

# Subdivided Module Catalogue for the Subject

# Artificial Intelligence

as a Master's with 1 major with the degree "Master of Science" (120 ECTS credits)

Examination regulations version: 2024 Responsible: Faculty of Mathematics and Computer Science Responsible: Institute of Computer Science

JMU Würzburg • generated 18-Jun-2025 • exam. reg. data record 88|jo5|-|-|H|2024



### **Course of Studies - Contents and Objectives**

The Artificial Intelligence programme leading to the degree of Master of Science (MSc) is offered by the Faculty of Mathematics and Computer Science of JMU as a research-based course in the framework of a consecutive Bachelor's/Master's model.

The aim of the course is to provide students with advanced skills and competencies for the analysis, development and evaluation of artificial intelligence (AI) systems. By training these skills, students should be able to independently apply, expand and deepen the basic knowledge they have already acquired in the bachelor's degree program "Artificial Intelligence and Data Science" in a consecutive bachelor-master study model, as well as to take on new tasks transmitted. This should later enable them to demonstrate methodological competence, creativity and flexibility in finding solutions in the diverse areas of responsibility presented to them in our society and, in particular, to use AI methods.

The course can be studied entirely in German. In order to make the course attractive for foreign students, it can also be studied entirely in English. All compulsory modules and the final thesis are therefore offered in parallel in both German and English. With regard to the compulsory elective area, a sufficient number of modules are available in both German and English (the compulsory elective modules are sometimes offered in parallel in both German and English, and sometimes exclusively in German or English). Internationalization is further promoted by providing support in arranging study places for one semester at selected foreign universities, thereby making it possible to obtain a double master's degree in combination with these foreign universities in individual cases.



## Abbreviations used

Course types:  $\mathbf{E}$  = field trip,  $\mathbf{K}$  = colloquium,  $\mathbf{O}$  = conversatorium,  $\mathbf{P}$  = placement/lab course,  $\mathbf{R}$  = project,  $\mathbf{S}$  = seminar,  $\mathbf{T}$  = tutorial,  $\ddot{\mathbf{U}}$  = exercise,  $\mathbf{V}$  = lecture

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

## Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

## Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

### In accordance with

the general regulations governing the degree subject described in this module catalogue:

#### ASPO2015

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

#### 16-May-2024 (2024-49)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

## The subject is divided into

Abbreviation	Module title		Method of	nage
			grading	pase
Compulsory Courses (35 E	CTS credits)	2		
10-AI=IAI-242-m01	Introduction in Al	5	NUM	22
10-AI=ML-242-m01	Machine Learning	5	NUM	25
10-AI=SEM1-242-m01	Seminar Artificial Intelligence	5	NUM	31
10-Al=P1-242-m01	Al Project 1	10	NUM	28
10-Al=P2-242-m01	Al Project 2	10	NUM	29
Compulsory Electives (55 E	CTS credits)			
KI Methods (20 ECTS cree	dits)			
10-Al=DS1-242-m01	Data Science 1	5	NUM	20
10-Al=DS2-242-m01	Data Science 2	5	NUM	21
10-AI=AML1-242-m01	Advanced Machine Learning 1	5	NUM	14
10-AI=AML2-242-m01	Advanced Machine Learning 2	5	NUM	15
10-AI=NLP1-242-m01	Natural Language Processing 1	5	NUM	26
10-AI=NLP2-242-m01	Natural Language Processing 2	5	NUM	27
10-AI=TAI1-242-m01	Theory of Artificial Intelligence 1	5	NUM	33
10-AI=TAI2-242-m01	Theory of Artificial Intelligence 2	5	NUM	34
10-Al=CV1-242-m01	Computer Vision 1	5	NUM	16
10-Al=CV2-242-m01	Computer Vision 2	5	NUM	18
10-I=MLN1-232-m01	Machine Learning for Networks 1	5	NUM	56
10-I=MLN2-232-m01	Machine Learning for Networks 2	5	NUM	58
10-I=IP-222-m01	Image Processing and Computational Photography	5	NUM	50
10-I=RLCDM-232-m01	Reinforcement Learning and Computational Decision Making	5	NUM	62
10-I=MNLP-232-m01	Multilingual NLP	5	NUM	60
10-AI=AKAIM1-242-m01	Selected Topics in Al Methods 1	5	NUM	11
10-AI=AKAIM2-242-m01	Selected Topics in Al Methods 2	5	NUM	12
General KI Applications (	10 ECTS credits)			
10-l=3D-232-m01	3D Point Cloud Processing	5	NUM	40
10-LURI=PHO-	Photogrammetric Machine Vision	E	NUM	72
TO-232-m01		,		/2
10-LURI=AMS-232-m01	Autonomous Mobile Systems	10	NUM	70
10-LURI=R01-232-m01	Robotics 1	5	NUM	73
10-LURI=R02-232-m01	Robotics 2	10	NUM	75
10-I=DB2-242-m01	Databases 2	5	NUM	44
10-I=DRLOC-221-m01	Deep Reinforcement Learning for Optimal Control	5	NUM	47
10-I=IR-242-m01	Information Retrieval	5	NUM	52
10-AI=SAC-242-m01	Self-aware Computing	5	NUM	30
10-l=lCG-232-m01	Interactive Computer Graphics	5	NUM	49
07-MLBI-202-m01	Machine Learning in Bioinformatics	5	NUM	10
10-AI=AKAKI-242-m01	Selected Topics in AI Application & Technologies	5	NUM	13
10-I=MIR-232-m01	Music Information Retrieval	5	NUM	55
10-l=RRS-232-m01	Remote Sensing	5	NUM	63
10-AI=SEM2-242-m01	Seminar AI Applications	5	NUM	32

Master's with 1 major Artificial Intelligence (2024)

JMU Würzburg • generated 18-Jun-2025 • exam. reg. data record Master (120 ECTS) Künstliche Intelligenz - 2024

KI Applications form App	lication-oriented Subjects							
04-GEO-OMA23-242- m01	Information sciences in Remote Sensing	5	NUM	8				
04-GEO-OMA25-242- m01	Al approaches in Earth Observation	5	NUM	9				
12-M-EAI-242-m01	Enterprise Al	5	NUM	79				
12-M-DSS-242-m01	Decision Support Systems	5	NUM	77				
03-M-KI-242-m01	Medical AI Applications	5	NUM	6				
Computer Science	Computer Science							
10-I=ST-232-m01	Discrete Event Simulation	5	NUM	68				
10-l=SSS-232-m01	Security of Software Systems	5	NUM	66				
10-I=DDB-212-m01	Deductive Databases	5	NUM	45				
10-I=LP-212-m01	Logic Programming	5	NUM	53				
10-I=SB-212-m01	Systems Benchmarking	5	NUM	64				
10-I=APR-212-m01	Advanced Programming	5	NUM	42				
10-I=AKII-232-m01	Selected Topics in Computer Science	5	NUM	41				
10-HCI-PRIS-212-m01	Principles of Interactive Systems	5	NUM	38				
10-HCI-MMI-212-m01	Multimodal Interfaces	5	NUM	36				
10-HCl-3DUl-212-m01	3D User Interfaces	5	NUM	35				
Master Project Modules (	Master Project Modules (30 ECTS credits)							
10-AI=MA-242-m01	Master's Thesis Artificial Intelligenz	25	NUM	23				
10-AI=MK-242-m01	Concluding Colloquium Artificial Intelligence	5	B/NB	24				

Module	e title				Abbreviation		
Medical AI Applications			03-M-Kl-242-m01				
Module	e coord	inator		Module offered by			
Institut	e of Cli	nical Epidemiology an	d Biometry (ICE-B), hol-	Institute of Clinical	Epidemiology and B	iometry (ICE-	
der of t	he Pro	fessorship for Medical	informatics	B)		-	
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)			
5	nume	rical grade					
Duratio	on stor	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten		• 1 1	· · · · · · · · · · · · ·	· ·· · · · · · · ·	• 1, • 1	<u> </u>	
pics an such as medica presen iatry ar Moodle	id initia s health al data ted and id its ir	illy focuses on fundam ncare systems and eth will be discussed. Exar d analyzed. These exar itegration into clinical es with case studies or	ental knowledge that is ics. In addition, specific nples of projects at the nples will demonstrate trials. To enhance learn n each topic covered.	crucial for understa applications of mac University Hospital the impact of Al on r ing and engagement	nding the role of Al i chine learning in the of Würzburg that use neuroimaging, neuro t, the course include	n healthcare, analysis of Al will be logy, psych- s interactive	
Intend	ed lear	ning outcomes					
The mo cal insi standir se tech cal data transfo of the u assess	The module "Artificial Intelligence in Medicine" aims to provide students with a solid understanding and practi- cal insights into the application of AI in medical practice. Students develop professional competence by under- standing the basic principles and applications of AI in medicine, including the evaluation and integration of the- se technologies into existing systems. They acquire methodological competence by learning to interpret clini- cal data and recognize the relevance of different data formats without engaging in programming or detailed data transformation. In addition, they develop social competence by discussing and reflecting on the ethical aspects of the use of AI and promote personal competence by fostering critical thinking and the ability to independently						
Course	<b>s</b> (type	, number of weekly cor	ntact hours, language –	- if other than Germa	ın)		
V (2) + Module	Ü (2) e taugh	t in: German and/or Er	iglish				
Metho ster, in	<b>d of as</b> format	sessment (type, scope ion on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-	
Written If anno examin prox. 19 Langua credita	Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English						
Allocat	ion of <sub>l</sub>	olaces					
50 (lot)							
Additio	onal inf	ormation					
Worklo	ad						
150 h							
Teachi	ng cycl	e					
Teachi	ng cycle	e: winter semester					
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)			
			<u> </u>	<u> </u>			
Module	e appea	ars in					
Master's w	ith 1 majo	r Artificial Intelligence (2024)	JMU Würzburg • ta record Master	9 generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 6 / 80	

Master's degree (1 major) Artificial Intelligence (2024)

Module	e title				Abbreviation
Informa	ation so	ciences in Remote Sensi	ıg		04-GEO-OMA23-242-m01
Module	e coord	inator		Module offered by	
				Institute of Geograp	ohy and Geology
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Intende	ed lear	ning outcomes			
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
S (1) +	Ü (1)				
Module	e taugh	t in: English			
Metho ster, in	<b>l of ass</b> formati	s <b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
a) pres	entatio	n (approx. 30 minutes) o	r		
b) prep	aring a	poster (approx. 10 hours	s total) or		
c) term	paper ge of a	(15 pages) ssessment: English or Ge	erman (assessment w	ill he held in English	in addition the examiner may
where	ossibl	e, decide to hold assess	ment in German)		, in addition, the examiner may,
credita	ble for	bonus			
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
150 h					
Teachi	ng cycl	e			
Referre	d to in	LPO I (examination regu	lations for teaching-c	legree programmes)	
Module	e appea	irs in			
Master	's degr	ee (1 major) Artificial Inte	lligence (2024)		
Master	's degr	ee (1 major) Applied Eartl	h Observation and Ge	oanalysis (EAGLE) (2	2024)

Module	e title				Abbreviation
Al appr	oaches	in Earth Observation			04-GEO-OMA25-242-m01
Module	e coord	inator		Module offered by	
	<u> </u>			Institute of Geograp	bhy and Geology
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Intende	ed learr	ning outcomes			
Course	<b>s</b> (type,	, number of weekly conta	ct hours, language —	if other than Germa	n)
S (1) + l	Ü (1)				
Module	taugh	t in: English			
Method ster, in	<b>l of ass</b> formati	<b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
a) pres	entatio	n (approx. 30 minutes) o	r		
b) prep	aring a	poster (approx. 10 hours	s total) or		
c) term	paper ge of a	(15 pages) ssessment: English or Ge	erman (assessment w	ill he held in English	in addition, the examiner may
where p	ossibl	e, decide to hold assessi	nent in German)		, in addition, the examiner may,
credita	ble for	bonus			
Allocat	ion of p	olaces			
Additio	nal info	ormation			
Worklo	ad				
150 h					
Teachi	ng cycl	9			
Referre	d to in	LPO I (examination regu	lations for teaching-d	legree programmes)	
Module	appea	rs in			
Master	's degre	ee (1 major) Artificial Inte	lligence (2024)		
Master	's degre	ee (1 major) Applied Earth	n Observation and Ge	oanalysis (EAGLE) (2	2024)

Module	e title				Abbreviation		
Machine Learning in Bioinformatics 07-MLBI-202-m01					07-MLBI-202-m01		
Module	e coord	inator		Module offered by			
holder	of the (	Chair of Bioinformatics		Institute of Comput	er Science		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)			
5	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	ts						
Machir se we s cal que	ne learn shed lig estions.	ing are powerful comput ht on several different m	ational methods with achine learning appro	numerous applicati baches and discuss	on in bioinformatics. In this cour- how they help to answer biologi-		
Intend	ed lear	ning outcomes					
Knowle compe	edge ab tence te	out the different concept o apply this for solving bi	s and techniques of r oinformatical questic	machine learning an ons.	d big data analysis as well as the		
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	· if other than Germa	n)		
V (2) + Module	Ü (2) e taugh	t in: English					
Metho ster, in	<b>d of ass</b> formati	<b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
Written If anno examir prox. 19 Langua credita	Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English						
Allocat	ion of p	olaces					
10 plac lot.	es. Sho	ould the number of applic	cations exceed the nu	Imber of available p	laces, places will be allocated by		
Additio	onal inf	ormation					
Worklo	ad						
150 h							
Teachi	ng cycl	e					
Referre	ed to in	LPO I (examination regu	lations for teaching-c	legree programmes)			
Module	e appea	ars in					
Master	's degr	ee (1 major) eXtended Art	ificial Intelligence (xt	Al) (2020)			
Master	's degr	ee (1 major) Artificial Inte	lligence & Extended	Reality (2024)			
master	5 uegl	ee (1 major) Artificial fille	(115CHCC (2024)				

Module	title				Abbreviation
Selecte	d Topi	cs in Al Methods 1			10-AI=AKAIM1-242-m01
Module	coord	inator		Module offered by	
Dean of	fStudie	es Informatik (Computer S	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Selecte	d Topio	s in Al Methods.			
Intende	ed learr	ning outcomes			
The stu to comp	dents p olex pro	oossess an advanced kno oblems in this area and to	owledge in the area o o transfer them to rela	f Al Methods. They a ated questions.	re able to understand solutions
Course	s (type,	number of weekly conta	ct hours, language —	if other than Germa	n)
V (2) +	Ü (2)	,			-
Module	taugh	t in: German and/or Engl	ish		
Method ster, inf	<b>l of ass</b> formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
a) writte b) proje the top c) oral e	en exar ect worl ic or examin	nination (approx. 60 to 9 k: report (approx. 20 pag ation of one candidate es	o minutes) or es) with presentation ach (approx. 20 minu	(30 to 45 minutes) a tes) or	and subsequent discussion on
Langua credital	ge of a ble for	ssessment: German and, bonus	or English	15 minutes per can	
Allocat	ion of p	olaces			
			-		
Additio	nal info	ormation			
Worklo	ad				
150 h					
Teachir	ng cycl	9			
Teachir	ng cycle	e: if announced			
Referre	d to in	LPO I (examination regu	lations for teaching-c	legree programmes)	
Module	e appea	rs in			
Master'	s degre	ee (1 major) Artificial Inte	lligence (2024)		
Master'	s degre	ee (1 major) Mathematica	l Data Science (2025	)	

