

Course Catalogue – Bridge Modules

Modulhandbuch - Brückenmodule

Suitable for the master study programme

Artificial Intelligence for Industrial Applications

Künstliche Intelligenz für industrielle Anwendungen



Department of Electrical Engineering, Media and Computer Science
Fakultät Elektrotechnik, Medien und Informatik

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Document history

02.10.2025	Creation of document (S. Konrad)
21.11.2025	Modules, that are offered temporarily are removed. (M. Wiehl)
05.05.2026	Programming for KI removed added Digitale Kommunikationstechnik added Mathematics Bridge removed Mathematics 1 removed Software Project

Preliminary notes

Vorbemerkungen

The bridge modules give graduates of a Bachelor's degree programme with less than 210 ECTS (but at least 180 ECTS) the opportunity to acquire the missing ECTS.

They are suitable for the following master degree programme:

- Artificial Intelligence for Industrial Applications

• Registration formalities:

All examinations must be registered with the Students' Office (through PRIMUSS). Additional formalities are listed in the module descriptions.

• Abbreviations:

ECTS = The European Credit Transfer and Accumulation System (ECTS) is a credit point system for accreditation of course achievements.

SWS = Semesterwochenstunden = Semester hours per week

• Workload:

According to the Bologna Process, a credit point is based on a workload of 25-30 hours. The number of hours includes the time spent at the university, the time spent preparing for and following up on courses, the time spent writing papers or preparing for examinations.

Example calculation of workload (course with 4 SWS, 5 ECTS credits):

Workload: 5 ECTS x 30 h/ECTS = 150 h

- Lecture (4 SWS x 15 weeks) = 60 h
- Self study = 60 h
- Exam preparation = 30 h

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= 150 h

Modules

Industrie 4.0 Projekt

Classification Zuordnung zum Curriculum	Module ID Modul-ID	Kind of Module Art des Moduls	Number of Credits Umfang in ECTS-Leistungspunkte
	140P	Bridge Module	5 ECTS

Location Ort	Language Sprache	Duratrion of Module Dauer des Moduls	Frequency of Module Vorlesungsrythmus	Max. Number of Participants Max. Teilnehmerzahl
Amberg	English	one semester	summer/winter semester	
Module Convenor Modulverantwortliche/r			Professor / Lecturer Dozent/In	
Prof. Dr. Gerald Pirkl			Prof. Dr. Michael Wiehl	
Prerequisites* Voraussetzungen				
Experience and knowledge from previous projects and bachelor grade studies especially on project management				
Usability Verwendbarkeit			Teaching Methods Lehrformen	Workload
Bridge module for international master study programmes Elective for Bachelor study programmes Compulsory module in the Industry 4.0 Informatics			Project work	10h: Project meetings 140h: Project processing including documentation = 150 h

Learning Outcomes

Lernziele / Qualifikationen des Moduls

After successfully completing the module, students have the following professional, methodological and personal skills:

Professional competence:

Students create software with regard to usability, intelligence, reliability and can evaluate its elements accordingly. They discover new topics and possible fields for future work and research in various fields.

Methodological competence:

Students can evaluate and assess the project being worked on in terms of reliability, availability and security using appropriate software tools and application lifecycle management tools. They can analyze larger software projects and implement them in test-driven or scrum-based processes. You can apply various known technologies in the project environment.

Personal competence (social competence and self-competence):

Students can familiarize themselves independently with new subject areas and know how to work on a problem in a team.

Course Content

Inhalte der Lehrveranstaltungen

The course is structured in difference meetings.

- Meeting on project definition, team building, project preparation and kickoff
- Meeting on project monitoring, milestone evaluation, presentation of intermediate results
- Meeting on final presentation and discussion about project content, approach and further workload

Teaching Material / Reading

Lehrmaterial / Literatur

Material for self study on project management, organisation of projects with waterfall model, software engineering and structuring complex software systems.

Internationality

Internationalität (Inhaltlich)

Module is offered in English.

Method of Assessment (ggf. Hinweis zu Multiple Choice - APO §9a)

Modulprüfungen

Type of examination ^{*1)} Prüfungsform	Type/scope including weighting ^{*2)} Art/Umfang inkl. Gewichtung	Learning objectives/competencies to be assessed Zu prüfende Lernziele/Kompetenzen
ModA	Project work of 150 hours; the objectives and content are defined in advance in an exposé and agreed with the lecturer. The project phase and the results are discussed in a report.	Independent processing of a larger CPS-related project in a team, analysis, planning, design and development of a solution approach for a problem

^{*1)} Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden

^{*2)} Please additionally provide information on the weighting (in % share) and, if applicable, also a reference to a bonus system.

