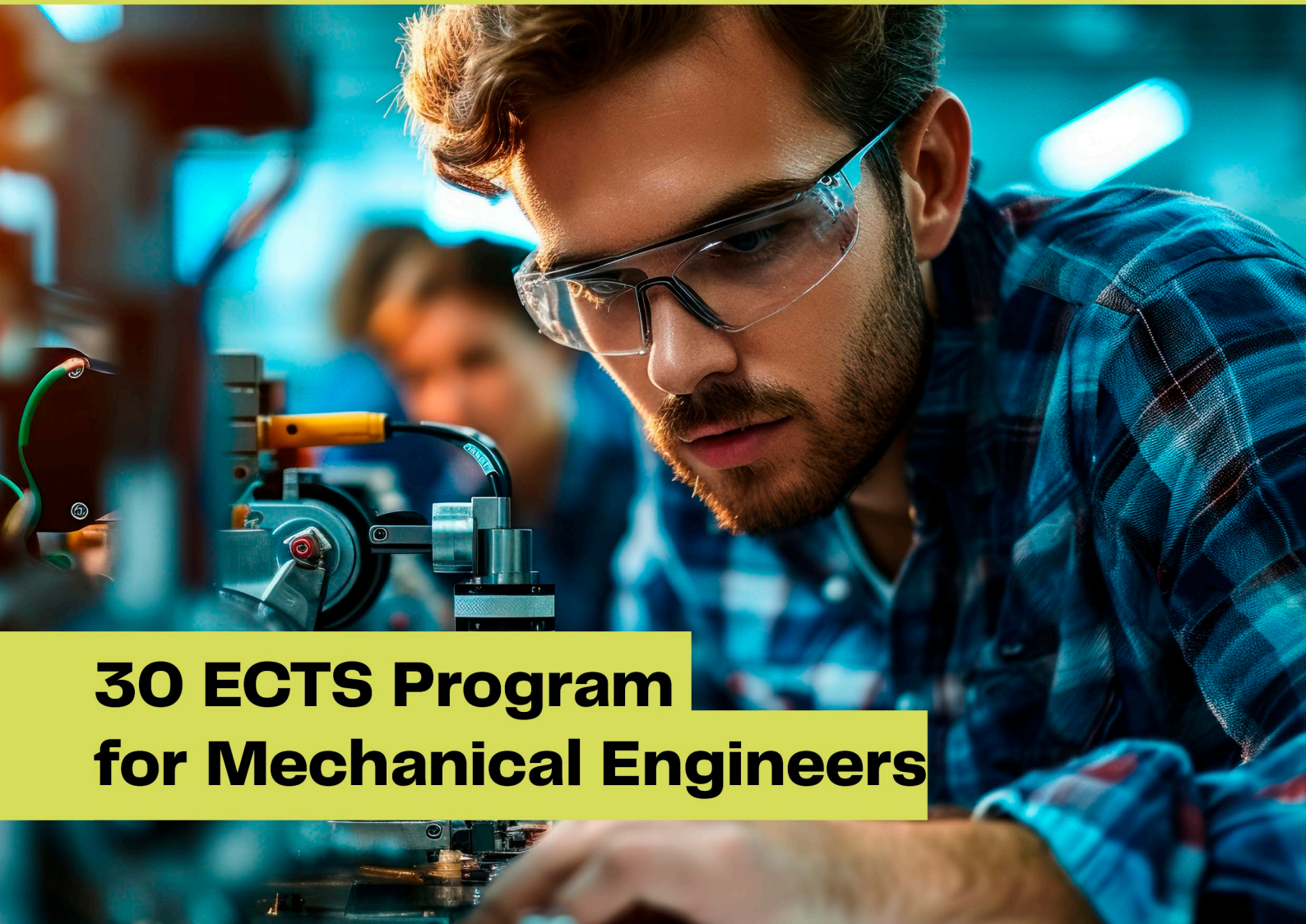




**HOCHSCHUL  
ALLIANZ  
RUHR**

Cluster  
**Internationalisierung**



# **30 ECTS Program for Mechanical Engineers**

**Module Manual  
Winter Semester 2024/25**

[hochschulallianz.ruhr/study-here](https://hochschulallianz.ruhr/study-here)



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## PRELIMINARY REMARKS

Welcome to the 30 ECTS Program for Mechanical Engineers in English language at Bochum University of Applied Sciences, Fachhochschule Dortmund – University of Applied Sciences and Arts, and the Westphalian University of Applied Sciences. The program is open to international undergraduate students, offering an insight into the expertise in mechanical engineering on a bachelor level at the three participating universities. It grants an overall unique international experience.

### **How to study at three reputable German universities of applied sciences?**

When you are a student of the 30 ECTS Program for international incomings, you get the opportunity to study not at one but at three reputable German universities of applied sciences. While you enroll at one of the three universities as an incoming international student, it is necessary to register as a cross-registered student as well to be able to attend the modules at all three universities and thus benefitting from the broader selection of elective modules in English. You will receive detailed instructions on how to enroll as a secondary student at the other two universities. The process is fully digital and simple. No worries. Enrolling as a cross-registered student at the other two universities is free of charge for you.

### **Exams**

Your exam achievements from the other two universities will be recognized by your host university as all three are part of the Higher Education Alliance Ruhr (HAR). You will receive detailed guidance on the enrolling process once you have enrolled at your guest university.

### **Module manual and workload**

To prepare your learning agreement, the present module manual gives you the entire choice of courses from the 30 ECTS Program of all three alliance universities. Please be aware that the workload and therefore the number of ECTS for a module might vary according to the requirement of your host university. If you have questions concerning the number of ECTS, please do not hesitate to contact us at [study@hochschulallianz.ruhr](mailto:study@hochschulallianz.ruhr) Details can be discussed individually.

Please be aware that all information is subject to possible changes.

### **Program Locations**

The courses of the 30 ECTS Program take place at the university campuses in Dortmund and in Bochum as well as at the two locations of the Westphalian University of Applied Sciences in Gelsenkirchen and in Bocholt. All modules in this manual are in-class lectures requiring a physical presence of the students at the respective campus. Depending on your choice of modules, you will be required to commute between the universities accordingly. Please become familiar with the locations of Fachhochschule Dortmund - University of Applied Sciences and Arts, Bochum University of Applied Sciences, and the campuses of the



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Westphalian University of Applied Sciences in Gelsenkirchen and in Bocholt. We will also give you more information on the different locations in an onboarding session.