Module	title				Abbreviation
Selecte	d Topi	cs in Al Methods 2			10-AI=AKAIM2-242-m01
Module	coord	inator		Module offered by	
Dean of	fStudie	es Informatik (Computer S	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Selecte	d Topio	s in Al Methods.			
Intende	ed learn	ning outcomes			
The stu to comp	dents p olex pro	oossess an advanced kno oblems in this area and to	owledge in the area o o transfer them to rel	f Al Methods. They a ated questions.	re able to understand solutions
Course	s (type	number of weekly conta	ct hours, language —	if other than Germa	n)
V (2) +	Ü (2)				
Module	taugh	t in: German and/or Engl	ish		
Method ster, inf	<b>l of ass</b> formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
a) writte b) proje the top c) oral e	en exar ect worl ic or examin	nination (approx. 60 to 9 k: report (approx. 20 pag ation of one candidate et	o minutes) or es) with presentation ach (approx. 20 minu	(30 to 45 minutes) a tes) or	and subsequent discussion on
Langua credital	ge of a ble for	ssessment: German and, bonus	or English	. 15 minutes per can	
Allocat	ion of p	olaces			
Additio	nal info	ormation			
Worklo	ad				
150 h					
Teachir	ng cycl	9			
Teachir	ng cycle	e: if announced			
Referre	d to in	LPO I (examination regu	lations for teaching-c	legree programmes)	
Module	appea	rs in			
Master'	s degre	ee (1 major) Artificial Inte	lligence (2024)		
Master'	s degre	ee (1 major) Mathematica	l Data Science (2025	)	

Module	title				Abbreviation		
Selected Topics in AI Application & Technologies			10-AI=AKAKI-242-m01				
Module	coord	inator		Module offered by			
Dean of	f Studie	es Informatik (Computer S	Science)	Institute of Comput	er Science		
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)			
5	nume	rical grade					
Duratio	n	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	ts						
Selecte	d Topi	cs in AI application & tech	nnologies				
Intende	ed learı	ning outcomes					
Studen <sup>®</sup> lutions	ts unde to com	erstand the basic approac plex problems in these a	ch to AI applications reas and transfer the	and AI technologies. m to related issues.	. They are able to understand so-		
Course	s (type	number of weekly conta	ct hours, language —	if other than Germa	n)		
V (2) +	Ü (2)						
Module	taugh	t in: German and/or Engli	ish				
Method ster, inf	<b>l of ass</b> formati	e <b>ssment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
a) writte b) proje the top c) oral e d) oral o Langua credital	<ul> <li>a) written examination (approx. 60 to 90 minutes) or</li> <li>b) project work: report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic or</li> <li>c) oral examination of one candidate each (approx. 20 minutes) or</li> <li>d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate).</li> <li>Language of assessment: German and/or English</li> </ul>						
Allocat	ion of p	olaces					
Additio	nal inf	ormation					
Worklo	ad						
150 h							
Teachir	ng cycl	e					
Teachir	ng cycle	e: if announced					
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)			
		<u> </u>		<u> </u>			
Module	appea	irs in					
Master'	s degr	ee (1 major) Artificial Inte	lligence (2024)				
Master'	s degr	ee (1 major) Mathematica	l Data Science (2025	)			

Module title			Abbreviation			
Advanced Machine Learning 1			10-Al=AML1-242-m01			
Module coordinator		Module offered by				
Dean of Studies Informatik (Computer	Science)	Institute of Comput	er Science			
ECTS Method of grading	Only after succ. com	pl. of module(s)				
5 numerical grade						
Duration Module level	Other prerequisites					
1 semester graduate						
Contents						
Advanced topics in machine learning. I In-depth knowledge of complex machin best practices are taught.	For example, method ne learning algorithm	s of data preparatior s and models as wel	n, generation and augmentation. Il as their implementation and			
Intended learning outcomes						
Students possess the theoretical know le to put complex methods into practic	ledge of advanced m e to solve problems i	ethods and models n the field of machin	of machine learning. They are ab- le learning.			
<b>Courses</b> (type, number of weekly conta	ct hours, language —	· if other than Germa	n)			
V (2) + Ü (2)						
Module taught in: German and/or Engl	ish					
<b>Method of assessment</b> (type, scope, la ster, information on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-			
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additional information						
Workload						
150 h						
Teaching cycle						
Teaching cycle: if announced						
Referred to in LPO I (examination regu	lations for teaching-c	legree programmes)				
Module appears in						
Master's degree (1 major) Artificial Inte	lligence (2024)					

Module title			Abbreviation			
Advanced Machine Learning 2			10-Al=AML2-242-m01			
Module coordinator		Module offered by				
Dean of Studies Informatik (Computer	Science)	Institute of Comput	er Science			
ECTS Method of grading	Only after succ. com	pl. of module(s)				
5 numerical grade						
Duration Module level	Other prerequisites					
1 semester graduate						
Contents						
Advanced topics in machine learning. F In-depth knowledge of complex machin best practices are taught.	For example, methods ne learning algorithm	s of data preparatior s and models as wel	n, generation and augmentation. Il as their implementation and			
Intended learning outcomes						
Students possess the theoretical know le to put complex methods into practic	ledge of advanced m e to solve problems i	ethods and models n the field of machin	of machine learning. They are ab- le learning.			
<b>Courses</b> (type, number of weekly conta	ct hours, language —	· if other than Germa	n)			
V (2) + Ü (2)						
Module taught in: German and/or Engl	ish					
<b>Method of assessment</b> (type, scope, la ster, information on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-			
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additional information						
Workload						
150 h						
Teaching cycle						
Teaching cycle: if announced						
Referred to in LPO I (examination regu	lations for teaching-c	legree programmes)				
Module appears in						
Master's degree (1 major) Artificial Inte	lligence (2024)					

Modul	e title				Abbreviation	
Computer Vision 1			10-Al=CV1-242-mo	1		
Module coordinator Module offered by						
holder	of the (	Chair of Computer Scie	nce IV	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	<b>;</b>		
1 seme	ster	graduate				
Conter	Its					
The lec	ture pro	ovides knowledge abo as the most recent ap	ut current methods and proaches to image repr	l algorithms in the fi resentation, image p	eld of computer vision rocessing and image	on. Important analysis are
taught		us the most recent up		esentation, mage p		anatysis are
Topics	include	e data representation,	mage acquisition, rest	oration and enhance	ment, features, obje	ect modeling,
image	and vid	eo understanding, dee and mothods of mash	p learning and general	tive methods and ap	plications. grounds are procent	ad and thair
respec	tive apr	plications in Computer	Vision are shown.		giounus are present	eu allu theil
Intend	ed leari	ning outcomes				
Studer	its have	e fundamental knowled	lge of problems and te	chniques in the field	of computer vision a	and are able
to inde	pender	ntly identify and apply	suitable methods for co	oncrete problems.		
• (	)verviev	w of the most importan	t concepts of image rep	presentation, image a	analysis, machine lea	arning and
• (	Gaining	experience through ho	on me assignments, prac	tical computer and p	rogramming exercise	es
• F	Providin	g a sound solid backg	round knowledge for th	e advanced Comput	er Vision 2 course	
Course	<b>s</b> (type	, number of weekly cor	itact hours, language –	– if other than Germa	ın)	
V (2) +	Ü (2)					
Modul	e taugh	t in: English				
Metho ster, in	<b>d of ass</b> formati	<b>essment</b> (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
Writter	ı exami	nation (approx. 60 to 1	20 minutes)			
lf anno	unced	by the lecturer at the b	eginning of the course,	the written examina	tion may be replace	d by an oral
examir	nation o	of one candidate each ( res per candidate)	approx. 20 minutes) of	r an oral examinatior	i in groups of 2 cand	idates (ap-
Langua	age of a	ssessment: English				
credita	ble for	bonus				
Allocat	ion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teaching cycle						
Teachi	Teaching cycle: every year, summer semester					
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Modul	e appea	ars in				
Master	's degr	ee (1 major) Artificial Ir	telligence & Extended	Reality (2024)		
Master	's degr	ee (1 major) Artificial Ir	telligence (2024)			
Master	's degr	ee (1 major) Managemo	ent (2024)			
Master's w	ith 1 majoi	Artificial Intelligence (2024)	JMU Würzburg ta record Maste	• generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- igenz - 2024	page 16 / 80
					с т	

#### Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Information Systems (2024) Master's degree (1 major) Economathematics (2024) Master's degree (1 major) Information Systems (2025) Master's degree (1 major) Management (2025) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Economathematics (2025)

Module title					Abbreviation	
Compu	Computer Vision 2 10-AI=CV2-242-m01					
Module coordinator Module offered by				Module offered by		
holder	of the C	Chair of Computer Science	ce IV	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	lts					
The lecture provides knowledge about current state-of-the-art in the field of computer vision. The most recent ad- vances are taught. The topics that will be covered are: • review of computer vision • review of deep learning • classification, detection, recognition • motion and tracking • geometry and 2D/3D modeling • segmentation • lightfields and neural radiance fields • generative methods and diffusion models • transformers and foundation models • efficiency and explainability • applications State-of-the-art models and methods as well as their technical backgrounds are presented and their respective						
Intend	ed learr	ning outcomes				
Studen indepe • ( • F	<ul> <li>Students have advanced knowledge of problems and techniques in the field of computer vision and are able to independently identify and apply suitable methods for concrete problems.</li> <li>Overview of the main concepts and state-of-the-art machine learning models and algorithms from Computer Vision</li> <li>Hands-on experience through home assignments, practical computer and programming exercises</li> </ul>					
Course			act nours, language –		11)	
Module	o (2) e taugh	t in: English				
Metho ster, in	<b>d of ass</b> formati	essment (type, scope, la on on whether module c	anguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English creditable for bonus						
Allocation of places						
Additional information						
Workload						
150 h						
Teaching cycle						
Teachi	Teaching cycle: every year winter semester					
Master's w	ith 1 major	Artificial Intelligence (2024)	JMU Würzburg • ta record Maste	9 generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	ım. reg. da- genz - 2024	page 18 / 80

Referred to in LPO I (examination regulations for teaching-degree programmes)

#### Module appears in

Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Mathematical Data Science (2025)

Module title	Abbreviation				
Data Science 1	10-Al=DS1-242-m01				
Module coordinator		Module offered by			
Dean of Studies Informatik (Computer	Science)	Institute of Comput	er Science		
ECTS Method of grading	Only after succ. com	pl. of module(s)			
5 numerical grade					
Duration Module level	Other prerequisites				
1 semester graduate					
Foundations in the following areas: ap sualisation of large amounts of data. V	proaches to data acq Vorking with different	uisition, preprocess data types. Supervi	ing, management, storage and vi- sed and unsupervised learning		
Intended learning outcomes					
The students have the theoretical and data science and machine learning. Th ledge discovery with the methods taug data science algorithms.	practical knowledge o ey are able to solve p ht. They have gained	of typical procedures ractical problems of experience in the ap	s and algorithms in the field of data representation and know- oplication or implementation of		
Courses (type, number of weekly conta	act hours, language —	if other than Germa	n)		
V (2) + Ü (2) Module taught in: German and/or Engl	ish				
<b>Method of assessment</b> (type, scope, la ster, information on whether module c	anguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
Written examination (approx. 60 to 120 If announced by the lecturer at the beg examination of one candidate each (ap prox. 15 minutes per candidate). Language of assessment: German and creditable for bonus	o minutes) ;inning of the course, oprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-		
Allocation of places					
Additional information					
Workload					
150 h					
Teaching cycle					
Teaching cycle: if announced					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024)					

Module title	Abbreviation					
Data Science 2 10-AI=DS2-242-mo1						
Module coordinator		Module offered by				
Dean of Studies Informatik (Computer	Science)	Institute of Comput	er Science			
ECTS Method of grading	Only after succ. com	npl. of module(s)				
5 numerical grade						
Duration Module level	Other prerequisites					
1 semester graduate						
Contents						
Advanced models, approaches and mo knowledge discovery and knowledge e mation and knowledge from different of	ethods of data scienc extraction from data. ( data sources.	e, processing of stru Complex and specific	ctured and unstructured data, c algorithms for extracting infor-			
Intended learning outcomes						
The Students possess advanced theor perience in implementing models and	etical and practical ki algorithms for knowle	nowledge in the field edge discovery and k	l of data science and have the ex- knowledge extraction.			
Courses (type, number of weekly conta	act hours, language —	- if other than Germa	n)			
V (2) + Ü (2) Module taught in: German and/or Eng	lish					
<b>Method of assessment</b> (type, scope, la ster, information on whether module of	anguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-			
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English						
Allocation of places						
Additional information						
Workload						
150 h						
Teaching cycle						
Teaching cycle: if announced						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Artificial Intelligence (2024)						

Module title					Abbreviation
Introduction in AI					10-AI=IAI-242-m01
Module	e coord	inator		Module offered by	
Dean o	f Studie	es Informatik (Computer	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Essenti ging fro	ial conc om clas	epts and algorithms of a sical simple heuristic me	rtificial intelligence. T thods to more compl	Theoretical or praction ex probabilistic moc	cal competences are taught, ran- lels of artificial intelligence.
Intende	ed learı	ning outcomes			
The stu tify and	idents l I apply	nave theoretical and prac appropriate methods to s	tical knowledge in th solve problems in the	e field of artificial in field of AI.	telligence. They are able to iden-
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
V (2) + Module	Ü (2) e taugh	t in: German and/or Engl	ish		
Methor ster, in	<b>d of ass</b> formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Written If anno examin prox. 19 Langua credita	exami unced aation o 5 minut ge of a ble for	nation (approx. 60 to 12c by the lecturer at the beg of one candidate each (ap res per candidate). ssessment: German and, bonus	o minutes) inning of the course, oprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Worklo	ad				
150 h					
Teaching cycle					
Teaching cycle: every year, winter semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
§ 22 II Nr. 3 b)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Mathematical Data Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)					

Module title					Abbreviation
Master's Thesis Artificial Intelligenz					10-Al=MA-242-m01
Module	e coord	inator		Module offered by	
Dean o	of Studie	es Informatik (Computer	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
25	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conten	its				
Indepe	ndent r	research and work on an	artificial intelligence	topic that was agree	d upon with a lecturer.
Intend	ed learı	ning outcomes			
The stu method ble ma	udent is ds that nner.	able to independently re they acquired in the mas	esearch a given artific ter courses. They are	ial intelligence subj able to present the r	ect and use the knowledge and result of their work in an accepta-
Course	es (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
No cou	irses as	signed to module			
Metho ster, in	<b>d of ass</b> formati	s <b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Master Langua	's thesi age of a	s (50 to 100 pages) ssessment: German and,	/or English		
Allocat	tion of p	olaces			
Additio	onal inf	ormation			
Time to	o compl	ete: 6 months			
Worklo	ad				
750 h					
Teaching cycle					
Teaching cycle: every semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Master	's degr	ee (1 major) Artificial Inte	lligence (2024)		