International Affairs & Intercultural Meeting

Classification Zuordnung zum Curriculum	Module ID Modul-ID	Kind of Module Art des Moduls	Number of Credits Umfang in ECTS-Leistungspunkte
	INT	Bridge Module	5 ECTS

Location Ort	Language Sprache	Duratrion of Module Dauer des Moduls	Frequency of Module Vorlesungsrythmus	Max. Number of Participants Max. Teilnehmerzahl
Online, Amberg	English, German	one semester	summer/winter semester	
Module Convenor Modulverantwortliche/r			Professor / Lecturer Dozent/In	
Prof. Dr.-Ing. Dominikus Heckmann			Prof. Dr.-Ing. Dominikus Heckmann	
Prerequisites* Voraussetzungen				
Note: please also observe the preperquisites according to eximinations regulations law in the current version of the SPO.				
Usability Verwendbarkeit			Teaching Methods Lehrformen	Workload
Bridge module for international master study programmes Elective for Bachelor study programmes			Seminar-based teaching with exercises	Contact time/coaching: 60 h Self-study and project work: 80 h Total workload: 140 h

Learning Outcomes Lernziele / Qualifikationen des Moduls		
After successfully completing the module, students have the following professional, methodological and personal skills:		
Professional competence: Knowledge of the content of the course		
Methodological competence: Discussion culture, scientific work, presentation skills		
Personal competence (social competence and self-competence): improved interaction and teamwork skills, and group discussion in English and German, structured work and effective group work. Intercultural experience. Presentation & discussion experience in mixed groups.		
Course Content Inhalte der Lehrveranstaltungen		
- International aspects (in general and in particular for technical studies) - Intercultural aspects (in general and in particular for a technical degree program) - Interlingual aspects (in general and in particular for technical studies) - Regional characteristics of the Oberrhein & Bavaria with excursions - Special features of the participating nationalities and native languages - Partner universities, information and potential partners for the internship semester or an optional semester abroad - KI.Meeting meetings, information on study organization - Academic work (reading, writing, research)		
Teaching Material / Reading Lehrmaterial / Literatur		
Teaching material Will be announced at the beginning of the semester.		
Internationality Internationalität (Inhaltlich)		
• This course will be taught bilingual in English and German. • All Teaching Materials and Readings will be offered in English and German. • If possible, small intercultural groups are set up for group work		
Method of Assessment (ggf. Hinweis zu Multiple Choice - APO §9a) Modulprüfungen		
Type of examination ^{**1)} Prüfungsform	Type/scope including weighting ^{*2)} Art/Umfang inkl. Gewichtung	Learning objectives/competencies to be assessed Zu prüfende Lernziele/Kompetenzen

ModA		Learning objectives / qualifications of the module, see above
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*¹⁾ Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden

*²⁾ Please additionally provide information on the weighting (in % share) and, if applicable, also a reference to a bonus system.

Robotics Starter & Meeting

Classification Zuordnung zum Curriculum	Module ID Modul-ID	Kind of Module Art des Moduls	Number of Credits Umfang in ECTS-Leistungspunkte
	ROS	Bridge Module	5 ECTS

Location Ort	Language Sprache	Duratrion of Module Dauer des Moduls	Frequency of Module Vorlesungsrythmus	Max. Number of Participants Max. Teilnehmerzahl
Amberg	EN (50%) + DE (50%) Bilingual	one semester	summer/winter semester	
Module Convenor Modulverantwortliche/r			Professor / Lecturer Dozent/In	
Prof. Dr. Dominikus Heckmann			Prof. Dr. Dominikus Heckmann	
Prerequisites* Voraussetzungen				
Usability Verwendbarkeit			Teaching Methods Lehrformen	Workload
Bridge module for international master study programmes			Blended learning, block, Seminar-based teaching with practical training, partly guided self-study	Contact time/coaching: 60 h Self-study and project work: 90 h Total workload: 150 h

Learning Outcomes

Lernziele / Qualifikationen des Moduls

This module is taught in blocks and consists of two parts, a theoretical online-taught first part and a second practical part with project work.