Please make sure to calculate enough time between the seminars on the different campuses. (The commute with public transportation can vary from one hour between the campuses in Bochum and Dortmund up to two and a half hours to Bocholt from Bochum or Dortmund and vice versa). Your semester ticket allows you to shuttle at no extra costs and you have a sustainable journey between the different cities.

### **What is the HAR?**

The “30 ECTS Program for international Mechanical Engineers” is an offer of the Higher Education Alliance Ruhr (HAR). The HAR is a consortium of Universities of Applied Sciences in the Ruhr area consisting of Bochum University of Applied Sciences, Fachhochschule Dortmund - University of Applied Sciences and Arts, and the Westphalian University of Applied Sciences. They cooperate in various fields, seeking to strengthen their international visibility, their networking and exchange opportunities as well as the mobility of their students, lecturers, researchers, and staff. The goal of the university alliance is to promote cross-border, intercultural exchange as well as international competences to prepare students for an international career.

The HAR enables students to choose from a broader range of offers, to set an individual focus in their studies and to look beyond their own horizons.

### **Contact:**

If you have questions, if you need more information, please contact the project coordinator Selma Halilović at [study@hochschulallianz.ruhr](mailto:study@hochschulallianz.ruhr).

Feel free to schedule a video call. We are happy to assist you.



## ADVANCED ENGINEERING MECHANICS

Westphalian University of Applied Sciences, Campus: Gelsenkirchen

ID	Workload 180 hours	Credits 6 ECTS	Study Semester 2nd semester	Offer Winter Semester	Duration One Semester	
1	<b>Courses</b> a) Lecture (2 hours per semester week) b) Exercises (2 hours per semester week)			<b>Contact Time</b> 60 hours	<b>Self-Study</b> 120 hours	<b>Planned group size</b>
2	<b>Learning Output / Outcome</b> Upon successful completion of the module, students will be able to: <ul style="list-style-type: none"><li>• describe different types of mechanisms and their design.</li><li>• assess the conditions under which the different types of mechanisms are used in practice.</li><li>• describe real problems regarding the analysis of mechanisms and solve the corresponding mathematical problem.</li><li>• interpret the solution to the problem and, in particular, assess whether the mechanical model in question describes the problem under consideration with sufficient accuracy.</li></ul>					
3	<b>Contents</b> <b>Professional Knowledge and Procedures:</b> <ul style="list-style-type: none"><li>• Structure and systematics of gearboxes and their applications</li><li>• Flat Four-Bar-Linkage</li><li>• Kinematic Analysis of Planar Gears</li><li>• Speed &amp; Acceleration Plans</li><li>• Graphical representation of speed ratios</li><li>• Gearbox synthesis using the example of a planetary gearbox</li><li>• Power flow and power splitting</li></ul>					
4	<b>Forms of teaching</b> Lecture in seminar form with accompanying exercises, in which students learn to solve problems independently.					
5	<b>Eligibility Requirements</b> The module builds on the module Engineering Mechanics/Dynamics.					
6	<b>Forms of examination</b> Exam (120 min) at the end of the semester					
7	<b>Requirements for the award of credits</b> Passed written exam (grade)					
8	<b>Requirements for taking the exam</b> None					
9	<b>Module Coordinator and Lecturer</b> Prof. Dr.-Ing. Klaus Mecking					



## BIOLOGY AND BIOMIMETICS III

Westphalian University of Applied Sciences, Campus: Bocholt

<b>Code:</b>	BIO3	<b>Workload:</b>	180 hours	<b>ECTS credits:</b>	6
<b>Semester:</b>	3rd semester	<b>Duration:</b>	1 semester	<b>Frequency:</b>	Every winter semester
<b>Teaching events:</b>				<b>Attendance Time:</b>	<b>Self-Study:</b>
Lecture: 3 hours per semester week				45 hours	90 hours
Practical Training: 1 hour per semester week				15 hours	30 hours
<b>Forms of teaching:</b>					
Lecture, Practical training					
<b>Group size:</b>					
Lecture: limited as per notice Practical training: 15					
<b>Objectives:</b>					
The participants will learn to describe the working principles of biological systems (senses, locomotion) and to experimentally analyse biological systems to be enabled to conduct scientific experiments. This includes the methodological skills of recording, presenting and interpreting data, implementing guidelines on ethics and safety, and independently drawing up scientific protocols.					
<b>Contents:</b>					
<ul style="list-style-type: none"> <li>• Basics: Membranes, resting potential, action potential, neuronal systems</li> <li>• Seeing: Evolution of visual systems, functional anatomy and image formation in vertebrate and invertebrate eyes, accommodation, lateral inhibition, oculomotor reflex, elementary motion detectors</li> <li>• Mechanosensors: human sense of touch, tactile and mechanical senses in invertebrates, hearing, directional hearing, coincidence detection, frequency analysis, lateral line organ in fish</li> <li>• Selected aspects of chemosensors, infrared, thermosensors, electro- and magnetosensors, nociception</li> <li>• Muscle and skeletal systems, locomotion modes: inverse pendulum and feather-mass system, movements in the plant kingdom, turgor, nastia, tropisms</li> <li>• Mechanisms of learning and memory</li> <li>• Getting to know neuroethological basics and model organisms and, using navigation as an example, the interaction of biological sensory and movement systems in behaviour</li> </ul>					
<b>Use of the module:</b>					
Compulsory module of the Bachelor of Biomimetics degree					
<b>Prerequisites:</b>					
Participation in the practical training of BIO1 and BIO2. Eligibility to participate in this course is subject to individual assessment. Please directly contact the lecturer for more information.					



<b>Type of examination:</b>
Written examination, written composition
<b>Requirements for award of ECTS points:</b>
Passing the examination and the practical training
<b>Importance of the grade of the module to the final score:</b>
According to the examination regulations
<b>Lecturer:</b>
Prof. Dr. Tobias Seidl
<b>Module coordinator:</b>
Prof. Dr. Tobias Seidl
<b>Additional Information:</b>
The current literature will be announced by the lecturer at the beginning of the module.