10-Al=MK-242-m01         Module ordered by         Module ordered by         Module ordered by         Informatik (computer Science)       Institute of Computer Science         Computer Science       Institute of Computer Science         Duration       Module level       Only after succ. compl. of module(s)         Science       Science       Science         Duration       Module level       Other prerequisites         Science       Grading       Other prerequisites         Interverteres Science       Other the science of the results of the Master's theses and defend them in a discussion.         Intervertere       Science	Module title					Abbreviation	
Module coordinator       Module offered by         Dean of Studies Informatik (Computer Science)       Institute of Computer Science         ECTS       Method of grading       Only after succ. compl. of module(s)         5       (not) successfully completed          Duratior       Module level       Other prerequisites         1 semester       graduate          Contents           Presentation and defence of the results of the Master's thesis in an open discussion.       Intended learning outcomes         The students are able to present the results of their Master's theses and defend them in a discussion.       Courses (type, number of weekly contact hours, language — if other than German)         K (o)       K (o)           Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)          final colloquium (approx. 60 minutes)           Language of assessment: German and/or English       Allocation of places                Motikoid            Feaching cycle	Concluding Colloquium Artificial Intelligence					10-AI=MK-242-m01	
Dean of Studies Informatik (Computer Science)       Institute of Computer Science         ECTS       Metion of grading       Only after succ. compl. of module(s)         5       (not) successfully completed          Duration       Module level       Other prerequisites         1 semester       graduate          Contents           Presentation and defence of the results of the Master's thesis in an open discussion.       Intended learning outcomes         The students are able to present the results of their Master's theses and defend them in a discussion.       Courses (type, number of weekly contact hours, language — if other than German)         K (o)       K (o)       K (o)       Institute of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)       If not every semester         final colloquium (approx. 60 minutes)       Ianguage of assessment: German and/or English       Iso in the set set set set set set set set set se	Module coordinator Mod				Module offered by		
ECTSMethod of gradingOnly after succ. compl. of module(s)5(not) successfully completedDurationModule levelOther prerequisites1 sem successfullygraduateContentsgraduategraduateset successfullyof the Master's thesis in an open discussion. <td con<="" td=""><td>Dean of</td><td>f Studie</td><td>es Informatik (Computer</td><td>Science)</td><td>Institute of Comput</td><td>er Science</td></td>	<td>Dean of</td> <td>f Studie</td> <td>es Informatik (Computer</td> <td>Science)</td> <td>Institute of Comput</td> <td>er Science</td>	Dean of	f Studie	es Informatik (Computer	Science)	Institute of Comput	er Science
5       (not) successfully completed          Duration       Module level       Other prerequisites         1 semester       graduate          Contents        Contents         Presentation and defence of the results of the Master's thesis in an open discussion.       Intended learning outcomes         The students are able to present the results of their Master's theses and defend them in a discussion.       Courses (type, number of weekly contact hours, language — if other than German)         K (o)       K (o)       Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)         final colloquium (approx. 60 minutes)       Language of assessment: German and/or English         Allocation of Jaces              Workload          150 h          Teaching cycle	ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
DurationModule levelOther prerequisites1 semestergraduateContentsPresentation and defence of the results of the Master's thesis in an open discussion.Intended learning outcomesThe students are able to present the results of their Master's theses and defend them in a discussion.Courses (type, number of weekly contact hours, language — if other than German)K (o)Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)final colloquium (approx. 60 minutes) Language of assessment: German and/or EnglishAllocation of placesModitional informationMorkloadInfo hTeaching cycle	5	(not) s	successfully completed				
1 semester graduate   Contents Presentation and defence of the results of the Master's thesis in an open discussion.   Intended learning outcomes Intended learning outcomes   The students are able to present the results of their Master's theses and defend them in a discussion. Courses (type, number of weekly contact hours, language — if other than German)   K (o) K (o)   Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)   final colloquium (approx. 60 minutes)   Language of assessment: German and/or English   Allocation of places     Additional information     Workload   150 h   Teaching cycle	Duratio	n	Module level	Other prerequisites			
Contents         Presentation and defence of the results of the Master's thesis in an open discussion.         Intended learning outcomes         The students are able to present the results of their Master's theses and defend them in a discussion.         Courses (type, number of weekly contact hours, language — if other than German)         K (o)         Method of assessment (type, scope, language — if other than German, examination offered — if not every seme-ster, information on whether module can be chosen to earn a bonus)         final colloquium (approx. 60 minutes)         Language of assessment: German and/or English         Allocation of places            Additional information            Workload         150 h         Teaching cycle	1 semes	ster	graduate				
Presentation and defence of the results of the Master's thesis in an open discussion. Intended learning outcomes The students are able to present the results of their Master's theses and defend them in a discussion. Courses (type, number of weekly contact hours, language — if other than German) K (o) Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) final colloquium (approx. 60 minutes) Language of assessment: German and/or English Allocation of places Additional information Workload 150 h Teaching cycle	Conten	ts					
Intended learning outcomes         The students are able to present the results of their Master's theses and defend them in a discussion.         Courses (type, number of weekly contact hours, language – if other than German)         K (o)         Method of assessment (type, scope, language – if other than German, examination offered – if not every seme- ster, information on whether module can be chosen to earn a bonus)         final colloquium (approx. 60 minutes)         Language of assessment: German and/or English         Allocation of places            Additional information            Workload         150 h         Teaching cycle	Present	tation a	and defence of the result	s of the Master's thes	is in an open discus	sion.	
The students are able to present the results of their Master's theses and defend them in a discussion. Courses (type, number of weekly contact hours, language — if other than German) K (o) Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) final colloquium (approx. 60 minutes) Language of assessment: German and/or English Allocation of places Additional information Workload 150 h Teaching cycle	Intende	ed leari	ning outcomes				
Courses (type, number of weekly contact hours, language – if other than German)         K (o)         Method of assessment (type, scope, language – if other than German, examination offered – if not every seme- ster, information on whether module can be chosen to earn a bonus)         final colloquium (approx. 60 minutes)         Language of assessment: German and/or English         Allocation of places            Additional information            Workload         150 h         Teaching cycle	The stu	dents a	are able to present the re	sults of their Master'	s theses and defend	them in a discussion.	
K (o)  Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) final colloquium (approx. 60 minutes) Language of assessment: German and/or English Allocation of places Additional information Workload 150 h Teaching cycle	Courses	<b>s</b> (type	, number of weekly conta	ct hours, language —	- if other than Germa	in)	
Method of assessment (type, scope, language – if other than German, examination offered – if not every seme- ster, information on whether module can be chosen to earn a bonus)         final colloquium (approx. 60 minutes) Language of assessment: German and/or English         Allocation of places            Additional information            Workload         150 h         Teaching cycle	К (о)						
final colloquium (approx. 60 minutes) Language of assessment: German and/or English Allocation of places  Additional information  Workload 150 h Teaching cycle	Method ster, inf	<b>d of ass</b> formati	s <b>essment</b> (type, scope, la on on whether module ca	inguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
Allocation of places Additional information Workload 150 h Teaching cycle	final co Langua	lloquiu ge of a	ım (approx. 60 minutes) ssessment: German and	/or English			
Additional information Workload 150 h Teaching cycle	Allocati	ion of p	olaces				
Additional information Workload 150 h Teaching cycle							
Workload 150 h Teaching cycle	Additio	nal inf	ormation				
Workload 150 h Teaching cycle							
150 h Teaching cycle	Workload						
Teaching cycle	150 h						
Teaching cycle: every semester							
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)							
Module appears in							
Master's degree (1 major) Artificial Intelligence (2024)	Master'	's degr	ee (1 major) Artificial Inte	lligence (2024)			

Machine Learning   10     Module coordinator   Module offered by	IO-AI=ML-242-mo1				
Module coordinator         Module offered by					
	. <b>C</b>				
Dean of Studies Informatik (Computer Science) Institute of Computer	rScience				
ECTS Method of grading Only after succ. compl. of module(s)					
5 numerical grade					
Duration Module level Other prerequisites					
1 semester graduate					
Contents					
Foundations in the following areas: Theoretical knowledge and practical experience dels, approaches and algorithms, and their practical implementation for the classi ning. Supervised and unsupervised learning methods	ce in machine learning. Mo- sical problems of machine lear-				
Intended learning outcomes					
The students have theoretical and practical knowledge of typical models, methods machine learning. They are able to solve practical problems in the field of machine propriate methods. They have experience in the application or implementation of	ls and algorithms in the field of e learning with the help of ap- machine learning approaches.				
<b>Courses</b> (type, number of weekly contact hours, language — if other than German)	)				
V (2) + Ü (2) Module taught in: German and/or English					
<b>Method of assessment</b> (type, scope, language — if other than German, examination ster, information on whether module can be chosen to earn a bonus)	on offered — if not every seme-				
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination examination of one candidate each (approx. 20 minutes) or an oral examination in prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus	on may be replaced by an oral n groups of 2 candidates (ap-				
Allocation of places					
Additional information					
Workload					
150 h					
Teaching cycle					
Teaching cycle: every year, winter semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
§ 22    Nr. 3 b)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Mathematical Data Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)					

Module title				Abbreviation		
Natural Language Processing 1					10-AI=NLP1-242-m01	
Module	coord	inator		Module offered by		
holder	of the C	Chair of Computer Science	e XII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 semes	ster	graduate				
Conten	ts					
Founda process their so	tions in sing (Ni lution	n the following areas: Bas LP). Classical problems o and their practical impler	sic theoretical and pr f word processing an mentation.	actical knowledge in d information extrac	the field of natural language tion. Methods and algorithms for	
Intende	ed learn	ning outcomes				
The stu NLP. Th applica	dents ł ey are tion or	nave the theoretical and p able to solve practical pr implementation of NLP a	oractical knowledge o oblems with the help lgorithms.	of typical procedures of the methods taug	and algorithms in the field of ght. They have experience in the	
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	n)	
V (2) + I Module	Ü (2) taugh	t in: German and/or Engli	ish			
Method ster, inf	<b>l of ass</b> formati	e <b>ssment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
Written If annou examin prox. 15 Langua credital	examin unced l ation o minut ge of a ble for	nation (approx. 60 to 120 by the lecturer at the beg f one candidate each (ap es per candidate). ssessment: German and/ bonus	o minutes) inning of the course, prox. 20 minutes) or or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-	
Allocati	ion of p	olaces				
Additio	nal info	ormation				
Workload						
150 h						
Teaching cycle						
Teachir	Teaching cycle: every year, winter semester					
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module	appea	irs in				
Master'	Master's degree (1 major) Artificial Intelligence (2024)					

Module title					Abbreviation
Natural Language Processing 2					10-AI=NLP2-242-m01
Module	e coord	inator		Module offered by	
holder	of the (	Chair of Computer Scienc	e X	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
The lec dels an applica presen practica	ture pro d meth ation po tation a al appli	ovides advanced knowled ods of machine learning ossibilities in word proces as well as the latest mode cation of the methods ar	dge about techniques as well as their techr ssing are shown. Imp els from the field of N nd models learned is	s of Natural Languag nical backgrounds ar ortant basics of mod LP are taught. In adc also covered.	e Processing (NLP). Current mo- re presented and their respective lern NLP techniques for text re- lition to the theoretical skills, the
Intende	ed leari	ning outcomes			
The par dently i	rticipan identify	ts have knowledge abou and apply suitable meth	t problems and techr ods for concrete prol	iques in the field of olems.	NLP and are able to indepen-
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
V (2) + Module	Ü (2) e taugh	t in: German and/or Engl	ish		
Methoo ster, in	<b>d of ass</b> formati	e <b>ssment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Written If anno examin prox. 19 Langua credita	exami unced ation o 5 minut ge of a ble for	nation (approx. 60 to 120 by the lecturer at the beg f one candidate each (ap es per candidate). ssessment: German and, bonus	o minutes) inning of the course, oprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-
Allocat	ion of p	olaces			
Additio	nal inf	ormation			
Workload					
150 h					
Teaching cycle					
Teaching cycle: every year, summer semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module	Module appears in				
Master	Master's degree (1 major) Artificial Intelligence (2024)				

Module title					Abbreviation
Al Project 1					10-Al=P1-242-m01
Module	e coord	inator		Module offered by	
Dean o	f Studi	es Informatik (Computer	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
10	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Comple	etion of	a practical task from the	artificial intelligence	field	
Intend	ed lear	ning outcomes			
The pra	actical a	allows participants to wo	rk on a artificial intell	igence problem in te	eams.
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
R (6)					
Module	e taugh	t in: German and/or Engl	ish		
Metho ster, in	<b>d of ass</b> formati	<b>sessment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Project pic Langua credita	: report age of a ble for	: (approx. 10 to 20 pages) ssessment: German and, bonus	) with presentation (3 /or English	o to 45 minutes) foll	owed by a discussion on the to-
Allocat	ion of p	olaces			
Additio	onal inf	ormation			
Workload					
300 h					
Teaching cycle					
Teaching cycle: every semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024)					

Module title					Abbreviation
Al Project 2					10-Al=P2-242-m01
Module	e coord	inator		Module offered by	
Dean o	f Studi	es Informatik (Computer	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
10	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Comple	etion of	a practical task from the	artificial intelligence	field	
Intend	ed lear	ning outcomes			
The pra	actical a	allows participants to wo	rk on a artificial intell	igence problem in te	eams.
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	- if other than Germa	n)
R (6)					
Module	e taugh	t in: German and/or Engl	ish		
Metho ster, in	<b>d of ass</b> formati	<b>sessment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Project pic Langua credita	: report age of a ble for	: (approx. 10 to 20 pages) ssessment: German and, bonus	) with presentation (3 /or English	o to 45 minutes) foll	owed by a discussion on the to-
Allocat	ion of p	olaces			
Additional information					
Workload					
300 h					
Teaching cycle					
Teaching cycle: every semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024)					

Module title				Abbreviation		
Self-aw	Self-aware Computing 10-AI=SAC-242-mo1					
Module	e coord	inator		Module offered by		
Dean o	f Studi	es Informatik (Computer	Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	npl. of module(s)		
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
The lec gorithm Compu such as thods f are tau	ture pro ns and ting, So s i. e. Ir or eval ght.	ovides knowledge about concepts for Self-Aware ( elf-Organized Systems, o iternet of Things or Cyber uating their performance	techniques and meth Computing Systems a r Self-Adaptive System -Physical Systems ar , and how they can be	nods for Self-Aware ( is well as related cor ms are taught. Addit e discussed. Basic c e improved through	Computing Systems. Current al- neepts such as e.g. Autonomic ionally, current application areas apabilities of these systems, me- the use of artificial intelligence	
Intende	ed lear	ning outcomes				
The par and are stems a	rticipar e able t approp	its have basic knowledge o independently identify riately.	e of methods and tech and apply suitable m	nniques in the field c nethods for concrete	of Self-Aware Computing Systems problems and to evaluate sy-	
Course	<b>s</b> (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (2) + Module	Ü (2) e taugh	t in: German and/or Engl	ish			
Method ster, in	<b>l of ass</b> formati	<b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
Written If anno examin prox. 19 Langua credita	exami unced ation c 5 minut ge of a ble for	nation (approx. 60 to 120 by the lecturer at the beg of one candidate each (ap res per candidate). ssessment: German and, bonus	o minutes) inning of the course, oprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-	
Allocat	ion of p	olaces				
Additio	nal inf	ormation	·			
Workload						
150 h						
Teaching cycle						
Teaching cycle: if announced						
<b>Referred to in LPO L</b> (examination regulations for teaching-degree programmes)						
Module appears in						
Master	's degr	ee (1 maior) Artificial Inte	lligence (2024)			
Master	's degr	ee (1 major) Mathematica	al Data Science (2025	)		

Module title					Abbreviation
Seminar Artificial Intelligence					10-Al=SEM1-242-m01
Module coordinator				Module offered by	
Dean of Studies Informatik (Computer Science)			Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	ading Only after succ. compl. of module(s)		
5 numerical grade					
Duratio	n	Module level	Other prerequisites		
1 seme	ster	graduate			
Conten	ts				
Indepe with wr	ndent r itten a	eview of a current artifici nd oral presentation.	al intelligence topic b	based on literature a	nd, where applicable, software
Intende	ed lear	ning outcomes			
The stu aspects	dents a s in wri	are able to independently tten form and to orally pr	/ review a current arti esent these in an app	ficial intelligence top propriate way.	pic, to summarise the main
Course	<b>s</b> (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
S (2) Module	e taugh	t in: German and/or Engl	ish		
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)					
Term paper (10 to 15 pages) and presentation (30 to 45 minutes) followed by a discussion on the topic Language of assessment: German and/or English creditable for bonus					
Allocation of places					
Additional information					
Workload					
150 h					
Teaching cycle					
Teaching cycle: every semester					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024)					
Master	Master's degree (1 major) Mathematical Data Science (2025)				

Module title					Abbreviation	
Semina	ır Al Ap	plications		10-AI=SEM2-242-m01		
Module coordinator				Module offered by		
Dean of	f Studie	es Informatik (Computer S	Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	mpl. of module(s)		
5	nume	numerical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Indepe with wr	ndent r itten ar	eview of a current topic f nd oral presentation.	rom AI applications b	ased on literature a	nd, where applicable, software	
Intende	ed learr	ning outcomes				
The stu aspects	dents a 5 in writ	are able to independently tten form and to orally pro	v review a current top esent these in an app	ic from AI application propriate way.	ns, to summarise the main	
Course	<b>s</b> (type,	, number of weekly conta	ct hours, language —	· if other than Germa	n)	
S (2) Module	e taugh	t in: German and/or Engli	ish			
Methoo ster, inf	<b>l of ass</b> formati	e <b>ssment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
Term paper (10 to 15 pages) and presentation (30 to 45 minutes) followed by a discussion on the topic Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additional information						
Workload						
150 h						
Teaching cycle						
Teaching cycle: every semester						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
Module appears in						
Master	Master's degree (1 major) Artificial Intelligence (2024)					