After successfully completing the "Artificial Intelligence Robotics Starter course", students have the following technical, methodological and personal skills:

- **Professional competence:** students gain broad insights into the current topics of robot starter kits, consumer robots, service robots in relation to consumer robots, service robots in relation to artificial intelligence topics, as well as the general basics of robotics.

The students have initial knowledge from the field of human-technology interaction and from the field of cyber-physical systems.

- **Methodological competence:** Students have basic knowledge of the development of simple robots, both in a simulation environment and with physical robots. Students can classify robots and categorize human-robot interaction systems.

- **Personal competence (social competence and self-competence):** Students can work in project teams to design individual design and realize simple robot interaction systems in project teams.

Course Content

Inhalte der Lehrveranstaltungen

- Information processing & sensors for robotics
- Robot hardware & interaction hardware
- Consumer Robotics, Service Robotics, Robot Starter Kits
- Programming robots, also with graphical development environments

Teaching Material / Reading

Lehrmaterial / Literatur

Teaching material

- Material in Moodle & instructions

Literature:

- LEGO EV3 Software
- Softbank Robotics Software
- Scratch Software

Internationality

Internationalität (Inhaltlich)

Module is offered in English.

English and German literature is used.

Method of Assensment (ggf. Hinweis zu Multiple Choice - APO §9a)

Modulprüfungen

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Type of examination ^{*1)} Prüfungsform	Type/scope including weighting ^{*2)} Art/Umfang inkl. Gewichtung	Learning objectives/competencies to be assessed Zu prüfende Lernziele/Kompetenzen
ModA	Will be announced at the beginning of the semester	Robot project: design, realization, programming, presentation and documentation

^{*1)} Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden

^{*2)} Please additionally provide information on the weighting (in % share) and, if applicable, also a reference to a bonus system.

Mathematics Bridge

Classification Zuordnung zum Curriculum	Module ID Modul-ID	Kind of Module Art des Moduls	Number of Credits Umfang in ECTS-Leistungspunkte
	MABR	Bridge Module	5 ECTS

Location Ort	Language Sprache	Duratrion of Module Dauer des Moduls	Frequency of Module Vorlesungsrythmus	Max. Number of Participants Max. Teilnehmerzahl
Amberg	English	one semester	summer/winter semester	
Module Convenor Modulverantwortliche/r			Professor / Lecturer Dozent/In	
Prof. Dr.-Ing. Nada Sissouno			Prof. Dr. F. Brunner, Prof. Dr. T. Nierhoff, Prof. Dr. N. Sissouno	
Prerequisites* Voraussetzungen				
Students are expected to have prior knowledge in the following areas: calculus, linear algebra, and geometry				
*Note: please also observe the preperquisites according to eximinations regulations law in the current version of the SPO.				
Usability Verwendbarkeit		Teaching Methods Lehrformen		Workload
Bridge module for international master study programmes		Seminar with exercises		Contact time: 45h lecture 15h tutorials Pre- and post-processing: 60h Exam preparation: 30h

Learning Outcomes

Lernziele / Qualifikationen des Moduls

After completing this module successfully, students will have the following professional, methodological and personal competences:

- **Professional competence:** Students can apply key mathematical concepts from calculus, linear algebra, discrete mathematics, and statistics, as well as use standard computational methods to solve practical problems in engineering and natural sciences. They can also explain fundamental mathematical concepts, use them to structure arguments, and understand the interplay between different areas of mathematics in applications.
- **Methodological competence:** Students can interpret and formulate mathematical models for engineering problems, translate them into mathematical or algorithmic representations, and select and apply appropriate methods to solve applied challenges.
- **Personal competence (social competence and self-competence):** Students are able to discuss and analyze mathematical problems and their applications with peers. They are able to reflect on their own level of understanding and identify gaps in their knowledge as well as independently work through mathematical content and manage their learning process effectively.

Course Content

Inhalte der Lehrveranstaltungen

- **Analysis:** properties of elementary functions, Integral calculus (1D, integration by parts and substitution) and Multivariate differential calculus including basics of multivariate optimization (extreme values and Lagrange multipliers), approximation theory (Taylor expansions and Fourier series)
- **Linear Algebra:** Linear systems and their solution structures, matrix representations and operations, linear operators and eigenvalue problems
- **Stochastics and Statistics:** Fundamental concepts of probability (e.g. random variables, common distributions, expectation, variance) and statistics (e.g. descriptive statistics, practical data analysis and inferential techniques such as parameter estimation methods)

Teaching Material / Reading

Lehrmaterial / Literatur

Stewart, J.: *Calculus: Early Transcendentals*, 8th ed., Cengage Learning, 2015.