<b>BIOMIMETIC SENSOR SYSTEMS II</b>					
<b>Westphalian University of Applied Sciences, Campus: Bocholt</b>					
<b>Code:</b>	BSE2	<b>Workload:</b>	180 hours	<b>ECTS credits:</b>	6
<b>Semester:</b>	5th semester	<b>Duration:</b>	1 semester	<b>Frequency:</b>	Every winter semester
<b>Teaching events:</b>				<b>Attendance Time:</b>	<b>Self-study:</b>
Lecture: 2 hours per semester week				30 hours	60 hours
Practical training: 2 hours per semester week				30 hours	60 hours
<b>Forms of teaching:</b>					
Lecture, Practical training					
<b>Group size:</b>					
Lecture: limited as per notice Practical training: 15					
<b>Objectives:</b>					
The participants learn to independently carry out biomimetic innovation projects with a scientific background in order to later be able to carry out technical / scientific innovation projects of their own responsibility in a leading role.					
<b>Contents:</b>					
<ul style="list-style-type: none"> <li>• Group work with open task, independent familiarization and development of solution concepts</li> <li>• Generation of scientific backed solutions using the biomimetic process (top-down/bottom-up)</li> <li>• Developing and carrying out central elements of project management (project types, project structures, planning methods, submission of applications)</li> <li>• Written documentation and public presentation</li> <li>• Biorobotics history, definition, objectives and selected model organisms</li> <li>• Biorobotic concepts for locomotion on land, in water and in air</li> <li>• Control architectures, embodiment, situatedness, adaptivity</li> <li>• Modelling of experimental findings using artificial neural networks</li> <li>• Swarm behavior, stigmergy, self-organization</li> </ul>					
<b>Use of the module:</b>					
Compulsory module of the Bachelor of Biomimetics degree					
<b>Prerequisites:</b>					
Contents from BSE 1. Eligibility to participate in this course is subject to individual assessment. Please directly contact the lecturer for more information.					
<b>Type of examination:</b>					
Oral examination					
<b>Requirements for award of ECTS points:</b>					
Passing the examination and the practical training					
<b>Importance of the grade of the module to the final score:</b>					
According to the examination regulations					

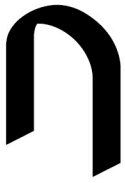


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<b>Lecturer:</b>
Prof. Dr. Tobias Seidl
<b>Module coordinator:</b>
Prof. Dr. Tobias Seidl
<b>Additional Information:</b>
The current literature will be announced by the lecturer at the beginning of the module.



<b>CHASSIS TECHNOLOGY</b>					
<b>Fachhochschule Dortmund – University of Applied Sciences and Arts</b>					
<b>Identification number</b>	<b>Workload</b>	<b>Credits</b>	<b>Semester of study</b>	<b>Frequency</b>	<b>Duration</b>
FT_P03	150 h	5 ECTS	5th semester	Winter term	one semester
<b>1</b>	<b>Courses</b> Chassis technology		<b>Contact time</b> 2 V / 30 h 2 exercises / 30 h	<b>Self-study</b> 45 h 45 h	<b>Group size</b> 60 students 20 students
<b>2</b>	<b>Learning outcomes / competences</b> Students will be familiar with the main chassis designs and will be able to design and tune chassis components for vehicles.  With the help of suitable chassis simulation tools, students can apply optimization strategies in an application-oriented and targeted manner.				
<b>3</b>	<b>Contents</b> <ul style="list-style-type: none"> <li>• Fundamentals of vertical and lateral dynamics</li> <li>• Chassis components</li> <li>• Wheel suspensions</li> <li>• Chassis kinematics</li> <li>• Chassis simulation</li> <li>• Optimization strategies in chassis development</li> </ul>				
<b>4</b>	<b>Teaching methods</b> Lecture, exercises with calculation examples and kinematic simulation on the computer				
<b>5</b>	<b>Participation requirements</b> Formal:  Content:				
<b>6</b>	<b>Forms of examination</b> Module examination Written exam chassis technology as well as assignments				
<b>7</b>	<b>Requirements for the awarding of credit points</b> Module examination must be passed.				
<b>8</b>	<b>Use of the module</b> (in other degree programmes)				
<b>9</b>	<b>Importance of the grade for the final grade</b> 2.53 % (cf. StgPo)				



<b>10</b>	<b>Module coordinator and full-time lecturer</b> Module coordinator: Prof. Dr Vinod Rajamani Lecturer: Prof. Dr Vinod Rajamani
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## COMPUTER AIDED MANUFACTURING (CAD / CAM APPLICATIONS)

Fachhochschule Dortmund – University of Applied Sciences and Arts

Identification number	Workload	Credits	Semester of study	Frequency	Duration
CCA	150 h	5 ECTS	5th semester	Winter term	1 semester
<b>1</b>	<b>Courses</b> Computer Aided Manufacturing		<b>Contact time</b> 4P / 60 h	<b>Self-study</b> 90 h	<b>Group size</b> 20 students
<b>2</b>	<p><b>Learning outcomes / competences / key qualifications</b></p> <p>After successfully completing the module, students will be able to plan and design manufacturing processes independently and implement them in modern CAD/CAM systems. As part of the practical courses, students will have acquired the expertise to pre-design manufacturing processes on the basis of technical drawings. They are able to create computer-aided NC programs for machining production as direct path programming, workshop-oriented dialogue programming and modern 3D-CAD/CAM software. The possibility of simulating and experimentally verifying NC programs is known and was carried out in a practice-oriented manner using a sample component.</p>				
<b>3</b>	<p><b>Contents</b></p> <p>Contents of the lectures and exercises:</p> <ul style="list-style-type: none"> <li>• Basics of machining processes (chip formation, chip shapes and types, ISO application groups, cutting materials and coatings)</li> <li>• Tool and cutting value determination (Tool design and engagement parameters for turning, drilling and milling processes)</li> <li>• NC program optimisation (machine-compatible programming, machining strategies, feed rate adjustment)</li> <li>• CAM basics (Terms, types of CAM programming, parameterisation of cutting processes)</li> <li>• Simulation techniques (material removal/engagement simulation, machine kinematics, process simulation)</li> </ul> <p>The practical course comprises the step-by-step development of the complete machining manufacturing process for a sample component, including semi-finished product, tool, production and equipment planning. Based on a 3D model of the component, the students generate an executable NC program using various</p>				



	programming strategies. The machining program is verified by means of machine simulation and by manufacturing the component on existing laboratory equipment.
<b>4</b>	<b>Teaching methods</b> Lecture with accompanying exercises, project tasks based on real products, possibly supplemented by excursion and guest lecture from industry
<b>5</b>	<b>Participation requirements</b> <b>Formal:</b> none <b>Content:</b> Materials and production engineering I+II, CAD
<b>6</b>	<b>Forms of examination</b> Project work in small project teams and written exams
<b>7</b>	<b>Requirements for the awarding of credit points</b> The project work and the written examination must be passed.
<b>8</b>	<b>Use of the module</b> (in other degree programmes) Bachelor Vehicle Development
<b>9</b>	<b>Importance of the grade for the final grade</b> 2.45 % (see StgPO)
<b>10</b>	<b>Module coordinator and full-time lecturer</b> Module coordinator: Prof. Dr. Stefan Hesterberg Full-time lecturer: Prof. Dr. Stefan Hesterberg