Module title	Abbreviation					
Theory of Artificial Intelligence 1	10-Al=TAl1-242-m01					
Module coordinator		Module offered by				
Dean of Studies Informatik (Computer S	icience)	Institute of Computer Science				
ECTS Method of grading	Only after succ. com	pl. of module(s)				
5 numerical grade						
Duration Module level	Other prerequisites					
1 semester graduate						
Contents						
The course provides a theoretical overvi al Intelligence. Implementation of efficie Al are covered. Advanced data structure taught.	iew of algorithms and ent algorithms as we es for data representa	d mathematical met Il as theoretical bas ation to improve the	hods used in the area of Artifici- is of approximate algorithms in performance of AI methods are			
Intended learning outcomes						
Students have a theoretical understand capable of applying theoretical optimizares.	ing of the mathemat ations on algorithms	ical background of a and understand the	algorithms applied in AI. They are appropriate use of data structu-			
Courses (type, number of weekly contac	ct hours, language —	if other than Germa	n)			
V (2) + Ü (2) Module taught in: German and/or Englis	sh					
<b>Method of assessment</b> (type, scope, lan ster, information on whether module car	nguage — if other tha n be chosen to earn	in German, examina a bonus)	tion offered — if not every seme-			
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additional information	Additional information					
Workload						
150 h						
Teaching cycle						
Teaching cycle: every year, winter semester						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Artificial Intell	ligence (2024)					

Module title	Abbreviation				
Theory of Artificial Intelligence 2			10-Al=TAl2-242-m01		
Module coordinator		Module offered by			
Dean of Studies Informatik (Computer	Science)	Institute of Computer Science			
ECTS Method of grading	Only after succ. com	pl. of module(s)			
5 numerical grade					
Duration Module level	Other prerequisites				
1 semester graduate					
Contents					
The lecture provides theoretical or pra- plied in the field of artificial intelligence ches to their solution are taught. Adva nical backgrounds are presented and t shown.	ctical knowledge abor e. The most importan nced models and met he relevant application	ut classical and mod t problems are cons hods of Artificial Inte on possibilities for p	ern algorithms and methods ap- idered and the recent approa- elligence as well as their tech- roblems in the field of AI are		
Intended learning outcomes					
The students have knowledge of advar and are able to independently identify	nced models, method and apply suitable m	s and techniques in ethods for concrete	the field of artificial intelligence problems.		
Courses (type, number of weekly conta	act hours, language —	· if other than Germa	n)		
V (2) + Ü (2) Module taught in: German and/or Engl	ish				
<b>Method of assessment</b> (type, scope, la ster, information on whether module c	anguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
Written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus					
Allocation of places					
Additional information					
Workload					
150 h					
Teaching cycle					
Teaching cycle: if announced					
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Artificial Intelligence (2024)					

Module title					Abbreviation		
3D User Interfaces 10-HCI-3DUI-212-m01					10-HCI-3DUI-212-m01		
Module coordinator				Module offered by			
holder of the Chair of Computer Science		e IX	Institute of Comput	er Science			
ECTS Method of grading			Only after succ. con	Only after succ. compl. of module(s)			
5	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ster	graduate					
Conten	ts						
ne mo menteo quality Design groups sentati nologie	The module provides knowledge about the possibilities and specifics of 3D user interfaces in the areas of aug- mented, mixed and virtual reality, mobile devices, robotics and computer games. The lecture will introduce high- quality 3D interaction techniques and discuss their advantages and disadvantages in specific application areas. Design guidelines are taught as well as the theory needed to implement them. In the exercise, students work in groups of 2-3 participants to develop appropriate 3D interaction techniques for a virtual reality application. Pre- sentations, exercises and discussions help the student groups to familiarize themselves with the required tech- nologies and activities and to organize the project as a whole.						
Intend	ed lear	ning outcomes					
After pa They ki nes. St apply t pender in a joi	After participating in the module courses, students will be able to develop 3D user interfaces independently. They know high-quality 3D interaction techniques and can recall, explain and classify important design guideli- nes. Students know advantages and disadvantages of available tools for typically occurring tasks and are able to apply them. Students can independently familiarize themselves with complex technical systems as well as inde- pendently develop problem-solving proposals, communicate these in a team and implement and evaluate them						
Course	<b>s</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (2) + Module	Ü (2) e taugh	t in: German and/or Engl	ish				
Metho ster, in	<b>d of as</b> formati	s <b>essment</b> (type, scope, la ion on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
a) presentation of project results (approx. 30 minutes) or b) oral examination of one candidate each (approx. 30 minutes) Language of assessment: German and/or English creditable for bonus							
Allocat	ion of <sub>l</sub>	places					
Additio	onal inf	ormation					
Workload							
150 h							
Teachi	ng cycl	e					
Teaching cycle: every year, summer semester							
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)							
Module appears in							
Master's degree (1 major) Human-Computer-Interaction (2021) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024)							

Module title					Abbreviation	
Multimodal Interfaces 10-HCI-MMI-212-mo1						01
Module coordinator				Module offered by	offered by	
holder of the Chair of Computer Science		ce IX	Institute of Comput	er Science		
ECTS	Metho	od of grading	Only after succ. compl. of module(s)			
5	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conte	nts					
Multin des bo put fro the int course logy and dal an examp This in gleme accom a syne <b>Intend</b> After p modal can su	Multimodal interactions make use of different modalities to interact with computers or machines. The field inclu- des both analysis and synthesis of multimodal utterances. This course focuses on analysis, i.e., processing in- put from, for example, speech, gestures, touch, gaze direction, or even biosensors. The goal here is to determine the intent of the interactor from multiple channels and signals in order to perform desired (inter-) actions. In this course, students will learn about examples of multimodal interfaces, their advantages, the underlying termino- logy and theoretical background. In addition, students will learn the steps necessary for processing both unimo- dal and multimodal input. As core content, building on this, the fusion of multimodal signals is taught using the example of synergistic speech-gesture interfaces as well as its integration into an interactive real-time system. This includes on the one hand typical aspects of multimodal dependencies, e.g. temporal and semantic entan- glements, and on the other hand prominent approaches to perform multimodal fusion on decision level. In the accompanying exercise, the theoretical contents are deepened by a practical examination of the development of a synergistic speech-gesture interface for a virtual environment. <b>Intended learning outcomes</b> After participating in the module courses, students are able to recognize basic application scenarios for multi- modal interfaces. They remember subject-specific approaches and can apply them to adequate problems. They					
tasks a	and kno es (type	w their advantages and , number of weekly conta	disadvantages. 	- if other than Germa	in)	
V (2) + Modul	Ü (2) e taugh	t in: German and/or Eng	lish			
<b>Metho</b> ster, ir	<b>d of ass</b> formati	sessment (type, scope, la ion on whether module c	anguage — if other th an be chosen to earn	an German, examina a bonus)	ition offered — if not	every seme-
a) written examination (approx. 90 minutes) or b) presentation of project results (approx. 30 minutes) or c) oral examination of one candidate each (approx. 30 minutes) Language of assessment: German and/or English creditable for bonus						
Alloca	tion of p	olaces				
Additional information						
Workload						
150 h						
Teaching cycle						
Teaching cycle: every year, summer semester						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
Module appears in						
Master's degree (1 major) Human-Computer-Interaction (2021)						
Master's v	vith 1 majo	r Artificial Intelligence (2024)	JMU Würzburg ta record Maste	generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 36 / 80


Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024)

Modul	e title				Abbreviation		
Princiț	Principles of Interactive Systems 10-HCI-PRIS-212-m01						
Modul	e coord	inator		Module offered by			
holder	of the (	Chair of Computer Scienc	e IX	Institute of Comput	er Science		
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)			
5	nume	rical grade					
Durati	on	Module level	Other prerequisites				
1 seme	ester	graduate					
Conter	nts						
The mo extence cyber- as real In the rent ar real-tir tencies by a pu these cy, dis reality avatar search works Intend	The module teaches requirements, concepts and practical solutions for interactive human-computer systems of extended reality (virtual reality, mixed reality, augmented reality), perceptual computing, computer games and cyber-physical systems. Due to their common characteristics, these systems have recently often been referred to as real-time interactive systems. In the lecture, theoretical models are introduced, requirements of the application domain are derived, and current and novel conceptual and practical solutions are presented. First, conceptual principles for characterizing real-time interactive systems are presented. Then, conceptual models of the mission-critical aspects of time, latencies, processes, and events necessary to describe the behavior of a system are introduced. This is followed by a presentation of the application state, its distribution and coherence requirements, and the consequences of these requirements on decoupling and software quality in general. Then, potential solutions for data redundancy, distribution, synchronization, and interoperability are addressed. Furthermore, concepts underlying virtual reality such as immersion and presence are discussed, as well as various methods for measuring them. Finally, avatars and the concept of embodiment will be discussed. The exercise will provide an insight into practical research work and experiments of the chair as well as a first practical insight into software technologies and frameworks for the creation of interactive real-time systems, e.g. Unity3d and/or Unreal Engine.						
Aftor p	articina	ting in the module course	as students are able	to recognize basis a	polication scaparios for Interacti		
ve Sys theore formar ges. Fu dently	tems. The tical monocology of tical monocology of the tical monocology of tical mo	hey remember subject-sp odels and they can summ by can apply available too ore, you can independent o problem-solving propos	ecific approaches and arize, compare and e Is to typically occurri tly familiarize yourse sals, communicate th	ind can apply them to explain different app ing tasks and know t If with complex technices in a team and in	adequate problems. They know roaches and evaluate their per- heir advantages and disadvanta- nical systems as well as indepen- tegrate them in a prototype.		
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)		
V (2) + Modul	Ü (2) e taugh	t in: German and/or Engli	ish				
Metho	d of ass	essment (type, scope. la	nguage — if other tha	an German, examina	tion offered — if not everv seme-		
ster, ir	nformati	on on whether module ca	an be chosen to earn	a bonus)			
a) writi b) oral Langua credita	ten exan examir age of a able for	mination (approx. 90 min ation of one candidate e ssessment: German and/ bonus	utes) or ach (approx. 30 minu ′or English	utes)			
Alloca	tion of p	olaces					
Additi	Additional information						
Workle	oad						
150 h							
Teachi	ng cycl	e					
Teachi	ng cycle	e: every semester					
	0 9	,					

Referred to in LPO I (examination regulations for teaching-degree programmes)

### Module appears in

Master's degree (1 major) Human-Computer-Interaction (2021) Master's degree (1 major) Computational Mathematics (2022) Master's degree (1 major) Mathematics (2022) Master's degree (1 major) Media Entertainment (2022) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024)

Modul	<u>e title</u>				Abbreviation	
3D Poi	nt Clou	d Processing			10-l=3D-232-m01	
Modul	e coord	inator		Module offered by		
holder	of the (	Chair of Computer Scienc	e XVII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Laser s d trees mappi	scannin 5, regist ng.	g, Kinect and camera mor ration, features, segment	dels, basic data struc ation, tracking, appli	ctures (lists, arrays, o cations for airborne	oc-trees), calculating normals, k- mapping, applications to mobile	
Intend	ed lear	ning outcomes				
Studer munica data p require	nts unde ate with rocessin ements,	erstand the fundamental engineers / surveyors / ng and have experienced in terms of memory requ	principles of all aspe CV people / etc. Stud that real application irements and in term	ects of 3D point cloud lents are able to solv scenarios are challe is of implementation	d processing and are able to com- ve problems of modern sensor enging in terms of computational issues.	
Course	<b>es</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)	
V (2) + Modul	Ü (2) e taugh	t in: English				
<b>Metho</b> ster, in	<b>d of ass</b> Iformati	sessment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written If anno examin prox. 1 Langua credita	examin ounced nation c 5 minut age of a oble for	nation (approx. 60 to 120 by the lecturer at the beg of one candidate each (ap res per candidate). ssessment: German and, bonus	minutes) inning of the course, prox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-	
Alloca	tion of p	olaces				
Additio	onal inf	ormation				
Focuse R,HCl,(	es availa GE	able for students of the N	laster's programme l	nformatik (Computer	Science, 120 ECTS credits): KI,L-	
Worklo	bad					
150 h						
Teachi	ng cycl	e				
Teachi	Teaching cycle: if announced					
Referre	ed to in	LPO I (examination regu	lations for teaching-o	legree programmes)		
				<u> </u>		
Modul	e appea	ars in				
Modul	e studie	es (Master) Computer Sci	ence (2019)			
Master	's degr	ee (1 major) Computer Sc	ience (2023)			
Master	r's degr	ee (1 major) Artificial Inte	lligence (2024)			
Master	r's degr	ee (1 major) Computer Sc	ience (2025)			

