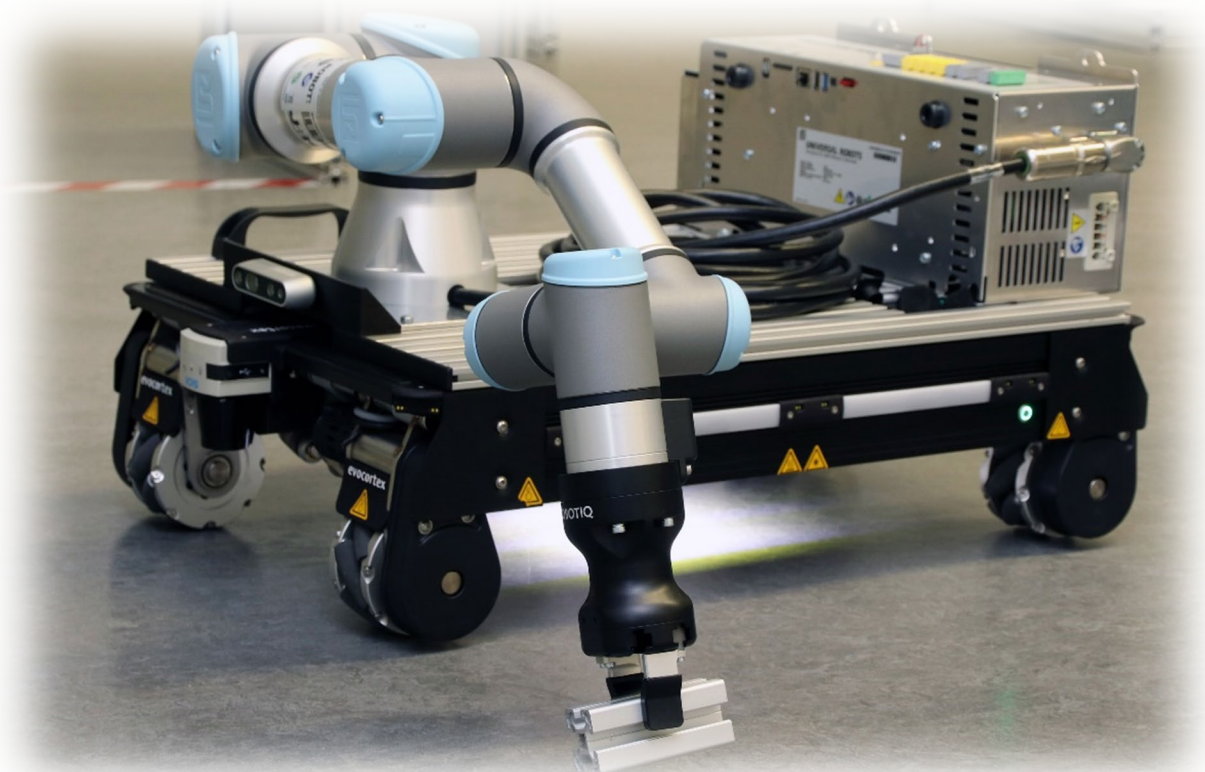




Study Plan

Bachelor Robotics (IRO)

SPO 2020 and 2023



Summer semester 2024

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Abbreviations

APO	General Examination Regulations of THWS
AWPF	General elective course
AWPM	General elective module
BA	Bachelor's thesis
bZv	Special admission requirements
CP	Credit points
D	German (as language of examination)
E	English (as language of examination)
ECTS	European Credit Transfer and Accumulation System
FANG	Faculty of Applied Natural Sciences and Humanities
FE	Faculty of Electrical Engineering
FM	Faculty of Mechanical Engineering
FWPM	Core elective
LV	Course
m.E./o.E.	Passed successfully / failed
mP	Oral examination
NG	Grade weights
P	Internship or lab course
Pro	Project
RaPo	State Examination Regulations
S	Seminar
soP	Other type of assessment
sP	Written exam
SPO	Study and examination regulations
SuSe	Summer semester
SU	Seminar-like lecture
SW	Schweinfurt
SWS	Hours per week and semester
Tpf	Compulsory attendance
Ü	Practical course
V	Lecture
WiSe	Winter semester