<b>DEVELOPMENT PROJECT</b>					
<b>Bochum University of Applied Sciences</b>					
<b>Module number</b>	<b>Workload</b>	<b>Credits</b>	<b>Study semester</b>	<b>Frequency of the offer</b>	<b>Duration</b>
	150 hours	5 ECTS	6th semester	every semester	1 semester
<b>1</b>	<b>Courses</b> EP: Development project		<b>Contact time</b> 148 hours	<b>Self-study</b> 102 hours	<b>Planned group size</b> Up to 3
<b>2</b>	<b>Learning outcomes / competences</b> <p>The student should carry out a development project either individually or as part of a team. In the latter case, the student should demonstrate their own 'interdisciplinarity', 'ability to work in a team' and 'ability to integrate' within the team.</p> <p>This discipline serves to optimize the professional profile. The elements 'interdisciplinarity', 'ability to work in a team' and 'ability to integrate', which belong to the key qualifications, are practiced through group work.</p> <p>Within the development project, students should apply and expand the methodological skills they have already acquired. In addition to methods for technical problem solving, management tasks and moderation tasks are also applied. In the problem-solving methods, students are taught the basics of scientific work. Theoretical knowledge will be used to develop guidelines for practical implementation. The mechatronic development process should be practiced at least in part. Students who choose the specialization "International Engineering" should choose an "International Development Project".</p>				
<b>3</b>	<b>Contents</b> Project topics are assigned according to the research focus of the individual laboratories				
<b>4</b>	<b>Teaching methods</b> Project work individually or in groups				
<b>5</b>	<b>Participation requirements</b>				
<b>6</b>	<b>Forms of examination</b> Module examination in the form of a report and presentation				
<b>7</b>	<b>Requirements for the awarding of credit points</b> Passed presentation and report				
<b>8</b>	<b>Use of the module</b> (in other degree programs)				
<b>9</b>	<b>Importance of the grade for the final grade</b> 5/ Sum of the weighted ECTS relevant to the examination				
<b>10</b>	<b>Module coordinator and full-time lecturers</b> Prof. Dr.-Ing. Tim Richard, all laboratories				
<b>11</b>	<b>Other information</b>				



## ENGLISH FOR SCIENCE AND TECHNOLOGY

**Westphalian University of Applied Sciences,  
The Language Center, Campus: Gelsenkirchen**

<b>Credits:</b> 5 ECTS	<b>Workload:</b> 150 hours	<b>Contact Hours:</b> 60 hours	<b>Self-Study Hours:</b> 90 hours
<b>Term:</b> Winter Semester / Summer Semester	<b>Duration:</b> 1 Semester	<b>Group Size:</b> 20 – 30 students	<b>Campus:</b> Gelsenkirchen
<b>Learning Outcomes:</b> Upon completion students will be able to engage successfully in occupation-oriented and academic discourse settings using appropriate English while taking into account (inter)cultural elements.			
<b>Course Contents:</b> The course covers technical English language requirements with respect to engineering and scientific topics and professional communication, taking into account technical texts, documents and documentation. Methodological and content-related aspects include <ul style="list-style-type: none"> <li>• understanding technical texts and documents,</li> <li>• report writing,</li> <li>• presenting diagrams,</li> <li>• presentations,</li> <li>• formulae and mathematical expressions,</li> <li>• product and process descriptions,</li> <li>• listening exercises on science and technology.</li> </ul>			
<b>Type of Instruction:</b> Scheduled on-site teaching using a wide array of media. The classroom teaching is complemented by guided and independent study periods which are supported by a wide range of digital learning resources offered by the Language Centre (see below).			
<b>Participation Requirements:</b> Formal: none In terms of content: advanced English skills as stipulated by the German University and Higher Education entrance regulations If needed: attendance of the “English Support Programme (ESP)” offered by the Language Centre			
<b>Assessment/Test Format:</b> Written exam (120 min)			
<b>Requirements for Awarding Credit Points:</b> A minimum of 50% (50 points out of 100)			
<b>Lecturers:</b> Julia Brassat, MA; Dr. Thorsten Winkelr�ath et al. (The Language Centre)			
<b>Module Coordinator:</b> The Language Centre			



**Resources:**

Course Book:

David Bonamy (2011), TECHNICAL ENGLISH 4 (course book), Pearson/Longman: Harlow. ISBN- 978-1-4082-2955-2

Internet-websites of Technology / Engineering / Science - related magazines e.g.:

- <https://www.ingenia.org.uk>
- <https://eandt.theiet.org>
- <https://www.sciencedaily.com>
- [www.quantamagazine.org](http://www.quantamagazine.org)
- <https://www.facilitiesshow.com>
- <https://scitechdaily.com>
- <https://techxplore.com/engineering-news/> (formerly: <https://www.phys.org/technology-news/engineering>)
- <https://www.theengineer.co.uk>
- <https://www.nsf.gov/news/>
- <https://spectrum.ieee.org>
- <https://www.snexplores.org/> (formerly: <https://www.sciencenewsforstudents.org/>)

Web-based tutorials and educational materials, e.g.

- [www.howstuffworks.com](http://www.howstuffworks.com) (e.g. how Anti-Lock Brakes work)

Various YouTube Channels on topics like

maths (e.g. numberphile), physics (e.g. the Large Hadron collider), electronics (e.g. LASER technology), mech. engineering (e.g. material properties), fac. engineering (e.g. smart buildings/the internet of things)

IT/Multimedia-related (audio-video) podcast sources, e.g.:

- [www.thenakedscientists.com](http://www.thenakedscientists.com)

International Broadcasting Stations and their multimedia programmes: e.g.

- [www.bbc.co.uk](http://www.bbc.co.uk) – e.g. Tech Tent, Inside Science, The Science Hour
- [www.npr.org/](http://www.npr.org/) - e.g. STEM spots

Print- or web-based sections of internationally renowned quality newspapers: e.g.

- The Guardian
- The New York Times
- The Times
- The Washington Post



General English Dictionaries, e.g.