Select + Topics in Computer Science       10-i=AKII-32:::n01         Module continuer is studies informatik (Computer Science)       Institute of Computer Science         ECTS       Method of grading       Only after succ. comp.i. of module(S)         In summical grade          Duration       Module level       Other prerequisites         Is emester       graduate          Select topics in computer science.       Intervention (Computer Science and to transfer them to related questions.         Contents          The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.         Courses (type, number of weekly contact hours, language – if other than German, examination offered – if not every semester, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 20 page) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         o) oral examination of one candidate each (approx. 20 minutes) or         b) project work (report (approx. 20 page) with presentation (30 to 45 minutes) er candidate) language of assessment: Germa and/or English creditable for bonus         Allocation of paces	Module title				Abbreviation	
Module coordinator         Module offered by           Dean of Studies Informatik (Computer Science)         Institute of Computer Science           ECTS         Method of grading         Only after succ. compl. of module(s)           5         numerical grade            Duration         Module level         Other prerequisites           1 semester         graduate            Contents             Selected topics in computer science.             Intended learning outcomes             The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.            Courses (type, number of weekly contact hours, language – if other than German, examination offered – if not every semester, information on whether module can be chosen to earn a bonus)            a) written examination (approx. 6o to 120 minutes) or             b) project work (report (approx. 2o pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or            0 oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)            1 oral examination or prose of up to 3 candidates (approx. 15 minutes per candidate) <td colspan="5">Selected Topics in Computer Science</td> <td>10-I=AKII-232-m01</td>	Selected Topics in Computer Science					10-I=AKII-232-m01
Dean of Studies Informatik (Computer Science)       Institute of Computer Science         ECTS       Method of grading       Only after succ. compl. of module(s)         5       numerical gradue          Duration       Module level       Other prerequisites         Selected topics in computer science.          Intended learning outcomes          The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.         Courses (type, number of weekly contact hours, language — if other than German)         V(2) + Û/S (2)         Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 6o to 120 minutes) or         b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)         Language of assessment: German and/or English creditable for bonus         Additional Information	Module	e coord	inator		Module offered by	
ECTS       Method of grading       Only after succ. compl. of module(s)         5       numerical grade          Duration       Module level       Other prerequisites         1 semester       graduate          Contents         Selected topics in computer science.         Intended learning outcomes         The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.         Courses (type, number of weekly contact hours, language — if other than German)         V(2) + U/S (2)         Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         or do ral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)         Language of assessment: German and/or English creditable for bonus         Additional information	Dean o	fStudie	es Informatik (Computer S	Science)	Institute of Comput	er Science
5       numerical grade          Duration       Module level       Other prerequisites         1 semester       graduate          Contents           Selected topics in computer science.       Intended learning outcomes         The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.         Courses (type, number of weekly contact hours, language – if other than German, examination offered – if not every semester, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 6o to 120 minutes) or       b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)       Language of assessment. German and/or English creditable for bonus         Allocation of places	ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
Duration         Module level         Other prerequisites           1 semester         graduate	5	nume	rical grade		• • • • •	
1 semester graduate	Duratio	on	Module level	Other prerequisites		
Contents         Selected topics in computer science.         Intended learning outcomes         The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.         Courses (type, number of weekly contact hours, language — if other than German)         V (2) + U/S (2)         Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 6o to 120 minutes) or         b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         c) oral examination of one candidate each (approx. 20 minutes) or         d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)         Language of assessment: German and/or English creditable for bonus         Aldication of places               Workload         130 h         Teaching cycle:         Teaching cycle: if announced         Referred to in LPO1 (examination regulations for teaching-degree programmes)         § 2 vz IIN. 3 b)         Module appears in         Module appears in         Module appeare (1 major) Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended	1 seme	ster	graduate			
Selected topics in computer science. Intendel learning outcomes The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions. Courses (type, number of weekly contact hours, language — if other than German, V (2) + 0/S (2) Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a borus) a) written examination (approx. 6o to 120 minutes) or b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) Language of assessment: German and/or English creditable for bonus Allocation of places Additional information Additional information So h Teaching cycle: if announced Referred to in LPO1 (examination regulations for teaching-degree programmes) § 22 Il Nr. 3 b) Module appears in Module studies (Master) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2025) Supplementary course MINT Teacher Edu	Conten	ts				
Intended learning outcomes         The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.         Courses (type, number of weekly contact hours, language – if other than German)         V (2) + Û/S (2)         Method of assessment (type, scope, language – if other than German, examination offered – if not every seme-ster, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 60 to 120 minutes) or         b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         c) and examination of one candidate each (approx. 20 minutes) or         d) oral examination in groups of up to 2 candidates (approx. 15 minutes per candidate)         Language of assessment: German and/or English         creditable for bonus         Allocation of places         -         Vorkload         150 h         Teaching cycle: if announced         Referred to In LPO I (examination regulations for teaching-degree programmes)         § 2 zl INr. 3 b)         Module studies (Master) Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's degree (1 major) Artificial Int	Selecte	ed topic	s in computer science.			
The students are able to understand the solutions to complex problems in computer science and to transfer them to related questions.  Courses (type, number of weekly contact hours, language — if other than German)  V (a) + U/S (a)  Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) a) written examination (approx. 60 to 120 minutes) or b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) Language of assessment: German and/or English creditable for bonus  Allocation of places	Intend	ed learr	ning outcomes			
Courses (type, number of weekly contact hours, language — if other than German)         V (2) + Û/S (2)         Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 6o to 120 minutes) or         b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or         c) oral examination of one candidate each (approx. 20 minutes) or         d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate)         Language of assessment: German and/or English         creditable for bonus         Allocation of places            Additional information            Workload         150 h         Teaching cycle         Teaching cycle         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 Il Nr. 3 b)         Module studies (Master) Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2023)         Master's degree (1 major) Artificial Intelligence (2023)         Master's degree (1 major)	The stu them to	idents a p relate	are able to understand th d questions.	e solutions to compl	ex problems in comp	outer science and to transfer
V (2) + Û/S (2)  Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus) a) written examination (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) Language of assessment: German and/or English creditable for bonus  Allocation of places	Course	<b>s</b> (type,	, number of weekly conta	ct hours, language –	- if other than Germa	n)
Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)         a) written examination (approx. 60 to 120 minutes) or         b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topi() or         c) oral examination of one candidate each (approx. 20 minutes) or         d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) <ul> <li>Language of assessment: German and/or English creditable for bonus</li> </ul> Allocation of places	V (2) +	Ü/S (2)				
a) written examination (approx. 60 to 120 minutes) or b) project work (report (approx. 20 pages) with presentation (30 to 45 minutes) and subsequent discussion on the topic) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) Language of assessment: German and/or English creditable for bonus Allocation of places  Additional information  Workload 150 h Teaching cycle Teaching cycle: if announced Referred to in LPO I (examination regulations for teaching-degree programmes) § 22 II Nr. 3 b) Module appears in Module studies (Master) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Computer Science (2025) Eirst state examination of the teaching degree Realeclule Computer Science (2025) Master's degree (1 major) Computer Science (2025)	Metho ster, in	<b>d of ass</b> formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
Allocation of places Additional information Morkload Workload Teaching cycle Teaching cycle Teaching cycle: if announced Referred to in LPO I (examination regulations for teaching-degree programmes) § 22 II Nr. 3 b) Module appears in Module studies (Master) Computer Science (2019) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2023) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)	a) writt b) projo the top c) oral d) oral Langua credita	en exar ect wor ic) or examin examin ige of a ble for	nination (approx. 60 to 1 k (report (approx. 20 pag ation of one candidate en ation in groups of up to g ssessment: German and, bonus	20 minutes) or es) with presentatior ach (approx. 20 minu 3 candidates (approx /or English	n (30 to 45 minutes) a utes) or . 15 minutes per can	and subsequent discussion on didate)
Additional information Additional information Additional information Additional information Additional information Workload Associated to a serie the serie of the series of the	Allocat	ion of p	olaces			
Additional information            Workload         150 h         Teaching cycle         Teaching cycle: if announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Fulle Network Bavaria (ENB) (2025)         Master's degree (1 major) Artificial Intelligence (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Aerospace Computer Science (2025)         Master's degree (1 major) Aerospace Computer Science (2025)         First state examination for the teaching degree Realschule Computer Science (2027)		· · ·				
Workload         150 h         Teaching cycle         Teaching cycle: if announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Eite state examination for the teaching degree Realschule Computer Science (2025)         Eites tate examination for the teaching degree Realschule Computer Science (2025)	Additio	nal info	ormation			
Workload         150 h         Teaching cycle         Teaching cycle: if announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Eist state examination for the teaching degree Realschule Computer Science (2025)						
150 h         Teaching cycle         Teaching cycle: if announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Attificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Attificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         First state examination for the teaching degree Bealschule Computer Science (2025)	Worklo	ad				
Teaching cycle         Teaching cycle: if announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 Il Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Computer Science (2025)         Eist state examination for the teaching degree Paelschule Computer Science (2027)	150 h	au				
Teaching cycle:         Teaching cycle:       if announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Computer Science (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Aerospace Computer Science (2025)         Master's degree (1 major) Aerospace Computer Science (2025)         First state examination for the teaching degree Realschule Computer Science (2027)	150 H		_			
Teaching cycle: If announced         Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Computer Science (2025)         First state examination for the teaching degree Realschule Computer Science (2027)			e			
Referred to in LPO I (examination regulations for teaching-degree programmes)         § 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Computer Science (2025)         First state examination for the teaching degree Realschule Computer Science (2027)	Teachi	ng cycle	e: if announced			
§ 22 II Nr. 3 b)         Module appears in         Module studies (Master) Computer Science (2019)         Master's degree (1 major) Computer Science (2023)         Master's degree (1 major) Aerospace Computer Science (2023)         Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)         Master's degree (1 major) Artificial Intelligence (2024)         Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)         Master's degree (1 major) Computer Science (2025)         Master's degree (1 major) Aerospace Computer Science (2025)         First state examination for the teaching degree Realschule Computer Science (2027)	Referre	ed to in	<b>LPO I</b> (examination regu	lations for teaching-o	degree programmes)	
Module appears in Module studies (Master) Computer Science (2019) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	§ 22	Nr. 3 b)				
Module studies (Master) Computer Science (2019) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Module	e appea	irs in			
Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Module	e studie	es (Master) Computer Sci	ence (2019)		
Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Master	's degre	ee (1 major) Computer Sc	ience (2023)	)	
Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Master's degree (1 major) Aerospace Computer Science (2023)					
Master's degree (1 major) Artificial intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)					
Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Master's testering degree Cumpacium MINT Teacher Education DLUS – Elite Natural Deveria (END) (coor)					
Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Supple	mentar	ning degree Gynniasium i w.course MINT Teacher Fr	ducation PLUS Flite	Network Bayaria (FN	B) (2025)
Master's degree (1 major) computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Realschule Computer Science (2027)	Master	's dear	e (1 major) Computer Sc	ience (2025)		
First state examination for the teaching degree Realschule Computer Science (2025)	Master	's degri	ee (1 major) Aerosnace C	omnuter Science (202	25)	
הושרשונים באמווווומנוטוו וטרנות נתמנווווב מתצוכב ולכמושנוומנכ לטוושמנכו שנוכוונב ובטבאו	First st	ate exa	mination for the teaching	degree Realschule (	- )/ Computer Science (2)	025)
First state examination for the teaching degree Gymnasium Computer Science (2025)	First st	ate exa	mination for the teaching	degree Gymnasium	Computer Science (2	2025)

Module title				Abbreviation		
Advanced Programming 10-I=APR-212-m01						
Modul	e coord	inator		Module offered by		
holder of the Chair of Computer Science II			e ll	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
5	nume	rical grade		1		
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts	-				
With th grams. and co de a se cussec	te know If more de dup ensible I.	eledge of basic programm complex problems are to licates occur. In this lectu structure. Also, further to	ning, taught in introdu o be tackled, subopti ure, further knowledg ppics in the areas of s	uctory lectures, it is p mal results like long e is to be conveyed o oftware security and	oossible to realize si , incomprehensible on how to give progr parallel programmi	mpler pro- functions ams and co- ng are dis-
Intend	ed learı	ning outcomes				
Studer ges an ced cu	nts learr d their e lminatii	n advanced programming efficiency measured usin ng in the use of GPU arch	g paradigms. Differen g standard metrics. I itectures for extreme	t patterns are then ir n addition, parallel p ly quick processing.	nplemented in multi rocessing concepts	ple langua- are introdu-
Course	es (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)	,	· · · · ·			
Metho ster, in written If anno examir prox. 1 Langua credita	W(2) + 0 (2)         Method of assessment (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)         written examination (approx. 60 to 120 minutes)         If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (approx. 15 minutes per candidate).         Language of assessment: German and/or English					
Allocat	tion of p	olaces				
Additio	onal inf	ormation	·			
Focuse SE,KI,L	es availa .R, HCI,	able for students of the N ES,GE,SEC	laster's programme l	nformatik (Computer	Science, 120 ECTS o	credits):
Worklo	bad					
150 h						
Teachi	ng cycl	е				
Teachi	ng cycle	e: everv vear, winter seme	ester			
Referre	ed to in	LPOI (examination regu	lations for teaching-	legree programmes)		
				<u></u>		
Modul	e appea	irs in				
Master	's degr	ee (1 major) eXtended Art	tificial Intelligence (xt	Al) (2020)		
Master Master Master Master Master Master Master	f's degro f's degro f's degro f's degro f's degro f's degro	ee (1 major) Computer Sc ee (1 major) Aerospace Co ee (1 major) Computation ee (1 major) Information S ee (1 major) Mathematics ee (1 major) Computer Sc ee (1 major) Aerospace Co	ience (2021) omputer Science (202 al Mathematics (202 Systems (2022) 5 (2022) ience (2023) omputer Science (202	21) 2) 23)		
Master's w	ith 1 major	Artificial Intelligence (2024)	JMU Würzburg •	generated 18-Jun-2025 • exa	m. reg. da-	page 42 / 80

Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Information Systems (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025)

Module title			Abbreviation		
Databases 2 10-I=DB2-242-m01					
Module	coord	inator		Module offered by	
Dean of	Studie	es Informatik (Computer S	Science)	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
5	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	graduate			
Content	S				
Data wa	rehou	ses and data mining; wel	o databases; introdu	ction to Datalog.	
Intende	d learr	ning outcomes			
The stud	dents ł	nave advanced knowledg	e about relational da	tabases, XML and d	ata mining.
Courses	s (type,	, number of weekly conta	ct hours, language —	if other than Germa	n)
V (2) + Ĺ	j (2)				
Module	taugh	t in: German and/or Engl	ish		
Method ster, inf	<b>of ass</b> ormati	e <b>ssment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
examina prox. 15 Languag creditab	ation o minut ge of a ole for	f one candidate each (ap es per candidate). ssessment: German and, bonus	prox. 20 minutes) or (or English	an oral examination	in groups of 2 candidates (ap-
Allocati	on of p	olaces			
Additio	nal info	ormation			
Focuses KI, HCI	availa	able for students of the N	laster's programme li	nformatik (Computer	Science, 120 ECTS credits): SE,
Workloa	ad				
150 h					
Teachin	g cycl	e			
Teachin	g cycle	e: every year, summer ser	nester		
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)	
§ 22    N	Ir. 3 b)				
Module	appea	irs in			
Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)					

Module title Abbreviation						
Deductive Databases 10-I=DDB-212-mo1						
Module	e coord	inator		Module offered by	l	
Dean o	of Studie	es Informatik (Compute	er Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conten	nts					
Syntax relation program	and se nal data ms: rec	mantics of definite and abases; Evaluation me ursion, equivalence, tr	l normal logic program: thods for Datalog; Nega ansformation; Outlook	s; Model, proof, and ation and stratificatio on disjunctive logic	fixpoint theory; Con on; Structural proper programs.	nection to ties of logic
Intend	ed learı	ning outcomes				
The stu They ar their eo	udents l re able quivale	nave fundamental and to compactly implemented nce and other propertion	practicable knowledge nt declarative programs es.	about Datalog (inclustion in Datalog and to co	uding negation). ompare existing pros	grams w.r.t.
Course	<b>s</b> (type	, number of weekly cor	itact hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Metho ster, in	<b>d of ass</b> formati	s <b>essment</b> (type, scope, on on whether module	language — if other the can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
prox. 1 Langua credita	5 minut age of a ble for	es per candidate each ssessment: German ar bonus	nd/or English			luates (ap-
Allocat	tion of p	olaces				
Additio	onal info	ormation				
Focuse AT,SE,I	es availa IT,KI	able for students of the	Master's programme I	nformatik (Computer	r Science, 120 ECTS (	credits):
Worklo	oad					
150 h						
Teachi	ng cycl	e				
Teachi	ng cycle	e: every year, summer s	semester			
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
§ 22	Nr. 3 b)					
Module	e appea	nrs in				
Master	's degr	ee (1 major) Computer	Science (2021)			
Master's degree (1 major) Computational Mathematics (2022)						
Master's degree (1 major) Mathematics (2022)						
Master's degree (1 major) Computer Science (2023)						
Master	Master's degree (1 major) Artificial Intelligence (2024)					
Master	Master's degree (1 major) Computational Mathematics (2024)					
Master	's teach	ning degree Gymnasiur	n MINT Teacher Educat	ion PLUS. Flite Netw	ork Bayaria (FNR) (2	025)
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2025)	- 11
Master's w	vith 1 major	Artificial Intelligence (2024)	JMU Würzburg • ta record Master	generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 45 / 80



Master's degree (1 major) Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)

Modul	e title	Abbreviation				
Deep Reinforcement Learning for Optimal Control 10-I=DRLOC-221-m01						
Module coordinator			Module offered by			
Dean o	of Studies Informatik (Computer	Science)	Institute of Comput	er Science		
ECTS	Method of grading	Only after succ. con	npl. of module(s)			
5	numerical grade					
Duratio	on Module level	Other prerequisites				
1 seme	ester graduate					
<ul> <li>k</li> <li>E</li> <li>T</li> <li>F</li> <li>A</li> <li>F</li> <li>N</li> <li>A</li> <li>A</li> <li>F</li> <li>Intender</li> <li>Studer</li> <li>del-bas</li> <li>rithms</li> <li>Course</li> </ul>	<ul> <li>Key Concepts in Reinforcement Learning</li> <li>Exact Methods for Finite Markov Decision Processes</li> <li>Tabular Reinforcement Learning</li> <li>Planning and Learning with Tabular Methods</li> <li>Approximation Methods and Deep Reinforcement Learning</li> <li>Policy Optimization</li> <li>Value-Based Methods</li> <li>Applying Reinforcement Learning and Practical Tips and Tricks</li> <li>Aerospace Applications</li> <li>Model-Based Reinforcement Learning</li> <li>Challenges</li> <li>Frontiers and Future of Deep Reinforcement Learning</li> </ul> Intended learning outcomes Students understand the basics of reinforcement learning & deep reinforcement learning (model-free & model-based). They understand current challenges and unsolved problems. They are able to use standard algorithms for (continuous) control tasks and have learned about aerospace applications.					
V (2) + Module	Ü (2) e taught in: English					
Metho ster, in	<b>d of assessment</b> (type, scope, la formation on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-		
written If anno examir prox. 1 Langua credita	examination (approx. 60 to 120 bunced by the lecturer at the beg nation of one candidate each (ap 5 minutes per candidate). age of assessment: English able for bonus	minutes) inning of the course, oprox. 20 minutes) or	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-		
Allocat	tion of places					
 Additio  Worklo	 Additional information  Workload					
150 h						
Teachi	ng cycle					
Teachi	ng cycle: every year, summer sei	nester				
Referre	ed to in LPO I (examination regu	lations for teaching-o	degree programmes)			
Modul	e appears in					
Master	r's degree (1 major) eXtended Art	ificial Intelligence (xt	tAI) (2020)			