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Academic Advisory Service

Information on the Website: <https://www.thws.de/en/services-and-support/academic-advisory-service/>

Learning Outcomes to be Achieved

The degree programme is divided into three phases:

1st to 4th semester	Orientation phase, foundation studies and lab courses
5th semester	Internship
6th and 7th semester	Focus and specialisation studies, Robotics Project and bachelor's thesis

The Study Plan Robotics complements the study and examination regulations for the bachelor's programme in Robotics (SPO/IRO) at the University of Applied Sciences Würzburg-Schweinfurt.

It includes the following:

- The allocation of weekly hours per semester to each programme semester
- The course type of each subject
- Objectives and contents of the internship semester
- More detailed provisions regarding exams and certificates of participation
- The names of specialisation modules, their course type and weekly hours

Organisation of the Robotics programme

1st to 4th semester	Fundamental theoretical and practical courses at THWS in mathematical and technical subjects as well as foundation courses in computer science, lab courses, completion of two core elective modules.
5th semester	Internship semester spent in industry as well as courses at THWS teaching interdisciplinary contents (soft skills). <i>In order to enter the internship semester, a minimum of 90 CP is required. This minimum number of CP corresponds to having successfully completed 75% of modules from the first four semesters.</i>
6th and 7th semester	Theoretical and practical courses at THWS, interdisciplinary contents, Robotics project, completion of two core elective modules, specialisation module and bachelor's thesis. <i>In order to start the bachelor's thesis, successful completion of the internship module as well as a minimum of 150 CP is required.</i> <i>We offer the following specialisations consisting of three specialisation modules each:</i> <ul style="list-style-type: none"> • <i>Industrial Robotics</i> • <i>Mobile Robotics</i> • <i>Humanoid and Service Robotics</i> <i>Choice is made by taking a specialisation module's exam for the first time.</i>

Module Handbook

The Robotics Bachelor's programme is modularised, i.e. it consists of different module courses.

Modules combine subjects in thematically and chronologically complete, self-contained study units assigned with a number of credit points. They can be made up of different teaching and learning formats (such as lectures, exercise courses, lab courses, seminars etc.).

In general, modules are completed by an examination that is the basis for the award of credit points.

The degree programme's modules are relatively small study units to facilitate national and international recognition.

The module handbook contains details of important information on modules (such as learning outcomes and contents).

The current version of the module handbook for the Robotics programme is available online from <https://studium-robotik.thws.de/en/>.

Programme Structure

See the following figure for information on the programme structure. There are two variants available. For advice on anything concerning your individual course of study, please contact the programme advisor.

B.Eng. in Robotics - Structure															
Semester	1		2		3		4		5		6		7		
Study Plan	Foundation studies								Internship semester		Specialisation studies				
Variant A	GS	X	GS	X	GS	X	GS	X	PS	X	FV	X	FV	X	
												BA			
Variant B	GS	X	GS	X	GS	X	GS	X	PS	X	FV	X	FV	X	
													BA		

Variant A: Start your bachelor's thesis immediately after your specialisation studies in the 6th semester

Variant B: Start your bachelor's thesis at the start of the 7th semester
(Note: BA grade possibly not available before the 8th semester)

GS	Foundation studies
X	Semester break
PS	Internship semester
FV	Specialisation studies
BA	Bachelor's Thesis

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Robotics Lab

In each semester of the foundation phase (1st to 4th semester) a Robotics Lab for 5 ECTS credits each is scheduled. The Robotics Lab complements the foundation modules of robotics and serves to deepen the acquired specialist knowledge.

Each Robotics Lab covers four main areas:

- Robotics applications
- Robot development
- Software tools
- Lab experiments.

The corresponding courses are offered at fixed dates. These dates will be announced at the start of the semester by the Robotics Lab responsible.