- [www.merriam-webster.com/](http://www.merriam-webster.com/)
- [en.oxforddictionaries.com](http://en.oxforddictionaries.com)
- [www.collinsdictionary.com/dictionary/english](http://www.collinsdictionary.com/dictionary/english)
- [dictionary.cambridge.org/dictionary/english/](http://dictionary.cambridge.org/dictionary/english/)
- [www.leo.org](http://www.leo.org)
- [www.linguee.de/](http://www.linguee.de/)
- [de.pons.com/](http://de.pons.com/)
- [www.dict.cc/](http://www.dict.cc/)
- [de.langenscheidt.com/englisch-deutsch/](http://de.langenscheidt.com/englisch-deutsch/)
- [www.onelook.com](http://www.onelook.com) (search engine)

Technology / Engineering / Science - specific dictionaries, e.g.

- <https://www.engineering-dictionary.com>
- <https://www.lexicool.com/online-dictionary.asp?FSP=C153&FKW=engineering>
- <http://www.dictionary.bi.htwg-konstanz.de/index.php?load=start&lang=en>
- <https://www.thesciencedictionary.com/>
- <http://www.worldofscience.in/dictionary.aspx>

English Learning Software / Blended-Learning Modules:

- ET - Exam Trainer (in-house development by the Language Centre)
- FFT - Fast Formula Trainer (in-house development by the Language Centre)
- ESP - English Support Programme (in-house development by the Language Centre)
- various E-learning products, tools and further in-house developments



## JOINING TECHNOLOGY

**Westphalian University of Applied Sciences, Campus: Gelsenkirchen**

<b>Workload:</b> 180 hours	<b>Credits:</b> 6 ECTS	<b>Study Semester</b> 5th semester	<b>Offer:</b> Winter Semester
<b>Courses</b> a) Lecture b) Laboratory Internship		<b>Contact Time</b> 60 hours	<b>Self-Study</b> 120 hours
<b>Learning Output / Outcome</b>  After completing the “Joining Technology” lecture, students will have a comprehensive basic knowledge of the welding processes commonly used in trade and industry, such as arc, beam and resistance welding processes in their basic variants and mechanical joining. Possible applications and limitations are explained based on the functional principles. This should enable students to select suitable joining processes for common joining tasks. In addition, they will be familiar with the material and design requirements necessary for reliable use as well as the necessary occupational safety measures.			
<b>Contents</b> <b>Professional Knowledge and Procedures:</b> <ul style="list-style-type: none"> <li>• Professional welding: Autogenous welding, fundamentals of electrical engineering and arc physics, design and operation of electronic welding power sources, in-depth treatment of arc welding processes, Submerged arc welding, gas shielded arc welding, plasma welding, electron beam welding, laser welding</li> <li>• Additives Manufacturing process</li> <li>• Pressure welding: resistance pressure welding, friction welding, stud welding</li> <li>• Soldering</li> <li>• Thermal cutting methods</li> </ul>			
<b>Eligibility Requirements</b> The module builds on the module Physic and Material Science Eligibility to participate in this course is subject to individual assessment. Please directly contact the lecturer for more information.			
<b>Forms of examination</b> Exam (120 min) at the end of the semester			
<b>Module Coordinator and Lecturer</b> Prof. Dr.-Ing. Ghazal Moeini, IWE			



## MATHEMATICAL METHODS IN ENGINEERING PRACTICE

Bochum University of Applied Sciences

Module number	Workload	Credits	Study semester	Frequency of the offer	Duration
	150 hours	5 ECTS	5th semester	every semester	1 semester
<b>1</b>	<b>Courses</b> Lecture (2 hours), exercises (1 hour), practical training (1 hour)		<b>Contact time</b> 72 hours	<b>Self-Study</b> 78 hours	<b>Planned group size</b> 20 students
<b>2</b>	<b>Learning outcomes / competences</b> The students are able to implement mathematical methods in a numerical simulation environment such as Matlab/Simulink or Python and apply them to concrete, illustrative problems in engineering practice.				
<b>3</b>	<b>Contents</b> Linear/ nonlinear systems of equations, eigenvalue problems (principal stresses in strength of materials, natural frequencies/mode shapes in vibration theory, stability problems), methods for interpolation and approximation, initial and boundary value problems (statics/dynamics of bending beams, heat conduction, rope vibrations), differential-algebraic systems of equations (constrained multibody systems)				
<b>4</b>	<b>Teaching methods</b> Lecture (partly as inverted teaching units), problem-oriented exercises, computer practical				
<b>5</b>	<b>Participation requirements</b> Basic programming skills (Matlab or Python)				
<b>6</b>	<b>Forms of examination</b> Module examination in the form of a written exam (120 minutes)				
<b>7</b>	<b>Requirements for the awarding of credit points</b> Passed exam and successful participation in the practical (certificate)				
<b>8</b>	<b>Use of the module</b> (in other degree programs): Bachelor Mechatronics				
<b>9</b>	<b>Importance of the grade for the final grade</b> 5/ Sum of the weighted ECTS relevant to the examination				
<b>10</b>	<b>Module coordinator and full-time lecturer</b> Prof. Dr.-Ing. Ulrich Zwiers				
<b>11</b>	<b>Other information</b> Kong, Siau, et al.: „Python Programming and Numerical Methods: A Guide for Engineers and Scientists“, Academic Press Potter, Feeny: „Mathematical Methods for Engineering and Science“, Springer Asadi: “Applied Numerical Analysis with Matlab/ Simulink: For Engineers and Scientists”, Springer				



