Module	assessment: examination of the awar examination	Basic knowle Basic knowle Basic knowle or oral examinatio d of credit points:	edge of edge fr	fanalys omthe	is lecture"		s and Data	Structure	s"	
6	Formal: Content: Forms of Written Prerequis Module Application	Cassessment: examination of the awar examination of the modularing Computer	Basic knowle Basic knowle Basic knowle or oral examinatio d of credit points: pass le (in the following or Sciences Compter)	edge of edge from	fanalys omthe	is lecture "		s and Data	Structure	s"	
6	Formal: Content: Forms of Written Prerequis Module Applicati Enginee Importan	Cassessment: examination of the awar examination of the modularing Computer	 Bas ic knowle Bas ic knowle Bas ic knowle or oral examination d of credit points: pass le (in the following) 	edge of edge from	fanalys omthe	is lecture "		s and Data	Structure	s"	

11	Other information:
12	Language:
	German

Elective Module								WM				
Ident	ification	Workload:		Credits:	Study semester: Frequency of the off				of the offer	Duration:		
numl 9001		150 h		5	4th/5th/6th s em.			each semester		1 semester		
9001												
1	Course:		P	Planned group sizes		es Scope		Actual contact time / classroom teaching		Self-study		
	Lecture		60	60 students			SCH	- vewening	h		h	
	Sem. lesse	ons	30	30 students			SCH		h		h	
			1			0	CCII	0	1	0	1	
	Exercise			0 students 5 students		0	SCH SCH	0	h h	0	h h	
	Practical or seminar		1.	15 students		U	SCII	U	11	U	11	
	Supervised self-study		60	60 students			SCH		h		h	
2	Learning	outcomes/com	pete	nces:					<u> </u>			
3	Contents:											
4	Forms of teaching:											
5	Participation requirements:											
	Formal:											
	Content:											
6	Forms of assessment:											
7	Prerequisi	ite for the awai	d of	credit points:								
8	Applicati	Application of the module (in the following study programmes)										
-	~ ~	Engineering Computer Sciences B.Eng.										
9		ce of the grade										
10	Module C	Coordinator:										
		Prof. DrIng. Lutz Grünwoldt										
11	Other info	ormation:										
12	Language	:										
German												