Successful completion of the Safety Briefing is required for participation in the Robotics Lab.

The number of participants in the individual experiments is limited. Depending on the lab course, available places are either allocated or you can register independently via THWS E-Learning. Information on this will be announced at the start of the semester via the THWS E-Learning.

A Robotics Lab is completed as soon as all exams/assessments listed on the Attestation Card (a form listing required exams/assessments) have been completed. Successful completion is recorded on the Attestation Card.

Students can also take German-taught lab courses of the German Robotics programme (BRO) if places are available. There, too, exams/assessments have to be documented on the Attestation Card.

For some lab courses (esp. lab experiments) experiment instructions are usually available in the E-Learning. These instructions have to be worked through in advance. At the start of the experiment, it will be checked whether participants have prepared themselves suitably. Sufficient preparation is a prerequisite for participating in the lab experiment as well as for a positive statement on the Attestation Card.

After each Robotics Lab, the Robotics Lab responsible checks the attestation card for completeness and notifies the Department of Student Affairs (HSST) about successful completion of the lab.

Internship Module during the 5th Semester

The internship semester is intended to introduce students to activities and work methods used by engineers by way of concrete tasks. At the same time, students should gain in-depths insights into technical areas and social structures of companies. The internship has a duration of at least 20 weeks, but no more than 26 weeks.

Only students who have gained 90 ECTS credits at the start of the Internship Module are entitled to enter this part of studies.

This internship semester is complemented by a general elective module (AWPM) accompanying the internship.

General Elective Module (AWPM)

For the General Elective (No. 26), you must choose two courses (2 SWS each) from the AWPM catalogue. The elective courses offered are available from the catalogue of FANG. For more information, please visit the faculty's website:

<https://fang.thws.de/fakultaet/awpf/>

Robotics Project

During the specialisation studies (in the 6th and 7th semester) the Robotics Project is scheduled where you will work in teams and apply soft skills as well as already acquired specialist skills.

Here, students will work in small groups on industrial development tasks. Each participant must comply with the agreed schedule (completion of assigned work in due time, participating in team meetings).

The Robotics Project's success is assessed on the basis of the project execution on the basis of the development systematic progress of the project, the project documentation of 15-20 pages as well as the project presentations.

The project offer is limited and addressed to students in the 6th and 7th semester. Projects will be presented at the beginning of the 6th semester. Efforts will be made to assign the students to the projects in accordance with their individual preferences. However, since the number of participants in the projects is limited (usually 3-5 participants per project), participation in the preferred project cannot be guaranteed.

Seminars

Regular attendance in the seminars' sessions is required for their successful completion. Attendance is documented by signing the attendance list. If students cannot attend, they usually have to notify the lecturer of the session(s) they will miss in advance.

In order to complete seminars successfully, students will be required to write reports, compile portfolio assignments and hold presentations.

Core Elective Modules (FWPM)

Core elective modules are offered in the 4th and 6th semester. They offer students the opportunity to accentuate their studies according to personal and professional interests.

The students have to choose from two separate catalogues of subjects. Core Elective 1a and Core Elective 1b have to be chosen from the catalogue "Core Elective 1"; Core Elective 2a and Core Elective 2b have to be chosen from the catalogue "Core Elective 2".

These electives can only be offered once per year and if there is a sufficient number of participants. Each core elective is completed by a written exam.

Specialisation Studies

Each student has to choose an area of specialisation. Choice is made by taking a specialisation module's exam for the first time. After this, a change of the area of specialisation can be made if the necessary written request is approved by the examination committee.

The range of specialisations offered depends on a sufficiently large number of students in a given year. There is no entitlement that all areas of specialisation are offered if there is not a sufficient number of participants.

Bachelor's Thesis

The bachelor's thesis is scheduled for the 7th semester. It can either be written within THWS or in collaboration with an external partner, such as an industrial company.

Starting the bachelor's thesis can take place at the earliest if

- a) the Internship (module no. 25) has been completed successfully and
- b) at least 150 ECTS credits have been earned.