<b>OPERATIONAL EXCELLENCE</b>					
<b>Bochum University of Applied Sciences</b>					
<b>Module number</b>	<b>Workload</b>	<b>Credits</b>	<b>Study semester</b>	<b>Frequency of the offer</b>	<b>Duration</b>
	150 hours	5 ECTS	5 <sup>th</sup> Semester	Winter Term	1 Semester
<b>1</b>	<b>Courses</b> Operational Excellence	<b>Contact time</b> 2SV/2Ü/1P 80 hours	<b>Self-study</b> 70 hours	<b>Planned group size</b> V50, SV35, Ü20, P15, S15, EDV-P20	
<b>2</b>	<b>Learning outcomes / competences</b> Students understand the importance of operational excellence and the building of a sustainable culture in a company and are able to demonstrate the foundations for this. Various questions on the topic of culture in a company are dealt with in small groups. Students learn that in order to solve a problem in a company, it is important to think in systems and to use principles and tools in these systems and not simply try to solve the problem with a tool. Furthermore, students are taught the necessary coaching tools of insideout coaching, which they can then apply independently. After successfully completing the module, students are able to ... <ul style="list-style-type: none"> <li>- develop systems for a problem.</li> <li>- apply principles in the systems so that the problem is solved sustainably.</li> <li>- apply the various tools in the systems.</li> <li>- coach the necessary process in the system with the help of the insideout coaching method.</li> </ul> Translated with DeepL.com (free version)				
<b>3</b>	<b>Contents</b> Shingo Model and insideout coaching				
<b>4</b>	<b>Teaching methods</b> Seminar-based lectures, exercises and practical's as part of the logistics laboratory's learning factory				
<b>5</b>	<b>Participation requirements</b> Formal: none				
<b>6</b>	<b>Forms of examination</b> Written examination (90 minutes, electronically supported, at the university), written examination (90 minutes, written form, at the university), oral examination				
<b>7</b>	<b>Requirements for the awarding of credit points</b>				
<b>8</b>	<b>Use of the module</b> (in other degree programs): KIA Mechanical Engineering, Industrial Engineering Mechanical Engineering				
<b>9</b>	<b>Importance of the grade for the final grade</b> 5/ Sum of the weighted ECTS relevant to the examination				



<b>10</b>	<b>Module coordinator and full-time lecturers</b> Prof. Dr.-Ing. Marcus Kröger/ Prof. Dr.-Ing. Marcus Kröger
<b>11</b>	<b>Other information</b>



## SCIENTIFIC WRITING

Westphalian University of Applied Sciences, Campus: Bocholt

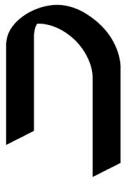
<b>Code:</b>	WAS	<b>Workload:</b>	180 hours	<b>ECTS credits:</b>	6
<b>Semester:</b>		<b>Duration:</b>	1 semester	<b>Frequency:</b>	According to demand
<b>Teaching events:</b>		<b>Attendance Time:</b>		<b>Self-Study:</b>	
4 hours per semester week		60 hours		120 hours	
<b>Forms of teaching:</b>					
Lecture, Exercise					
<b>Objectives:</b>					
Students are able to independently acquire comprehensive, detailed and specialised knowledge and skills in scientific writing. They work on given and self-selected topics, analyse, evaluate, and abstract the content and then present it to an audience in a way that is appropriate for the target group. In doing so, they acquire a detailed and critical understanding of specific specialised topics, are able to assess their significance and write academic texts on them. They can defend the results of their work but can also discuss alternatives.					
<b>Contents:</b>					
Lecture: Literature research, literature management, patent research, scientific text work, lecture techniques, presentation design, slide design, scientific poster design.					
Exercise: Practising presentations, presenting posters, teamwork					
<b>Prerequisites:</b>					
Elective module					
<b>Type of examination:</b>					
Presentation, term paper					
<b>Requirements for award of ECTS points:</b>					
Successful completion of the module examinations					
<b>Importance of the grade of the module to the final score:</b>					
See examination regulations					
<b>Lecturer:</b>					
Prof. Dr. Heike Beismann					
<b>Module coordinator:</b>					
Prof. Dr. Heike Beismann					
<b>Additional Information:</b>					
The current literature will be announced by the lecturer at the beginning of the module.					



## STATISTICS FOR ENGINEERS

**Bochum University of Applied Sciences,  
Institute for Academic Success and Didactics (ISD)**

<b>Workload</b> 150 hours	<b>Credits</b> 5 ECTS	<b>Frequency of the offer</b> Winter semester	<b>Duration</b> 1 semester
<b>1</b>	<b>Courses</b> Lecture (2 hours), exercise (1 hour), practical training (1 hour)	<b>Contact time</b> 4 hours per semester week / 64 hours in total	<b>Self-Study</b> 86 hours
<b>2</b>	<b>Learning outcomes / competences</b> The students learn how to apply standard descriptive methods to univariate and to multivariate data. They are familiar with the basic concepts of probability theory and common parametric distribution models. They know when and how to apply common hypothesis tests.		
<b>3</b>	<b>Contents</b> <ul style="list-style-type: none"> <li>• Types of data measurement scales</li> <li>• Describing empirical data sets</li> <li>• Graphical representation</li> <li>• Kolmogorov's laws of probability</li> <li>• Conditional probability and independent events</li> <li>• Bayes theorem and law of total probability</li> <li>• Random variables, expectation, and variance</li> <li>• Discrete parametric distribution models</li> <li>• Continuous parametric distribution models and density functions</li> <li>• Point estimation and interval estimation</li> <li>• Concepts of hypothesis testing Binomial tests</li> <li>• Tests using normal distribution assumption</li> </ul>		
<b>4</b>	<b>Teaching methods</b> Lecture, Exercise, Practical training (with R / R Studio)		
<b>5</b>	<b>Participation requirements</b> Mathematik I and II		
<b>6</b>	<b>Forms of examination</b> Written exam		
<b>7</b>	<b>Requirements for the awarding of credit points</b> Passing the exam and successful participation in the practical training		
<b>8</b>	<b>Use of the module</b> (in other degree programs): tba		



<b>9</b>	<b>Module coordinator and full-time lecturer</b> Dipl.-Math. André Thrun
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## TECHNICAL ACOUSTICS