Lay, D. C.; Lay, S. R.; McDonald, J. J.: *Linear Algebra and Its Applications*, 5th ed., Pearson, 2015.
 Montgomery, D. C.; Runger, G. C.: *Applied Statistics and Probability for Engineers*, 7th ed., Wiley, 2018.

Additional lecture notes and selected materials will be provided during the course.

Internationality

Internationalität (Inhaltlich)

Module is offered in English.

Method of Assessment (ggf. Hinweis zu Multiple Choice - APO §9a)

Modulprüfungen

Type of examination ^{*1)} Prüfungsform	Type/scope including weighting ^{*2)} Art/Umfang inkl. Gewichtung	Learning objectives/competencies to be assessed Zu prüfende Lernziele/Kompetenzen
Exam	Exam 60 minutes Parts of the exam may be administered using a multiple choice format. ^{*3)}	All learning outcomes listed above.

^{*1)} Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden

^{*2)} Please additionally provide information on the weighting (in % share) and, if applicable, also a reference to a bonus system.

^{*3)} The multiple-choice format is the only assessment method that allows for the evaluation of subject-specific and methodological competencies regarding the knowledge, application, and integration of the mathematical concepts, structures, and statements covered in the course, without requiring students to provide extensive answers to the questions. As a result, significantly more questions can be answered compared to an open-ended format, which leads to increased measurement accuracy in the aforementioned areas.

Programming Starter

Classification Zuordnung zum Curriculum	Module ID Modul-ID	Kind of Module Art des Moduls	Number of Credits Umfang in ECTS-Leistungspunkte
	PRS	Bridge Module	5 ECTS

Location Ort	Language Sprache	Duratrion of Module Dauer des Moduls	Frequency of Module Vorlesungsrythmus	Max. Number of Participants Max. Teilnehmerzahl
Online, Amberg	English	one semester	winter/summer semester	
Module Convenor Modulverantwortliche/r			Professor / Lecturer Dozent/In	
Prof. Dr. Sandra Rebholz			Prof. Dr. Sandra Rebholz, Prof. Dr. Alexander Prinz, Prof. Dr. Christian Bergler	
Prerequisites* Voraussetzungen				
Usability Verwendbarkeit			Teaching Methods Lehrformen	Workload
Bridge module for international master study programmes Elective for Bachelor study programmes			Seminar-based teaching with exercises	Contact time/coaching: 75 h Self-study and project work: 75 h Total workload: 150 h

Learning Outcomes

Lernziele / Qualifikationen des Moduls

After successfully completing the module, students have the following professional, methodological and personal skills:

Professional competence:

Students know the basics and principles of a programming language such as "Python" or "Processing". They know their syntax and can apply it. Students know the basics of the technical language "Programming" in the two target languages German and English.

Methodological competence:

Students are able to install and set up the Python programming environment independently and master basic concepts such as data types, variables, expressions and data structures, in particular also arrays, iteration, recursion, functions and the basics of object orientation in order to solve simple programming tasks (e.g. data analysis or visual tasks) and to be able to explain them in at least one target language (English/German).

Personal competence (social competence and self-competence):

Students can analyze and solve programming problems alone and in small international & intercultural teams and solve them. They can support each other in the acquisition of technical vocabulary.

Course Content

Inhalte der Lehrveranstaltungen

1. basics of programming, iteration, function, arrays, recursion, object orientation
2. programming project (example: data analysis and visualization, creative programming)
3. technical language "Programming" (English & German)

Teaching Material / Reading

Lehrmaterial / Literatur

Teaching material

Script/slides and tasks in the learning management system Moodle

Textbooks

- Matthes, E.: Python Crash Course, 3rd Edition, No Starch Press, 2023
- Barry, P.: Head First Python, 3rd Edition. O'Reilly, 2023
- Lubanovic, B.: Introducing Python, 2nd Edition. O'Reilly, 2019
- Lutz, M.: Learning Python, 5th Edition, O'Reilly, 2013
- Klein, B.: Introduction to Python 3. for beginners and newcomers. Hanser, 2021
- Barry, P.: Python from head to toe: Up to date on Python 3. O'Reilly, 2017.