The form for the registration of a bachelor's thesis is available in the E-Learning of the Faculty of Electrical Engineering: [Kurs: Info-Plattform Elektrotechnik, Abschnitt: Studiengang BRO / study programme IRO \(thws.de\)](#).

For **SPO 2020** students: If the thesis is assigned no later than one month after the start of the 7th semester, the completion period is 5 months; if the thesis is assigned later, it must be completed within 3 months.

For **SPO 2023** students: The thesis must be completed within 5 months.

Independent from the submission deadline, the workload is 12 ECTS credits, i.e. 360 hours.

Stays Abroad

Having international experience is of increasing importance. Many companies have global operations and even local companies collaborate with customers or suppliers based abroad. Thus, intercultural experience and foreign language skills are important not only for managerial personnel, but often also for the average employee. This professional aspect apart, a stay abroad is exciting and brings a lot of fun and loads of new impressions. The freedom abroad you enjoy as a student will be over when you are deployed for professional reasons.

There isn't just one way of going abroad. You can do the internship during your studies abroad, attend a summer or winter school, study for one or two semester at a foreign higher education institution or write your bachelor's thesis abroad. If you study abroad, you should keep in mind that the credits you earn there can be transferred to THWS. The core modules as well as general modules are particularly suitable for credit transfer, because in these cases the modules taken abroad do not have to correspond to the modules/courses in the Robotics programme.

Take care to plan your stay abroad well in advance for several reasons: to keep required deadlines here and abroad; to make the best use of possible funding opportunities; most importantly, to clarify already before you go abroad whether the credits you plan to earn can be transferred to THWS; to adjust your personal course of studies at THWS, if necessary.

A stay abroad makes sense after your 3rd semester; however, you should get information as soon as the 1st or 2nd semester. For more information, please contact the international affairs officer of the faculty and the THWS International Office (<https://international.thws.de/>)

European Credit Point Transfer System (ECTS)

Credit points awarded according the European Credit Transfer System (ECTS) are a measure for the students' workload; they facilitate the national and international recognition and transfer of academic achievements, for example for transfer students to/from another higher education institution.

One credit point corresponds to 30 hours of work of an average student. Sixty credit points are scheduled to be achieved per year of study. In order to obtain the academic degree Bachelor of Engineering, 210 credit points have to be achieved.

Graded modules contribute to the degree grade in proportion of their credit points. The study and examination regulations show further weighting factors.

In addition to other condition, the number of credit points earned decides whether a student may continue his or her studies as scheduled.

The student workload (30 hours per credit point) is calculated by taking the entire time needed to reach a module's qualification objectives. This not only includes the attendance time in lectures and seminars, but also the time for self-study, homework, preparation for and participation in exams.

Diploma Supplement

When the bachelor's examination has been passed, the student receives the Diploma Supplement and the Transcript of Records in addition to his or her Bachelor's Certificate.

The Diploma Supplement describes the type and contents of the degree programme and provides information on the German higher education system. It thus facilitates the programme's international classification.