Fachhochschule Dortmund – University of Applied Sciences and Arts

Identificatio n number	Workload	Credits	Semester of study	Frequency	Duration
TAK	150 hours	5 ECTS	5th semester	Winter term	1 semester
<b>1</b>	<b>Courses</b> Technical Acoustics (TAK)		<b>Contact time</b> 2SV / 30 h 2P / 30 h	<b>Self-Study</b> 90 h	<b>Group size</b> 40 students
<b>2</b>	<b>Learning outcomes / competences / key qualifications</b> <p>Students learn the fundamentals of acoustic principles in the area of sound generation and sound propagation in technical systems. In this context, students will be able to determine and calculate important acoustic parameters. Furthermore, they acquire knowledge of noise emission and noise immission as well as the underlying measurement regulations.</p> <p>Using practical examples and experiments, students learn to apply measurement methods and carry out acoustic analyses, such as a level calculation or a frequency analysis. In this way, students are able to solve typical tasks in the field of technical acoustics and thus evaluate and optimize technical systems / machines with regard to radiated noise.</p>				
<b>3</b>	<b>Contents</b> <ul style="list-style-type: none"><li>• <u>Sound generation and sound propagation:</u> Fundamentals of airborne and structure-borne sound, wave propagation in various transmission media</li><li>• <u>Acoustic parameters and calculating with levels:</u> Determination of key acoustic parameters such as sound pressure, sound velocity, impedance, sound power, sound intensity and level calculation from linear values</li><li>• <u>Physiological and psychological basics:</u> Sound impact on humans, psychoacoustic principles, frequency evaluation of hearing, loudness</li><li>• <u>Acoustic measurement technology and measurement methods:</u> Data acquisition, sensor technology and data analysis; practical experiments in the acoustics laboratory and application of central analysis and measurement methods with the HEAD ArtemiS software</li><li>• <u>Legislation, measurement regulations and limit values:</u> Requirements for sound emissions and sound immissions, determination of noise emissions from machines, measurement methods for external noise from motor vehicles</li><li>• <u>Sound insulation and damping:</u> Sound reduction with the help of absorption and insulation</li></ul>				



	<ul style="list-style-type: none"><li>• <u>Room acoustics:</u> Acoustic description of rooms, wave propagation in rooms, reverberation time</li><li>• <u>Digital signal processing in technical acoustics:</u> Using the example of active acoustics (active noise enhancement and active noise reduction), practical examples of digital signal analysis and filtering with Matlab are discussed</li></ul>
<b>4</b>	<b>Teaching methods</b> Seminar-based lecture, exercises and practicals in the acoustics laboratory
<b>5</b>	<b>Participation requirements</b> <b>Formal:</b> none <b>Content:</b> none
<b>6</b>	<b>Forms of examination</b> Written exam paper
<b>7</b>	<b>Requirements for the awarding of credit points</b> Module examination must be passed
<b>8</b>	<b>Use of the module</b> (in other degree programmes) optional
<b>9</b>	<b>Importance of the grade for the final grade</b> 2.45 % (see StgPO)
<b>10</b>	<b>Module coordinator and full-time lecturer</b> Module coordinator: Prof. Dr. Alessandro Fortino Lecturer: Prof. Dr. Alessandro Fortino



## TECHNICAL ENGLISH – COMPUTER SCIENCE

Westphalian University of Applied Sciences,  
The Language Center, Campus: Gelsenkirchen

<b>Credits:</b> 5 ECTS	<b>Workload:</b> 150 hours	<b>Contact Hours:</b> 60 hours	<b>Self-Study Hours:</b> 90 hours
<b>Term:</b> Winter Semester	<b>Duration:</b> 1 Semester	<b>Group Size:</b> 20 – 30 students	<b>Campus:</b> Gelsenkirchen
<b>Learning Outcomes:</b> Upon completion students will be able to engage successfully in occupation-oriented and academic discourse settings using appropriate English while taking into account (inter)cultural elements.			
<b>Course Contents:</b> The course is an introduction to technical English language based on selected topics from Various relevant fields, e.g.: <ul style="list-style-type: none"> <li>• basic geometric and mathematical terminology</li> <li>• diagrammatic representation</li> <li>• AI (Artificial Intelligence)</li> <li>• biometric systems</li> <li>• networking</li> <li>• online security threats</li> <li>• SDLC (Software Development Life Cycle)</li> <li>• robotics</li> <li>• display technology</li> </ul>			
<b>Type of Instruction:</b> Scheduled on-site teaching using a wide array of media. The classroom teaching is complemented by guided and independent study periods which are supported by a wide range of digital learning resources offered by the Language Centre (see below).			
<b>Participation Requirements:</b> Formal: none In terms of content: advanced English skills as stipulated by the German University and Higher Education entrance regulations If needed: attendance of the “English Support Programme (ESP)” offered by the Language Centre			
<b>Assessment/Test Format:</b> Written exam (120 min)			
<b>Requirements for Awarding Credit Points:</b> A minimum of 50% (50 points out of 100)			
<b>Lecturers:</b> Julia Brassat, MA; Mark Weller; Dr. Thorsten Winkelr�ath et al. (The Language Centre)			



**Module Coordinator:**

The Language Centre

**Resources:**

Selected texts developed and provided by the Language Centre or based on reputable online publications

Internet-websites of Technology / Science and related magazines e.g.:

- <https://www.sciencedaily.com>
- <https://scitechdaily.com>
- <https://www.newscientist.com/subject/technology/>
- <https://www.snexplores.org/> (formerly: <https://www.sciencenewsforstudents.org/>)

Web-based tutorials and educational materials, e.g.

- [www.howstuffworks.com](http://www.howstuffworks.com) (e.g. What is an AI Black Box?)

IT/Multimedia-related (audio-video) podcast sources, e.g.:

- [www.thenakedscientists.com](http://www.thenakedscientists.com)
- <https://www.ted.com/talks>
- <https://www.ted.com/podcasts/ted-tech>
- <https://podcasts.apple.com/us/podcast/darknet-diaries/id1296350485>
- <https://player.fm/series/practical-ai-machine-learning-data-science>
- <https://player.fm/series/data-science-at-home-2600992>

International Broadcasting Stations and their multimedia programmes: e.g.

- [www.bbc.co.uk](http://www.bbc.co.uk) – e.g. Tech Tent, Inside Science, The Science Hour
- [www.npr.org/](http://www.npr.org/) - e.g. STEM spots

Print- or web-based sections of internationally renowned quality newspapers: e.g.

- The Guardian
- The New York Times
- The Times
- The Washington Post

General English Dictionaries, e.g.

- [www.merriam-webster.com/](http://www.merriam-webster.com/)
- [en.oxforddictionaries.com](http://en.oxforddictionaries.com)
- [www.collinsdictionary.com/dictionary/english](http://www.collinsdictionary.com/dictionary/english)
- [dictionary.cambridge.org/dictionary/english/](http://dictionary.cambridge.org/dictionary/english/)
- [www.leo.org](http://www.leo.org)
- [de.langenscheidt.com/englisch-deutsch/](http://de.langenscheidt.com/englisch-deutsch/)
- [www.onelook.com](http://www.onelook.com) (search engine)



Technology - specific dictionaries, e.g.