Master's with 1 major Artificial Intelligence (2024)

JMU Würzburg • generated 18-Jun-2025 • exam. reg. data record Master (120 ECTS) Künstliche Intelligenz - 2024

Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024)

Module title			Abbreviation				
Interac	Interactive Computer Graphics 10-I=ICG-232-mo1						
Module coordinator				Module offered by			
holder	of the C	Chair of Computer Science	e IX	Institute of Comput	er Science		
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)			
5	nume	rical grade					
Duratio	on	Module level	Other prerequisites				
1 seme	ester	graduate					
Conter	nts						
Compu- cificall conten about jection line wi Accom or Dire	Computer graphics studies methods for digitally synthesising and manipulating visual content. This course spe- cifically concentrates on interactive graphics with an additional focus on 3D graphics as a requirement for many contemporary as well as for novel human-computer interfaces and computer games. The course will cover topics about light and images, lighting models, data representations, mathematical formulations of movements, pro- jection as well as texturing methods. Theoretical aspects of the steps involved in ray-tracing and the raster pipe- line will be complemented by algorithmical approaches for interactive image syntheses using computer systems. Accompanying software solutions will utilise modern graphics packages and languages like OpenGL, GLSL and/						
Intend	ed learr	ning outcomes					
At the computactive	end of t iter grap graphic	he course, the students w hics. They will be able to s applications and to cho	vill have a broad und implement a promin pose the right softwar	lerstanding of the un nent variety of these re tool for this task.	derlying theoretical models of models, to build their own inter-		
Course	es (type,	, number of weekly conta	ct nours, language –	- if other than Germa	n)		
V (2) +	U (2)	. /					
ster, in	<b>d of ass</b> Iformati	on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — If not every seme-		
written If anno examir prox. 1 Langua credita	examir ounced l nation o 5 minut age of a oble for	nation (approx. 60 to 120 by the lecturer at the beg f one candidate each (ap es per candidate). ssessment: German and/ bonus	minutes). inning of the course, prox. 20 minutes) or 'or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-		
Allocat	tion of p	laces					
	nalief	rmation					
Additio			actorio mus sus sus s	formatile (Commit			
Focuse		able for students of the M	laster's programme i	nformatik (Computer	Science, 120 ECTS credits): HCI.		
WORKIC	bad						
150 h							
Teachi	ng cycle	9					
Teachi	Teaching cycle: every year, summer semester						
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)						
Modul	e appea	rs in					
Master Master Master Bachel Master	Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Bachelor's degree (1 major) Artificial Intelligence and Data Science (2024) Master's degree (1 major) Computer Science (2025)						
		, , , , , , , , , , , , , , , , , , ,	× J/				

Module title			Abbreviation			
Image Processing and Computational Photography					10-I=IP-222-m01	
Module	e coordin	lator		Module offered by		
holder	of the Ch	nair of Computer Science	e IV	Institute of Comput	er Science	
ECTS	Method	l of grading	Only after succ. com	pl. of module(s)		
5	numeri	cal grade				
Duratio	on /	Module level	Other prerequisites			
1 seme	ester g	graduate				
Conten	nts					
Ihis co its und is und is ii ii ii ii ii ii ii ii ii ii ii ii	This course aims at offering a self-contained account of image processing and computational photography and its underlying concepts, including the recent use of deep learning. The topics that will be covered are: introduction to image processing and computational photography sampling and quantization light and color image acquisition deep learning generative methods image signal processing image restoration sensor and image quality assessment image compression applications Intended learning outcomes Students have fundamental knowledge of problems and techniques in the field of image processing and compu- tational photography and are able to independently identify and apply suitable methods for concrete problems. Overview of the most important concepts of image formation, perception and analysis, and Computatio- nal Photography					
Course	es (type, i	number of weekly conta	ct hours, language –	· if other than Germa	n)	
V (2) + Module	Ü (2) e taught	in: English				
Metho ster, in	<b>d of asse</b> Iformatio	e <b>ssment</b> (type, scope, la n on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written If anno examir prox. 1 Langua credita	written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English creditable for bonus					
Allocat	tion of pl	aces				
Additio	onal info	rmation				
Worklo	bad					
150 h						
Teachi	ng cycle					
Teachi	ng cycles	evenuvear wintercom	octor			
reaciili	ing cycle:	every year, winter serife	53101			

<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)
§ 22 II Nr. 3 b)
Module appears in
Master's degree (1 major) Information Systems (2019)
Master's degree (1 major) eXtended Artificial Intelligence (xtAl) (2020)
Master's degree (1 major) Information Systems (2022)
Master's degree (1 major) Computer Science (2023)
Master's degree (1 major) Aerospace Computer Science (2023)
Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)
Master's degree (1 major) Artificial Intelligence (2024)
Master's degree (1 major) Information Systems (2024)
Master's degree (1 major) Information Systems (2025)
Master's degree (1 major) Computer Science (2025)
Master's degree (1 major) Mathematical Data Science (2025)
Master's degree (1 major) Aerospace Computer Science (2025)
First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title				Abbreviation		
Information Retrieval 10-I=IR-242-m01					10-I=IR-242-m01	
Module	e coord	inator		Module offered by		
holder	ofthe	Chair of Computer Scienc	e XII	Institute of Comput	er Science	
ECTS	Meth	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
IR mod data st ges and thods t	els (e. ructure d parac o supp	g. Boolean and vector spa es (e. g. inverted index), q ligms, structured queries ort IR (e. g. recommendat	ace model, evaluatio uery elements (e.g. ), search engine (e.g tion systems, text clu	n), processing of tex query operations, rel g. architecture, crawli istering and classific	t (tokenising, text properties), levance feedback, query langua- ing, interfaces, link analysis), me- ation, information extraction).	
Intende	ed lear	ning outcomes				
Studen how to	ts acqu build a	uire theoretical and pract a search engine.	ical knowledge in the	e field of information	retrieval and the technical know-	
Course	<b>s</b> (type	, number of weekly conta	ct hours, language –	- if other than Germa	in)	
V (2) + Module	Ü (2) e taugh	t in: German and/or Engl	ish			
Metho	d of ass	sessment (type, scope, la	nguage — if other th	an German. examina	tion offered — if not every seme-	
ster, in	format	ion on whether module ca	an be chosen to earn	a bonus)		
Written If anno examin prox. 19 Langua credita	exami unced nation c 5 minut uge of a ble for	nation (approx. 60 to 12c by the lecturer at the beg of one candidate each (ap tes per candidate). Issessment: German and, bonus	o minutes) inning of the course, oprox. 20 minutes) or /or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-	
Allocat	ion of	places				
Additio	onal inf	ormation				
Focuse IT, KI, F	s availa ICI, GE	able for students of the N	laster's programme l	nformatik (Computer	r Science, 120 ECTS credits):	
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Teachi	ng cycl	e: every year, summer ser	mester			
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
§ 22	§ 22    Nr. 3 b)					
Module	e appea	ars in				
Master	's degr	ee (1 major) Artificial Inte	lligence (2024)			
Master	's degr	ee (1 major) Information S	Systems (2025)			
Master	's degr	ee (1 major) Computer Sc	ience (2025)			
First sta	ate exa	mination for the teaching	degree Gymnasium	Computer Science (2	2025)	

Module title Abbrevia				Abbreviation		
Logic P	Logic Programming					
Module	e coord	inator		Module offered by		
holder	of the (	Chair of Computer Scie	nce VI	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. cor	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	5		
1 seme	ester	graduate				
Conten	its					
Logic-re prograi	elationa mming	al programming paradi language Prolog: recur	gm, top-down evaluati sion, predicate-oriente	on with SLD(NF) reso d programming, bac	lution. Introduction ktracking, cut, side	to the logic effects, ag-
cepts li	ike con	straint logic programm	ing.	Son with Datatog, She		Ivanceu con-
Intend	ed lear	ning outcomes				
The stu	idents l	have fundamental and	practicable knowledge	of logic programmir	og. They are able to i	mplement
compa gramm	ct and o ing par	declarative programs in adigm.	n Prolog, and to compa	re this approach to t	he traditional imper	ative pro-
Course	es (type)	number of weekly cor	ntact hours, language -	- if other than Germa	ın)	
V (2) +	Ü (2)				· ·	
Metho	d of ass	essment (type, scope,	language — if other th	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		,
If anno examir prox. 19 Langua credita	examin ounced nation o 5 minut age of a oble for	nation (approx. 60 to 1 by the lecturer at the b f one candidate each ( es per candidate). ssessment: German ar bonus	20 minutes) eginning of the course, (approx. 20 minutes) or nd/or English	the written examina an oral examinatior	tion may be replace 1 in groups of 2 cand	d by an oral lidates (ap-
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Focuse AT,SE,I	es availa IT,KI	able for students of the	e Master's programme I	nformatik (Compute	r Science, 120 ECTS	credits):
Worklo	ad					
150 h						
Teachi	ng cycl	9				
Teachi	ng cycle	e: every year, winter se	mester			
Referre	ed to in	LPOI (examination re	gulations for teaching-	degree programmes)		
§ 22	Nr. 3 b)					
Module	e appea	rs in				
Master	Master's degree (1 major) eXtended Artificial Intelligence (xtAI) (2020)					
Master's degree (1 major) Computer Science (2021)						
Master's degree (1 major) Information Systems (2022)						
Master's degree (1 major) Computer Science (2023)						
Master	Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)					
Master	Master's degree (1 major) Artificial Intelligence (2024) Master's teaching degree Gympasium MINT Toachor Education DLUS, Elite Network Pavaria (ENP) (2025)					
Supple	ementar	y course MINT Teacher	Education PLUS, Elite	Network Bavaria (EN	B) (2025)	v2)
Master's w	vith 1 major	Artificial Intelligence (2024)	JMU Würzburg ta record Maste	• generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 53 / 80



Master's degree (1 major) Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title					Abbreviation	
Music	Music Information Retrieval 10-I=MIR-232-mo1					
Module	e coord	inator		Module offered by		
Dean o	of Studie	es Informatik (Computer S	Science)	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conten	nts					
This lecture introduces the research field of Music Information Retrieval (MIR), focussing on the following topics: Music representations (graphical, symbolic, audio), basic music theory concepts, audio signal processing (esp. time-frequency transformations, variants of the Fourier transform), selected machine learning techniques, over- view and in-depth study of individual MIR tasks (e.g., harmony analysis/chord recognition, beat tracking/tempo, structure analysis, genre/style classification), data preparation/annotation and corpus analysis for digital huma- nities/musicology						
Intend	ed learı	ning outcomes				
The stu and pra They ha rithms.	udents   actical   ave gain	nave a fundamental unde knowledge in the field of ned experience with typic	erstanding of music re audio signal process cal MIR tasks and are	epresentations and a ing and specialized able to understand,	audio data as well as theoretical machine learning techniques. develop, and apply MIR algo-	
Course	es (type	, number of weekly conta	ct hours, language —	· if other than Germa	n)	
V (2) + Module	Ü (2) e taugh	t in: German and/or Engli	ish			
Metho ster, in	<b>d of ass</b> Iformati	s <b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
a) written examination (approx. 60 to 120 minutes) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes) Language of assessment: German and/or English creditable for bonus						
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	bad					
150 h						
Teaching cycle						
Teaching cycle: every year, summer semester						
Referre	<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)					
Module	e appea	irs in				
Master	's degr	ee (1 major) Computer Sc	ience (2023)			
Master	r's degre	ee (1 major) Artificial Inte	lligence (2024)			
Master	r's degro	ee (1 major) Computation	al Mathematics (202	4)		
Master	Master's degree (1 major) Mathematics (2024)					

Module title	Abbreviation			
Machine Learning for Networks 1 10-I=MLN1-232-m01				
Module coordinator	Module offered by			
holder of the Chair of Computer Science XV	Institute of Computer Science			
ECTS Method of grading Only after su	cc. compl. of module(s)			
5 numerical grade				
Duration Module level Other prereq	uisites			
1 semester graduate				
Contents				
Networks matter! This holds for technical infrastructures like communication or transportation networks, for in- formation systems and social media in the World Wide Web, but also for various social, economic and biologi- cal systems. What can we learn from data that capture the interaction topology of such complex systems? What is the role of individual nodes and how can we discover significant patterns in the structure of networks? How do these structures influence dynamical process like diffusion or the spreading of epidemics? Which are the most influential actors in a social network? And how can we analyze time series data on systems with dynamic net- work topologies? Addressing those questions, the course combines a series of lectures which introduce fundamental concepts for the statistical modelling of complex networks with weekly exercises that show how we can apply them to practical network analysis tasks. Topics covered include foundations of graph theory, centrality and modulari- ty measures, aggregate statistical characteristics of large networks, random graphs and statistical ensembles of complex networks, generating function analysis of expected graph properties, scale-free networks, stocha- stic dynamics in networks, spectral analysis, as well as the modelling of time-varying networks. The course ma- terial consists of annotated slides for lectures as well as a accompanying git-Repository of jupyter notebooks, which implement and validate the theoretical concents covered in the lectures.				
written exam.				
The course will equip participants with statistical network analysis techniques that are needed for the data-driven modelling of complex technical, social, and biological systems. Students will understand how we can quantitatively model the topology of networked systems and how we can detect and characterize topological patterns. Participants will learn how to use analytical methods to make statements about the expected properties of very large networks that are generated based on different stochastic models. They further gain an analytical understanding of how the structure of networks shapes dynamical processes, how statistical fluctuations in degree distributions influence the robustness of systems, and how emergent network features emerge from simple ran-				
Courses (type, number of weekly contact hours, lang	uage — if other than German)			
V (2) + Ü (2) Module taught in: English				
<b>Method of assessment</b> (type, scope, language — if o ster, information on whether module can be chosen	ther than German, examination offered — if not every ser to earn a bonus)			
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English creditable for bonus				
Allocation of places				

## Additional information

Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): AT,IT,SE,KI,HCI,IN

### Workload

150 h

## Teaching cycle

Teaching cycle: every year, summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

### § 22 II Nr. 3 b)

Module appears in

P 9
Master's degree (1 major) Information Systems (2019)
Master's degree (1 major) Information Systems (2022)
Master's degree (1 major) Computer Science (2023)
Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)
Master's degree (1 major) Artificial Intelligence (2024)
Master's degree (1 major) Computational Mathematics (2024)
Master's degree (1 major) Mathematics (2024)
Master's degree (1 major) Information Systems (2024)
Master's degree (1 major) Information Systems (2025)
Master's degree (1 major) Computer Science (2025)
Master's degree (1 major) Mathematical Data Science (2025)
Master's degree (1 major) Aerospace Computer Science (2025)
First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title					Abbreviation	
Machir	Machine Learning for Networks 2       10-I=MLN2-232-m01					
Module	e coord	inator		Module offered by		
holder	of the C	Chair of Computer Scie	nce XV	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Graph representations of relational data have become an important foundation to address data science and ma- chine learning tasks across the sciences. Graph mining and learning techniques help us to detect functional mo- dules in biological networks and communities in social networks, to find missing links in social networks, or to address node-, link-, or graph-level classification tasks. But how can we apply frequentist and Bayesian statisti- cal learning techniques to data on complex networks? And how we can use the topology of relationships to infer similarity scores between objects that can, e.g., be used for the design of recommender systems? How can we use matrix factorization techniques to generate low-dimensional vector-space representations of nodes that re- tain a maximum amount of information about the topology of links? And how can we apply the latest deep lear- ning techniques to address node-, link-, or graph-level learning tasks in data with relation structures? Addressing these questions, this course combines a series of lectures - which introduce theoretical concepts in statistical learning, representation learning, and graph neural networks with practice sessions that show how we can apply them in practical graph learning tasks. The course material consists of annotated slides for lectures and a series of accompanying jupyter notebooks. Intended learning outcomes The course will equip students with techniques to address supervised and unsupervised learning tasks in data						
to infer cluster pattern and how topological similarity scores can be used to address unsupervised link predicti- on and graph reconstruction. Participants will further study both algebraic and deep learning based methods to learn low-dimensional vector-space representations of graph-structured data, and learn how graph neural net- works help us to apply deep learning to node- and graph-level learning tasks in large complex networks. Stu- dents can apply and deepen their knowledge through weekly exercise sheets. The successful completion of the course requires to pass a final written exam						
Course	<b>s</b> (type,	, number of weekly cor	tact hours, language –	- if other than Germa	n)	
V (2) + Module	V (2) + Ü (2) Module taught in: English					
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English creditable for bonus						
Allocation of places						
Additional information						
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits):						
Worklo	ad	•				
150 h						
Master's w	ith 1 major	Artificial Intelligence (2024)	JMU Würzburg • ta record Maste	• generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 58 / 80