Labs in the Faculty of Electrical Engineering

Laboratory	Abbreviation	Room*	Supervisor
Automation Technology	FE	N.N.	N.N.
Automation Technology and Biomedicine	FE	1.0.27-28	Dr. Hansmann
Autonomous Mobile Systems	FE	9.E.06	Dr. Borrmann
Battery Technology	FE	N.N.	Dr. Lorrman
Chip-Design and Microelectronics	FE	1.1.04	Dr. Endres
Circuit Design	FE	1.E.34	Dr. Schormann
CobotLab	FE	9.E.02	Dr. Kaupp
Communications Engineering	FE	1.E.32	Dr. Spiertz
Control Systems	FE	1.1.08	Dr. Ali
Control Technology	FE	N.N.	Dr. Mühlfeld
Cyber-Awareness, Cryptography and Hacking	FE	1.0.30	N.N.
Data Processing and Embedded Systems	FE	1.1.06	Dr. Eckert
Dielectric Diagnostics and Simulation	FE	2.1.04	Dr. Zink
Electrical Machines	FE	1.1.65	Dr. Herranz Gracia
Electrical Power Supply	FE	1.1.65	Dr. Rahimpour
Electromagnetic Compatibility	FE	N.N.	Dr. Kasten
Hardwaredesign	FE	9.E.05	Dr. Kaupp
High Voltage Engineering	FE	2.E.05	Dr. Zink
Human Robot Interaction	FE	N.N.	Dr. Friedrich
Industrial Robotics	FE	9.E.03	Dr. C. Ziegler
Intelligent Industrial Control Systems	FE	1.E.16	Dr. B. Müller
Machine Learning	FE	9.E.06	Dr. Herrler
Machine Vision	FE	9.E.17	Dr. Willert
Mechatronics Lab I – Electric Drives	FE	1.E.22-28	Dr. Kempkes
Mechatronics Lab II – Power Electronics	FE	1.E.22-28	Dr. Ackva, Dr. Pawellek
Mechatronics Lab III – Automotive Electronics and Simulation	FE	1.E.18	Dr. Hirn
Medical Engineering	FE	1.0.27-28	Dr. Strobel
Metrology and Opto-thermic Sensors	FE	1.0.26	N.N.
Microwave Engineering	FE	1.0.31	Dr. Eberspächer
Mobile Robotics	FE	9.E.17	Dr. Kaupp
Network Engineering and Network Management	FE	1.1.06	Dr. Eckert
Operation and Simulation of Electrical Energy Systems	FE	1.1.65	Dr. Wellhöfer
Optoelectronics	FE	1.0.29	Dr. Bohn
PCB Technology	FE	3.0.12	Dr. Schormann
Robotics I	FE	1.E.12	Dr. Brandenstein-Köth
Service Robotics	FE	9.E.06	N.N.
Signal Processing	FE	1.E.33	Dr. Spiertz
Software and Systems Engineering	FE	9.1.03	Dr. Daun
Software Engineering	FE	1.1.62	Dr. Mathes

Institute	Abbreviation	Room*	Supervisor
Center Robotics	CERI	Campus Konrad-Geiger	Dr. Kaupp
Institute for Power Engineering and High Voltage Technology	IEHT	1.1.17	Dr. Zink Dr. Kobus, FANG
Institute of Medical Engineering Schweinfurt	IMES	1.1.59 1.0.28	Dr. Strobel Dr. Hansmann
Technology Transfer Centre for E-Mobility	TTZ-EMO		Dr. Ackva Dr. Kasten

*Room number: 1-8.x.x = Campus Ignaz-Schön; 9.x.x = Robotics Campus Konrad-Geiger

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*Room number: 1-8.x.x = Campus Ignaz-Schön; 9.x.x = Robotics Campus Konrad-Geiger, 20.x.x = Campus Ledward

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Programme Advisor BRO	Willert, Volker	Prof. Dr.-Ing.	9.1.09	8598
Examination Committee	Herrler, Rainer	Prof. Dr. rer. nat.	9.1.03	9710
International Affairs Officer	Eberspächer, Mark	Prof. Dr.-Ing.	1.1.19	8494
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	Scheuring, Andrea	administrative staff	9.1.10	8735
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Faculty of Electrical Engineering

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Vice Dean	Zink, Markus H.	Prof. Dr.-Ing.	2.2.05	8498
Dean of Studies	Brandenstein-Köth, Bettina	Prof. Dr. rer. nat.	1.1.21	8456
Women's Affairs Officer	Brandenstein-Köth, Bettina	Prof. Dr. rer. nat.	1.1.21	8456
Dean's Office	<u>Campus Ignaz Schön:</u>			
	Rath, Katharina	administrative staff	1.1.23	9802
	Schmitt, Cordula	administrative staff	1.1.23	9802
	Gessner, Barbara	administrative staff	1.1.23	9802
	Glöckler, Daniela	administrative staff	1.1.23	8520
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