- <https://techterms.com/>
- <https://www.techopedia.com/dictionary>
- <https://www.techtarget.com/whatis/>
- <https://www.collinsdictionary.com/word-lists/mathematics-mathematical-terms>

English Learning Software / Blended-Learning Modules:

- ET - Exam Trainer (in-house development by the Language Centre)
- FFT - Fast Formula Trainer (in-house development by the Language Centre)
- ESP - English Support Programme (in-house development by the Language Centre)
- various E-learning products, tools and further in-house developments
- various CALL products



## TECHNICAL ENGLISH – ELECTRICAL ENGINEERING / SOFTWARE SYSTEMS / DATA SCIENCE

**Westphalian University of Applied Sciences,  
The Language Center, Campus: Bocholt**

<b>Credits:</b> 6 ECTS	<b>Workload:</b> 180 hours	<b>Contact Hours:</b> 60 hours	<b>Self-Study Hours:</b> 120 hours
<b>Term:</b> Winter Semester	<b>Duration:</b> 1 Semester	<b>Group Size:</b> 20 – 30 students	<b>Campus:</b> Bocholt

### Learning Outcomes:

Upon completion students will be able to engage successfully in occupation-oriented and academic discourse settings using appropriate English while taking into account (inter)cultural elements.

### Course Contents:

The course is an introduction to technical English language based on selected topics from Various relevant fields, e.g.:

- Software Development
- Moore's Law and Transistors
- Data Storage
- Job Applications
- VPN's
- Biometrics
- Robotics
- Maths / Formulae
- Object and Diagram Descriptions

### Type of Instruction:

Scheduled on-site teaching using a wide array of media. The classroom teaching is complemented by guided and independent study periods which are supported by a wide range of digital learning resources offered by the Language Centre (see below).

### Participation Requirements:

Formal: none

In terms of content: advanced English skills as stipulated by the German University and Higher Education entrance regulations

If needed: attendance of the "English Support Programme (ESP)" offered by the Language Centre

### Assessment/Test Format:

Written exam (120 min)

### Requirements for Awarding Credit Points:

A minimum of 50% (50 points out of 100)



**Lecturers:**

Mark Weller M.A. (The Language Centre)

**Module Coordinator:**

The Language Centre

**Resources:**

Selected texts developed and provided by the Language Centre or based on reputable online publications

Internet-websites of Technology / Science and related magazines e.g.:

- <https://www.sciencedaily.com>
- <https://scitechdaily.com>
- <https://www.newscientist.com/subject/technology/>
- <https://www.snexplores.org/> (formerly: <https://www.sciencenewsforstudents.org/>)

Web-based tutorials and educational materials, e.g.

- [www.howstuffworks.com](http://www.howstuffworks.com) (e.g. What is an AI Black Box?)

IT/Multimedia-related (audio-video) podcast sources, e.g.:

- [www.thenakedscientists.com](http://www.thenakedscientists.com)
- <https://www.ted.com/talks>
- <https://www.ted.com/podcasts/ted-tech>
- <https://podcasts.apple.com/us/podcast/darknet-diaries/id1296350485>
- <https://player.fm/series/practical-ai-machine-learning-data-science>
- <https://player.fm/series/data-science-at-home-2600992>

International Broadcasting Stations and their multimedia programmes: e.g.

- [www.bbc.co.uk](http://www.bbc.co.uk) – e.g. Tech Tent, Inside Science, The Science Hour
- [www.npr.org/](http://www.npr.org/) - e.g. STEM spots

Print- or web-based sections of internationally renowned quality newspapers: e.g.

- The Guardian
- The New York Times
- The Times
- The Washington Post

General English Dictionaries, e.g.

- [www.merriam-webster.com/](http://www.merriam-webster.com/)
- [en.oxforddictionaries.com](http://en.oxforddictionaries.com)
- [www.collinsdictionary.com/dictionary/english](http://www.collinsdictionary.com/dictionary/english)
- [dictionary.cambridge.org/dictionary/english/](http://dictionary.cambridge.org/dictionary/english/)
- [www.leo.org](http://www.leo.org)
- [de.langenscheidt.com/englisch-deutsch/](http://de.langenscheidt.com/englisch-deutsch/)



- [www.onelook.com](http://www.onelook.com) (search engine)

Technology - specific dictionaries, e.g.

- <https://techterms.com/>
- <https://www.techopedia.com/dictionary>
- <https://www.techtarget.com/whatis/>
- <https://www.collinsdictionary.com/word-lists/mathematics-mathematical-terms>

English Learning Software / Blended-Learning Modules:

- ET - Exam Trainer (in-house development by the Language Centre)
- FFT - Fast Formula Trainer (in-house development by the Language Centre)
- ESP - English Support Programme (in-house development by the Language Centre)
- various E-learning products, tools and further in-house developments
- various CALL products



## WINTER SCHOOL “SMART GREEN ISLAND”

Westphalian University of Applied Sciences, Campus: Gelsenkirchen

ID	Workload 180 hours	Credits 6 ECTS	Study Semester 5th semester	Offer Winter Semester	Duration 2 Weeks, Full-Time
1	<b>Courses</b> Complementary Lecture and Exercises		<b>Contact Time</b> 60 hours	<b>Self-Study</b> 120 hours	<b>Planned group size</b> 5
2	<b>Learning Outcomes / Competencies</b> Using the problem-based learning (PBL) the module offers a holistic approach that is equipping students with a diverse array of skills and competencies essential for success in academic, professional, and real-world settings				
3	<b>Contents</b> <ul style="list-style-type: none"> <li>• Matching event to select in the field of smart automation, smart production, green mobility or circular economy</li> <li>• Development of technical prototypes in international and multicultural teams</li> <li>• Presentation of intermediate results</li> <li>• Definition of part lists and needed supporting equipment</li> <li>• Realization of the concept idea with the help of the PBL method supported by aligned lecture units about used software, hardware, and data interfaces</li> <li>• Final presentation as group</li> </ul>				
4	<b>Teaching Methods</b> Lecture with accompanying exercises, project tasks based on real products.				
5	<b>Participation Requirements</b> <b>Formal:</b> none <b>Content:</b> Project management, Automation, Robotics, Programming, CAD				
6	<b>Forms of examination</b> Project work in project team and presentation				
7	<b>Requirements for the award of credits</b> The project work and the written examination must be passed.				
8	<b>Requirements for taking the exam</b> Module examination must be passed.				
9	<b>Importance of the grade for the final grade</b> 2,45 % (see study program examination regulations)				
10	<b>Module Coordinator and Lecturer</b> Prof. Dr.-Ing. Andreas Kneißler				
11	<b>Additional Information</b> The Winter School “Smart Green Island” is expected to take place in March 2025.				