Internet sources

<https://docs.python.org/3/tutorial/>

Internationality

Internationalität (Inhaltlich)

- Literature sources and documentation will be used in both English and German.
- This course is taught bilingually in English and German.
- All teaching materials and readings will be provided in English and German.
- Where possible, interlingual tandem pairs will be formed for group work.

Method of Assessment (ggf. Hinweis zu Multiple Choice - APO §9a)

Modulprüfungen

Type of examination ^{*1)} Prüfungsform	Type/scope including weighting ^{*2)} Art/Umfang inkl. Gewichtung	Learning objectives/competencies to be assessed Zu prüfende Lernziele/Kompetenzen
ModA	Weighting: 50% / 50% Details: Compulsory exercises, graded project work with presentation	Learning objectives / qualifications of the module, see above

^{*1)} Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden

^{*2)} Please additionally provide information on the weighting (in % share) and, if applicable, also a reference to a bonus system.

Digitale Kommunikationstechnik

Digital Communications

Classification	Module ID	Kind of Module	Number of Credits
Zuordnung zum Curriculum	Modul-ID	Art des Moduls	Umfang in ECTS-Leistungspunkte
	DKT	Bridge Module	5 ECTS

Location Ort	Language Sprache	Duratrion of Module Dauer des Moduls	Frequency of Module Vorlesungsrythmus	Max. Number of Participants Max. Teilnehmerzahl
Amberg	English	one semester	Winter semester	
Module Convenor Modulverantwortliche/r			Professor / Lecturer Dozent/In	
Prof. Dr. Jan Ortmann			Prof. Dr. Jan Ortmann	
Prerequisites* Voraussetzungen				
Students are expected to have prior knowledge in the following areas: calculus, linear algebra, and geometry, system theory and digital signal processing				
Usability Verwendbarkeit			Teaching Methods Lehrformen	Workload
Bridge module for international master study programmes			Seminar-based teaching with exercises	Contact time/coaching: 60 h
Elective for Bachelor study programmes				Self-study: 90 h
				Total workload: 150 h

Learning Outcomes

Lernziele / Qualifikationen des Moduls

After successfully completing the module, students have the following professional, methodological and personal skills:

Professional competence:

Students can apply fundamental methods of modern digital communication technology to various problems. They are also able to familiarize themselves with advanced modern systems, methods, and algorithms, and to model and evaluate their performance and complexity

Methodological competence:

Students can assess transmission-related problems in terms of implementation effort, complexity, and performance, and select the most suitable solution from known standards.

Personal competence (social competence and self-competence):

Students can discuss, design, and implement systems and algorithms in exercise groups, as well as optimize their personal time management for reviewing material and exam preparation.

Course Content

Inhalte der Lehrveranstaltungen

1. Fourier Transform
2. Convolution
3. Signals and Systems
4. Scattering Parameters
5. Fundamental Structure of Modern Communication Systems
6. Construction of Bandpass Signals from Equivalent Lowpass Signals
7. Random Signals
8. Pulse Shaping Filters
9. Digital Modulation and Detection Methods
10. AWGN Channel

Teaching Material / Reading

Lehrmaterial / Literatur

Teaching material

Slides (projector), blackboard, exercise sheets

J.-R. Ohm, H. D. Lüke, Signalübertragung (Signal Transmission)

K.-D. Kammeyer, Nachrichtenübertragung (Communication Transmission)

Internationality

Internationalität (Inhaltlich)		
- Literature sources and documentation will be used in both English and German. - This course is taught bilingually in English and German. - All teaching materials and readings will be provided in English and German. - Where possible, interlingual tandem pairs will be formed for group work.		
Method of Assessment (ggf. Hinweis zu Multiple Choice - APO §9a)		
Modulprüfungen		
Type of examination ^{*1)} Prüfungsform	Type/scope including weighting ^{*2)} Art/Umfang inkl. Gewichtung	Learning objectives/competencies to be assessed Zu prüfende Lernziele/Kompetenzen
Written Exam	Written Exam, 90 minutes	Learning objectives / qualifications of the module, see above

^{*1)} Please refer to the applicable overview of the forms of examination at the OTH Amberg-Weiden

^{*2)} Please additionally provide information on the weighting (in % share) and, if applicable, also a reference to a bonus system.