## **Teaching cycle**

## Teaching cycle: if announced

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 22 II Nr. 3 b)

# Module appears in

Master's degree (1 major) Computer Science (2023)

Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)

Master's degree (1 major) Artificial Intelligence (2024)

Master's degree (1 major) Computational Mathematics (2024)

Master's degree (1 major) Mathematics (2024)

Master's degree (1 major) Computer Science (2025)

Master's degree (1 major) Mathematical Data Science (2025)

First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title				Abbreviation		
Multili	Multilingual NLP 10-I=MNLP-232-m01					
Modul	e coord	inator		Module offered by		
holder	of the (	Chair of Computer Scien	ce XII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts		_			
Langua of-spec on spa ge Moo transla transfe pics: c tual pa	Languages of the world: language families, typology, etymology. Linguistic universals: words, morphology, parts- of-speech, syntax. Alphabets (scripts), encoding, and language identification. Multilingual word representati- on spaces (aka cross-lingual word embeddings). Transformer architecture and Pretrained (multilingual) Langua- ge Models. Machine translation. Multilingual resources: unlabeled corpora, lexico-semantic networks and word translations, parallel corpora. Cross-lingual transfer: from word alignment and label projection, over MT-based transfer to zero-shot and few-shot transfer with multilingual Transformer-based language models. Advanced to- pics: curse of multilinguality, modularization and language adaptation, multilingual sentence encoders, contex- tual parameter generation. multi-source transfer, gradient manipulations.					
Intend	ed lear	ning outcomes				
Studer and als from d transfe solve p to obta	Students will acquire theoretical and practical knowledge on modern multilingual natural language processing and also get an insight into cutting edge research in (multilingual) NLP. They will learn how to represent texts from different languages in shared representation spaces that enable semantic comparison and cross-lingual transfer for various NLP tasks. Upon successful completion of the course, the students will be well-equipped to solve practical NLP problems regardless of the language of the text data, and to determine the optimal strategy					
Course	es (type	, number of weekly cont	act hours, language –	- if other than Germa	ın)	
V (2) +	Ü (2)					
Mothe	e taugn	t in: German and/or Eng	usn anguaga if ather th	an Carman, avamina	tion offered if not	
ster, in	d of ass formati	on on whether module	can be chosen to earn	a bonus)	illion offered — If hol	every seme-
written If anno examir prox. 1 Langua credita	examin ounced nation c 5 minut age of a oble for	nation (approx. 60 to 12 by the lecturer at the be of one candidate each (a res per candidate). ssessment: German and bonus	o minutes) ginning of the course, pprox. 20 minutes) or d/or English	the written examina an oral examinatior	tion may be replace in groups of 2 cand	d by an oral idates (ap-
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Worklo	ad					
150 h						
Teaching cycle						
Teaching cycle: every year, summer semester						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
§ 22 II Nr. 3 b)						
Module appears in						
Master Master	r's degr r's degr	ee (1 major) Information ee (1 major) Information	Systems (2019) Systems (2022)			
Master's w	vith 1 majo	r Artificial Intelligence (2024)	JMU Würzburg ta record Maste	• generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 60 / 80

Master's degree (1 major) Computer Science (2023)
Master's degree (1 major) Artificial Intelligence (2024)
Master's degree (1 major) Computational Mathematics (2024)
Master's degree (1 major) Management (2024)
Master's degree (1 major) Mathematics (2024)
Master's degree (1 major) Information Systems (2024)
Master's degree (1 major) Economathematics (2024)
Master's degree (1 major) Information Systems (2025)
Master's degree (1 major) Management (2025)
Master's degree (1 major) Computer Science (2025)
Master's degree (1 major) Mathematical Data Science (2025)
Master's degree (1 major) Economathematics (2025)
First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title				Abbreviation		
Reinfo	Reinforcement Learning and Computational Decision Making         10-I=RLCDM-232-m01					
Module	e coordi	nator		Module offered by		
Dean o	fStudie	es Informatik (Computer S	Science)	Institute of Comput	er Science	
ECTS	Metho	d of grading	Only after succ. com	pl. of module(s)		
5	numer	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
This course will provide the essential notions about reinforcement learning and further related approaches for computational decision-making (e.g., multi-armed bandits, recommender systems). The topics will be covered under a both theoretical and empirical lens, providing the rigorous mathematical foundations of reinforcement learning and decision-making, complementing them with concrete examples of real-world applications.						
Intend	ed learr	ing outcomes				
The students will gain fundamental knowledge of Reinforcement Learning spanning from classical methods to modern algorithms based on deep learning techniques, and Decision-Making approaches such as multi-armed bandits and recommender systems. Students will know about the theoretical treatment of the methods explained in the course, and will have a deep understanding of the importance of Reinforcement Learning and Decision-Making in solving real-world problems. They will be able to design, implement, and conduct Reinforcement Learning experiments for solving problems from simulated basic tasks to advanced real-world applications, e.g., games, autonomous driving, finance, robotics.						
Course	<b>s</b> (type,	number of weekly conta	ct hours, language —	if other than Germa	n)	
V (2) + Module	Ü (2) e taught	in: German and/or Engli	ish			
Metho ster, in	<b>d of ass</b> formati	<b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written If anno examir prox. 1 Langua credita	examir unced b nation o 5 minut age of as ble for l	nation (approx. 60 to 120 by the lecturer at the beg f one candidate each (ap es per candidate). ssessment: German and/ ponus	minutes) inning of the course, prox. 20 minutes) or ′or English	the written examina an oral examination	tion may be replaced by an oral in groups of 2 candidates (ap-	
Allocat	ion of p	laces				
Additio	onal info	ormation				
Worklo	ad					
150 h						
Teachi	ng cycle	9				
Teaching cycle: every year, summer semester						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
	-					
Module	e appea	rs in				
Master	's degre	ee (1 major) Computer Sc	ience (2023)			
Master	's degre	ee (1 major) Artificial Inte	lligence (2024)			
Master	's degre	ee (1 major) Computation	al Mathematics (202	4)		
Master	's degre	ee (1 major) Mathematics	(2024)			

Module title Abbreviation						
Remot	Remote Sensing 10-I=RRS-232-mo1					
Modul	e coord	inator		Module offered by		
holder	of the (	Chair of Computer Scier	ce VIII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
5	nume	rical grade		•		
Duratio	on	Module level	Other prerequisites	;		
1 seme	ester	graduate				
Conter	Contents					
Remote on Earl magne aircraft flection	Remote sensing refers to the use of satellite- or aircraft-based sensor technologies to detect and classify objects on Earth, including on the surface and in the atmosphere and oceans, based on propagated signals (e.g. electro- magnetic radiation). It may be split into "active" remote sensing (i.e., when a signal is emitted by a satellite or aircraft and its reflection by the object is detected by the sensor) and "passive" remote sensing (i.e., when the re- flection of sunlight is detected by the sensor).					
Intend	ed lear	ning outcomes				
The stu sphere mote s	udents l to the ensing	earn the basics of earth object under investigat data, sensors and platf	observation. They ou on and back to the se orms.	tline and explain the nsor. They emphasiz	radiation path throu e essential characte	ugh the atmo- ristics of re-
Course	es (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)					
Modul	e taugh	t in: German and/or Eng	glish			
Metho ster, in	<b>d of ass</b> formati	essment (type, scope, on on whether module	language — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
written If anno examir prox. 1 Langua	written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English					
Allocat	tion of r					
Allocal		Jaces				
Additio	le maio	rs for MA 120 Computer	Science I P IN			
Worklo	ad					
150 h						
Teachi	ng cycl	e				
Teachi	ng cycle	e: every year, summer s	emester			
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
§ 22    Nr. 3 b)						
Module appears in						
Master's degree (1 major) Computer Science (2023)						
Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)						
Master	Master's degree (1 major) Artificial Intelligence (2024)					
Master's degree (1 major) Computational Mathematics (2024)						
Master's degree (1 major) Mathematics (2024)						
Master	Master's degree (1 major) Computer Science (2025)					
Master	's degr	ee (1 major) Aerospace	Computer Science (20	25)	``	
First st	ate exa	mination for the teaching	ng degree Gymnasium	Computer Science (2	2025)	
waster's w	ith 1 majo	Artificial Intelligence (2024)	JMU Würzburg ta record Maste	• generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	ım. reg. da- genz - 2024	page 63 / 80

Systems Benchmarking       10-I=SB-212-m01         Module offered by         holder of the Chair of Computer Science II       Institute of Computer Science         ECTS       Method of grading       Only after succ. compl. of module(s)         5       numerical grade          Duration       Module level       Other prerequisites         Isemester       graduate          Contents         Benchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basic, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.         Interd					
Module coordinator         Module offered by           holder of the Chair of Computer Science II         Institute of Computer Science           ECTS         Method of grading         Only after succ. compl. of module(s)           5         numerical grade            Duration         Module level         Other prerequisites           1 semester         graduate            Contents         Eenchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundation of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.           Interded learning outcomes         Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark r					
holder ∪ f the Chair of Computer Science II       Institute of Computer Science         ECTS       Methor f grading       Only after succ. compl. of module(s)         5       numerical grade          Duration       Module level       Other prerequisites         1 semester       graduate          Benchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.         Intended Learning outcomes       Studeents are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results.         Gourses (type, number of weekly contact hours, language — if other than German)					
ECTS       Meti→of grading       Only after succ. compl. of module(s)         5       num=rical grade          Duration       Module level       Other prerequisites         1 sem=ster       graduate          Benchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.         Intended lear					
5       numerical grade          Duration       Module level       Other prerequisites         1 semester       graduate          Contents       Emothmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.         Intended learning outcomes       Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results.         Courses (type, number of weekly contact hours, language — if other than German)       V (2) + Ü (2)					
Duration       Module level       Other prerequisites         1 semester       graduate          Contents          Benchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.         Intended learning outcomes         Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results.         Courses (type, number of weekly contact hours, language — if other than German)         V (2) + Ü (2)					
1 semester       graduate          Contents       Benchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmark standardization. Furthermore, the course covers selected application areas and case studies, such as benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security.         Intended learning outcomes       Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results.         Courses (type, number of weekly contact hours, language — if other than German)       V (2) + Ü (2)					
Benchmarking has become a major discipline in science and technology as a driver of product quality, efficiency, and sustainability. Reliable and fair benchmarks enable educated decisions and play an important role as evaluation tools during system design, development, and maintenance. In research, benchmarks play an integral part in the evaluation and validation of new approaches and methodologies. The course introduces the foundations of benchmarking as a discipline, covering the three fundamental elements of each benchmarking approach: metrics, workloads, and measurement methodology. More specifically the following topics are covered: benchmarking basics, metrics, statistical measurements, experimental design, workloads, measurement tools, operational analysis, basic queueing models, and benchmarking of energy efficiency, virtualization, storage, microservices, cloud elasticity, performance isolation, resource demand estimation, and software and system security. <b>Intended learning outcomes</b> Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results. <b>Courses</b> (type, number of weekly contact hours, language — if other than German) $V(2) + \ddot{U}(2)$					
Intended learning outcomes         Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results.         Courses (type, number of weekly contact hours, language — if other than German)         V (2) + Ü (2)					
Students are able to design and build fair and reliable benchmarks, metrics, and measurement tools. Students can evaluate the quality of existing benchmarking approaches and benchmark results.  Courses (type, number of weekly contact hours, language — if other than German)  V (2) + Ü (2)					
<b>Courses</b> (type, number of weekly contact hours, language — if other than German) V (2) + $\ddot{U}$ (2)					
V (2) + Ü (2)					
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)					
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus					
Allocation of places					
Additional information					
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): SE,IT,ES,HCI,GE					
Workload					
150 h					
Teaching cycle					
Teaching cycle: every year, summer semester					
Referred to in LPO I (examination regulations for teaching-degree programmes)					
Module appears in					
Master's degree (1 major) Information Systems (2019) Master's degree (1 major) eXtended Artificial Intelligence (xtAl) (2020) Master's degree (1 major) Computer Science (2021) Master's degree (1 major) Aprospace Computer Science (2021)					
Master's with 1 major Artificial Intelligence (2024) JMU Würzburg • generated 18-Jun-2025 • exam. reg. da- page 64 / 80					

Master's degree (1 major) Information Systems (2022) Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Information Systems (2024)

Module title				Abbreviation		
Securit	Security of Software Systems 10-I=SSS-232-m01					
Module	e coordi	nator		Module offered by		
holder	of the C	hair of Computer Scienc	e II	Institute of Comput	er Science	
ECTS	Metho	d of grading	Only after succ. com	npl. of module(s)		
5	numer	ical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	Contents					
The lecture provides an overview of common software vulnerabilities, state-of-the-art attack techniques on mo- dern computer systems, as well as the measures implemented to protect against these attacks. In the course, the following topics are discussed: <ul> <li>x86-64 instruction set architecture and assembly language</li> <li>Runtime attacks (code injection, code reuse, defenses)</li> <li>Web security</li> <li>Blockchains and smart contracts</li> <li>Side-channel attacks</li> <li>Hardware security</li> </ul> <li>Intended learning outcomes</li> <li>Students gain a deep understanding of software security, from hardware and low-level attacks to modern concepts such as blockchains. The lecture prepares for research in the area of security and privacy, while the exercises allow students to gain hands-on experience with attacks and analysis of systems from an attacker's perspective.</li>						
Course	<b>s</b> (type,	number of weekly conta	ct hours, language –	- if other than Germa	n)	
V (2) + Module	U (2) Staught	in, Englich				
Methor ster, in	<b>d of ass</b> formati	<b>essment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: English creditable for bonus						
Allocat	ion of p	laces				
Additio	nal info	ormation				
Focuse SE,KI,L	s availa R, HCI,	ble for students of the M ES, SEC,IN	laster's programme li	nformatik (Computer	Science, 120 ECTS credits):	
Worklo	ad					
150 h						
Teachi	ng cycle	9				
Teachi	ng cycle	e: every year, summer ser	nester			
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)		
§ 22	Nr. 3 b)					
Module	e appea	rs in				
Module Master	e studie 's degre	s (Master) Computer Sci ee (1 major) Computer Sc	ence (2019) ience (2023)			

Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Information Systems (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Information Systems (2025) Master's degree (1 major) Information Systems (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025)

First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title					Abbreviation	
Discret	Discrete Event Simulation 10-I=ST-232-m01					
Module	e coord	inator		Module offered by		
holder of the Chair of Computer Science			ce III	Institute of Comput	er Science	
ECTS Method of grading			Only after succ. con	npl. of module(s)		
5	nume	rical grade		• • • •		
Duratio	on	Module level	Other prerequisites			
1 seme	ster	graduate				
Contents						
The simulation of communication systems is illustrated and practically performed on contemporary examples, e.g., popular Internet services or the Internet of Things (IoT). The following topics will be conveyed: Introduction to simulation techniques, discrete-event simulation and process-oriented simulation, generating						
design delling	ing and si	l evaluating simulation emulation, advanced con	experiments, special r cepts and techniques	andom processes, p , practical execution	ossibilities and limit of simulation project	tations of mo-
Intend	ed lear	ning outcomes				
The stu (techni lation r	udents ical) sys method	possess the methodic ki stems, the evaluation of s.	nowledge and the pra results and the correc	ctical skills necessar t assessment of the	y for the stochastic possibilities and lin	simulation of nits of simu-
Course	<b>s</b> (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)					
Metho ster, in	<b>d of ass</b> formati	sessment (type, scope, l ion on whether module of	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English						
credita		bonus	_			
Allocat	tion of p	olaces				
			_			
Additio	onal inf	ormation				
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): IT,KI,ES,GE,IN						
Worklo	bad					
150 h						
Teaching cycle						
Teaching cycle: every year, summer semester						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
§ 22 II Nr. 3 b)						
Module appears in						
Module studies (Master) Computer Science (2019)						
Master	Master's degree (1 major) Computer Science (2023)					
Master's degree (1 major) Aerospace Computer Science (2023)						
Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)						
Master's degree (1 major) Artificial Intelligence (2024)						
Master	's degr	ee (1 major) Computatio	nal Mathematics (202	24)		
Master	's degr	ee (1 major) Mathematic	s (2024)			
Master's w	rith 1 majo	r Artificial Intelligence (2024)	JMU Würzburg • ta record Maste	e generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	am. reg. da- genz - 2024	page 68 / 80

Master's degree (1 major) Information Systems (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Information Systems (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title					Abbreviation
Autono	Autonomous Mobile Systems 10-LURI=AMS-232-m01				
Modul	e coord	inator		Module offered by	
holder	of the (	Chair of Computer Scienc	e XVII	Institute of Comput	er Science
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
10	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	graduate			
Conter	nts				
(1) Wha on (6) trol arc	at are m Localiza chitectu	obile robots? (2) Sensors ation in maps (7) Mappin res	s (3) Sensor data proo g and SLAM (8) Navig	cessing (4) Locomoti gation (9) Sensor dat	on and kinematics (5) Localizati- a interpretation (10) Robot con-
Intend	ed learı	ning outcomes			
Studer cepts t ve lear	nts knov o mobil ned the	v Bayesian concepts for s e robots. Derived concep steps to build and progr	sensor data processir ots like Kalman filter, am mobile systems.	ng for a mobile syste Particle filter, POMD	m and are able to apply the con- Ps, etc. are understood. They ha-
Course	es (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
V (4) + Module	Ü (2) e taugh	t in: German and/or Engl	ish		
Metho ster, in	<b>d of ass</b> Iformati	e <b>ssment</b> (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
lf anno examir prox. 1 Langua credita	written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English				
Allocat	tion of p	olaces			
Additio	onal inf	ormation			
Focuse KI, ES,	es availa LR, GE	able for students of the N	laster's programme li	nformatik (Computer	Science, 120 ECTS credits): IT,
Worklo	bad				
300 h					
Teachi	ng cycl	e			
Teaching cycle: every year, summer semester					
Referre	ed to in	LPOI (examination regu	lations for teaching-c	legree programmes)	
§ 22    Nr. 3 b)					
Module appears in					
Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Computational Mathematics (2024) Master's degree (1 major) Mathematics (2024) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025)					



First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title					Abbreviation	
Photogrammetric Machine Vision 10-LURI=PHOTO-232-mo1						
Module coordinator				Module offered by		
holder of the Chair of Computer Scienc		e XVII Institute of Computer Science				
ECTS Method of grading		Only after succ. compl. of module(s)				
5 numerical grade						
Duration Module level		Other prerequisites				
1 semester graduate						
Contents						
(1) What is Photogrammetry? (2) Cameras (3) Homogeneous Coordinates (4) Camera Parameter (5) Direct Linear Transform (6) Spatial Resection (7) Relative Orientation and Fundemental Matrix (8) Epipolar Geometry (9) FE-di- rect (10) Iterative-Solution (11) Triangulation (12) Multiview (13) Aerial photography (14) Orthophoto (15) Finding Corresponding Points (16) Matching						
Intended learning outcomes						
Students understand that photogrammetry means measuring in and with photos. They have learned the steps to calculate 3D information from 2D images and are able to evaluate accuracies. The know the limits of 3D computer vision.						
<b>Courses</b> (type, number of weekly contact hours, language — if other than German)						
V (2) + Ü (2) Module taught in: German and/or English						
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additional information						
Workload						
150 h						
Teaching cycle						
Teaching cycle: every year, winter semester						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
§ 22 II Nr. 3 b)						
Module appears in						
Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)						
Module title				Abbreviation		
---	--	------------------------	-------------------------	-------------------------------	-----------------------	-------------
Robotics 1 10-LURI=				10-LURI=R01-232-n	101	
Module coordinator				Module offered by		
holder	of the (	Chair of Computer Scie	nce XVII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	cc. compl. of module(s)		
5	nume	rical grade				
Durati	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	its					
History homog tor cor Works se dyn lonom Moven Sensor Intend The stu their k	History, applications and properties of robots, direct kinematics of manipulators: coordinate systems, rotations, homogenous coordinates, axis coordinates, arm equation. Inverse kinematics: solution properties, end effector configuration, numerical and analytical approaches, examples of different robots for analytical approaches. Workspace analysis and trajectory planning, dynamics of manipulators: Lagrange-Euler model, direct and inverse dynamics. Mobile robots: direct and inverse kinematics, propulsion system, tricycle, Ackermann steering, holonomes and non-holonome restrictions, kinematic classification of mobile robots, posture kinematic model. Movement control and path planning: roadmap methods, cell decomposition methods, potential field methods. Sensors: position sensors, speed sensors, distance sensors. Intended learning outcomes The students master the fundamentals of robot manipulators and vehicles and are, in particular, familiar with their kinematics and dynamics as well as the planning of paths and task execution.					
Course	<b>s</b> (type	, number of weekly con	tact hours, language –	- if other than Germa	n)	
V (2) + Modul	Ü (2) e taugh	t in: German and/or En	glish			
Metho	d of ass	essment (type, scope,	language - if other the	an German, examina	tion offered — if not	every seme-
ster, in	formati	on on whether module	can be chosen to earn	a bonus)		
written examination (approx. 60 to 120 minutes) If announced by the lecturer at the beginning of the course, the written examination may be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups of 2 candidates (ap- prox. 15 minutes per candidate). Language of assessment: German and/or English creditable for bonus						
Allocation of places						
Additional information						
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): KI, ES, LR, HCI, GE						
Worklo	oad					
150 h						
Teaching cycle						
Teaching cycle: every year, winter semester						
<b>Referred to in LPO I</b> (examination regulations for teaching-degree programmes)						
§ 22 II Nr. 3 b)						
Module appears in						
Master's degree (1 major) Computer Science (2023) Master's degree (1 major) Aerospace Computer Science (2023) Master's degree (1 major) Artificial Intelligence & Extended Reality (2024) Master's degree (1 major) Artificial Intelligence (2024) Master's degree (1 major) Computational Mathematics (2024) Master's with 1 major Artificial Intelligence (2024)						
			ta record Maste	(120 ECTS) Künstliche Intelli	genz - 2024	

#### Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Mathematics (2024) Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)

Master's with 1 major Artificial Intelligence (2024)

JMU Würzburg • generated 18-Jun-2025 • exam. reg. data record Master (120 ECTS) Künstliche Intelligenz - 2024

Module title			Abbreviation			
Robotics 2 10-LURI=RO2-232-mo1				01		
Module coordinator				Module offered by		
holder	of the (	Chair of Computer Scienc	e XVII	Institute of Comput	er Science	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
10	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ester	graduate				
Conter	nts					
Founda feedba stems: itialisin	ations o ack and foundang, app	of dynamic systems, cont feed-forward, state obse ations of stochastics, ran- lication examples, proble	rollability and observ rver, feedback with s dom processes, stocl ems of Kalman filters,	ability, controller de tate observer, time c hastic dynamic syste extended Kalman fi	sign through pole ass liscrete systems, stoc ems, Kalman filter: de lter.	signment: hastic sy- rivation, in-
Intend	ed learı	ning outcomes				
The stu tions o se the design	The students master all fundamentals that are necessary to understand Kalman filters and their use in applica- tions of robotics. The students possess a knowledge of advanced controller and observer methods and recogni- se the connections between the dual pairs controllability - observability as well as controller design and observer design. They also recognise the relationship between the Kalman filter as a state estimator and an observer.					n applica- nd recogni- and observer oserver.
Course	es (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)	
V (4) + Modul	Ü (2) + e taugh	P (1) t in: German and/or Engl	ish			
Metho	d of ass	sessment (type, scope, la	nguage — if other tha	an German, examina	tion offered — if not e	every seme-
ster, in	ıformati	on on whether module ca	an be chosen to earn	a bonus)		,
written	exami	nation (approx. 60 to 120	minutes)			
lf anno	ounced	by the lecturer at the beg	inning of the course,	the written examina	tion may be replaced	by an oral
examir	nation o	of one candidate each (ap	prox. 20 minutes) or	an oral examination	in groups of 2 candio	dates (ap-
prox. 15 minutes per candidate).						
Language of assessment: German and/or English creditable for bonus						
Allocat	tion of r	places				
Additio	onal info	ormation				
Focuses available for students of the Master's programme Informatik (Computer Science, 120 ECTS credits): KI, ES, IR, HCL GE						
Worklo	ad					
300 h						
Teachi	ng cycl	е				
Teaching cycle: every year, summer semester						
Referred to in LPO I (examination regulations for teaching-degree programmes)						
§ 22 II Nr. 3 b)						
Module appears in						
Master's degree (1 major) Computer Science (2023)						
Master's degree (1 major) Aerospace Computer Science (2023)						
Master's degree (1 major) Artificial Intelligence & Extended Reality (2024)						
Master's degree (1 major) Artificial Intelligence (2024)						
Master's degree (1 major) Computational Mathematics (2024)						
Master's teaching degree Gymnasium MINT Teacher Education PLUS Elite Network Rayaria (ENR) (2025)						
Master's w	ith 1 maio	r Artificial Intelligence (2024)		generated 18-lun-2025 • example	un Davalla (END) (20)	25J
			ta record Master	(120 FCTS) Künstliche Intelli	genz - 2024	P-3-75700

## Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Supplementary course MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2025) Master's degree (1 major) Computer Science (2025) Master's degree (1 major) Aerospace Computer Science (2025) First state examination for the teaching degree Gymnasium Computer Science (2025)

Module title				Abbreviation		
Decision Support Systems				12-M-DSS-242-m01		
Module coordinator				Module offered by		
holder	of the (	Chair of Business Analyt	ics	Faculty of Managem	nent and Economics	
ECTS	Metho	od of grading	Only after succ. cor	compl. of module(s)		
5	nume	rical grade				
Duratio	on	Module level	Other prerequisites	i		
1 seme	ester	graduate				
Conter	nts		_			
The co The ac (Pytho	The course discusses advanced approaches for modelling and solving decision problems in business settings. The acquired insights are used to design and implement decision support systems using standard software tools (Python).					
Intend	ed lear	ning outcomes				
After si	<ul> <li>After successfully completing the course, students should be able to</li> <li>Understand the structure of classic business decision problems</li> <li>Isolate key elements from general problem descriptions and convert them to quantitative decision models</li> <li>Solve different classes of optimization problems (linear, integer, non-linear, stochastic, dynamic)</li> <li>Implement decision support systems</li> </ul>					
Course	<b>es</b> (type	, number of weekly cont	act hours, language –	- if other than Germa	n)	
V (2) +	Ü (2)					
Modul	e taugh	t in: English	_			
Metho ster, in	<b>d of ass</b> Iformati	<b>sessment</b> (type, scope, l ion on whether module o	anguage — if other th can be chosen to earn	an German, examina a bonus)	tion offered — if not	every seme-
a) written examination (approx. 60 minutes) or b) oral examination (one candidate each: approx. 10 to 15 minutes, groups of 2: approx. 20 minutes, groups of 3: approx. 30 minutes) Language of assessment: English creditable for bonus						
Allocat	tion of p	olaces				
Additio	onal inf	ormation				
Workload						
150 h						
Teachi	ng cycl	e				
Teaching cycle: winter semester						
Referre	ed to in	LPO I (examination reg	ulations for teaching-	degree programmes)		
Module appears in						
Master's degree (1 major) Management International (2024)						
Master's degree (1 major) Artificial Intelligence (2024)						
Master's degree (1 major) Management (2024)						
Master's degree (1 major) Information Systems (2024)						
Master's degree (1 major) International Economic Policy (2024)						
Master's degree (1 major) Economathematics (2024) Master's degree (1 major) Information Systems (2025)						
Master's degree (1 major) International Economic Policy (2025)						
Master's w	vith 1 majo	r Artificial Intelligence (2024)	JMU Würzburg ta record Maste	• generated 18-Jun-2025 • exa r (120 ECTS) Künstliche Intelli	ım. reg. da- genz - 2024	page 77 / 80

## Julius-Maximilians-UNIVERSITÄT WÜRZBURG

Master's degree (1 major) Management (2025) Master's degree (1 major) Management International (2025) Master's degree (1 major) China Business and Economics (2025) Master's degree (1 major) China Language and Economy (2025) Master's degree (1 major) Economathematics (2025)

Module title				Abbreviation		
Enterprise Al				12-M-EAI-242-m01		
Module coordinator				Module offered by	<u> </u>	
holder	holder of the Chair of Business Informatics and AI for Enter- Faculty of Management and Economics					
prise	prise					
ECTS	ECTS Method of grading Only after succ. compl. of module(s)					
5	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	graduate				
Conten	ts					
Introdu Busine ML Ops ML Ops ML Ops ML Ops ML Ops ML Ops ML Ops Instrast Manag Intende In this stems i fing an	Introduction to Enterprise AI Business Requirements for AI Systems ML Ops I: Data Engineering ML Ops II: Obtaining Training Data ML Ops III: Data Preprocessing ML Ops IV: Feature Engineering ML Ops V: Feature Engineering ML Ops V: Modeling & Evaluation ML Ops VI: Deployment ML Ops VI: Deployment ML Ops VII: System Monitoring ML Ops VII: System Monitoring ML Ops VIII: Updating in Production Instrastructure and Tools Managing Machine Learning Teams Intended learning outcomes In this course, you will learn the fundamentals for developing, deploying and maintaining machine learning sy- stems in companies (MLOps). This includes an understanding of the associated IT infrastructure as well as staf- fing and organizational forms for managing machine learning and data science teams. You will refine and test your skills by practicing the theoretical concepts during exercise sessions. This includes					
Course $V(2)$ +	s (type	, number of weekly cor	itact hours, language –	- if other than Germa	in)	
Module	e taugh	t in: English				
<b>Method of assessment</b> (type, scope, language — if other than German, examination offered — if not every seme- ster, information on whether module can be chosen to earn a bonus)						
a) written examination (approx. 60 minutes) or b) term paper (approx. 15 pages) or c) oral examination of one candidate each (approx. 20 minutes) or d) portfolio (approx. 50 hours) Language of assessment: English Assessment offered: In the semester in which the course is offered creditable for bonus						
Allocation of places						
Number of places: 35. Should the number of applications exceed the number of available places, places will be allocated as follows: (1) Students who already have successfully completed courses offered by the supervising chair will be given pre- ferential consideration. a. Among applicants with the same number of successfully completed modules, places will be allocated accor- ding to the total number of ECTS credits achieved in the corresponding modules. b. When places are allocated in accordance with 1.b) and the number of applications exceeds the number of available places, places will be allocated according to the average grade of assessments taken in the correspon- ding courses.						
master's W	ui i majo	Annicial intelligence (2024)	ta record Master	(120 ECTS) Künstliche Intelli	genz - 2024	page /9 / 80

c. Among applicants with the same average grade, places will be allocated by lot.

(2) Any remaining places are available to students who have not yet successfully completed any courses of the supervising chair. The selection is made according to study progress (number of semesters); among applicants with the same number of semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

## Additional information

--

Workload

150 h

## Teaching cycle

Teaching cycle: summer semester

Referred to in LPO I (examination regulations for teaching-degree programmes)

# Module appears in

Master's degree (1 major) Management International (2024)

Master's degree (1 major) Artificial Intelligence (2024)

Master's degree (1 major) Management (2024)

Master's degree (1 major) Information Systems (2024)

Master's degree (1 major) International Economic Policy (2024)

Master's degree (1 major) Economathematics (2024)