



Future Challenges in Engineering International Master Summer School 2024

Course Description for Students from (Non-)Partner Universities

Master Summer School in Germany for international students joined by Master's students from TH Rosenheim

Date: 22 July to 27 July 2024

Rewards: Certificate + 3 ECTS CP

Location: TH Rosenheim, address: Hochschulstrasse 1, 83024 Rosenheim, Germany

Aims at:

- Master's / Graduate students enrolled in STEM / engineering studies
- Senior year's Bachelor's / Undergraduate students enrolled in STEM / engineering studies

Language of instruction: English, advanced English skills recommended ([B2 CEFR](#))



What do engineers need for the challenges ahead?

The future presents engineers with new challenges. To solve them, we need technical know-how, international teamwork and an efficient management of our resources. Our Master Summer School deals with career opportunities for future engineers. This is an English-taught programme in Rosenheim, Germany, for international students joined by Master's students from TH Rosenheim. Build on your engineering skills, explore the environmental impact of your actions and develop sustainable solutions in our labs. You get to choose a programme to achieve your desired learning outcomes. In each class, the hands-on courses are led by experts from practice who support you in taking a global perspective on the challenges ahead.

General Information and Contact

For more information about the programme and activities please visit the Master Summer School website at www.th-rosenheim.de/master-summer-school

Master Summer School coordinator Mr. Florian Thoma

florian.thoma@th-rosenheim.de

Teaching Language and Methods of Instruction

All classes are taught in English. The main methods of instruction are lectures, workshops and group exercises. Hands-on teaching also takes place in our campus labs. Participants get more practical input from leading industry partners during company visits. To pass the programme, students must participate in mandatory sessions during the outlined contact hours. Learning material for the classes will be provided online on our Learning Campus (Moodle).

Academic Programme and Workload

Participants get to choose between different classes.

- Class A: Industrial Engineering – Challenges in the next Decade
- Class B: Sustainability and Circular Economy
- Class C: Lightweight Design for Additive Manufacturing



Programme	Dates	Certification	Requirements and examination	Academic workload
Online Pre-Departure Workshop	17 July 2024	3 ECTS CP for successful participation	Being on time and attendance during at least 80 percent of mandatory contact hours (online / in class / laboratories / company visit)	2 online contact hours
Face-to-face Classes in Rosenheim	22 to 26 July 2024		Active participation and contribution to the workshops and discussions	32+ contact hours in class / laboratories / company visit
Master Summer School Class A or B or C (no mix of classes)			Individual studies and working on individual and group exercises All students take a written exam at the end of their class on Friday, 26 July 2024.	+ Individual studies + Assigned exercises and preparation for classes and exams
Munich excursion and weekend trip	26 to 28 July 2024	Social and cultural programme Organised activity		

Online Pre-Departure Crash Course on Bavarian Culture and Business Culture in Germany

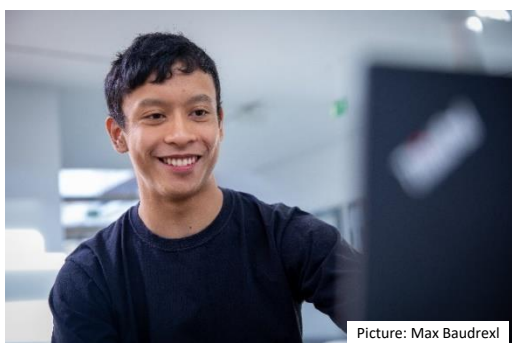
All classes are preceded by a **joint online training** for our guest students. In this training, students get to know each other and will be prepared for their stay in Germany.

Culture matters in business – whether it's going abroad or working from home in a global team. This training helps students to learn more about **Bavarian culture** and the do's and don'ts when **doing business in Germany**. The interactive workshop is taught in English by coach and trainer Ms. Verena Gruber.

During this session, you will also get **final updates before your travels to Germany**. The link and meeting details will be provided prior to the start of the programme. Class contents and times are subject to change. The training is part of the academic Master Summer School programme.

Date: 17 July 2024

Time	Input
Wednesday, 17 July 2024 16:00 pm	Pre-departure update for participants and final information for guests Host: Mr. Florian Thoma Online Crash Course on Bavarian Culture and Business Culture in Germany Trainer: Ms. Verena Gruber



Picture: Max Baudrex



Picture: Max Baudrex



International Master Summer School

Class A: Industrial Engineering – Challenges in the next Decade

Faculty of Management and Engineering

Course Contents

The purpose of the workshop is to familiarise students with various tools and methods in Industrial Engineering to stand the industrial challenges of the next decades via artificial intelligence (e.g. metaverse applications), management concepts for global companies (international management) as well as product design (gear design). The individualisation of products, organisations and work is reflected in historical development towards the future steps of change (Industry 4.X). Profound leadership skills are highly important in industrial corporations and will be a key part of this class.



The basic concept of this course is to transmit short overviews and insights into today's tools and methods transitioning fast to practical examples in personal exercises and workshops. The inputs come from actual situations or use cases of the industry.

Recommended Skills

No subject-specific requirements

Learning Outcomes

At the end of the course students should be able to

- understand what is behind the term AI and why data is being referred to as the 'new oil',
- classify and evaluate occurring industrial situations into change and future proof concepts,
- will have a basic understanding of various mechanical transmissions and their usage in different applications,
- understand the challenges of international management: stakeholder management, how to evaluate the performance of international management, ethics in int. management,
- develop an understanding of what does it take to be a successful leader in an international setting.

Academic Contacts

Sessions	Lecturers
Artificial Intelligence	Prof. Dr. Noah Klarmann
Company Visit	Prof. Dr. Robert Kuttler
Industry 1.0 to 4.0, Metaverse Applications in Engineering	Prof. Dr.-Ing. Andreas Straube
International Management	Prof. Dr.-Ing. Peter Kraus
Gear Design	Prof. Dr.-Ing. Andreas Doleschel
Leadership Skills	Prof. Dr. Sonja Unterlechner



Recommended Sources

- Burgess, Andrew (2020): *The Executive Guide to Artificial Intelligence*.
- Robert C. Higgins: *Analysis for financial management*, Irwin Mc Graw-Hill, 2012.
- Kollmann, Tobias (2019): *E-Business*.
- Matthes, E. (2019): *Python – Crash Course*. 2nd ed., no starch press.
- McKinney, W. (2017): *Python for Data Analysis*. 2nd ed., O Reilly.
- Kotler/Keller: *Marketing Management*, Global edition, Pearson, 2016.
- Radzevich S. (2016): *Dudley’s Handbook of practical gear design and manufacture*, CRC Press.
- Whetten/Cameron (2015): *Developing Management Skills*.

Examination

Written multiple-choice test

Programme Schedule

Class contents and times are subject to change. A final schedule will be available prior to the start of the programme. Social activities (evening programme and Saturday programme) are voluntary, while contact hours during classes are mandatory for all participants in order to complete their academic workload.

Industrial Engineering – Challenges in the Next Decade

Date/ Time	Monday 22 July 2024	Tuesday 23 July 2024	Wednesday 24 July 2024	Thursday 25 July 2024	Friday 26 July 2024	Saturday, 27 July 2024*
08:30 am - 10:00 am	Welcome Session and Campus Tour	Workshop Gear Design	Workshop International Management	Workshop Artificial Intelligence	Written Exam	Munich excursion and weekend trip
10:15 am - 11:45 am	Workshop Leadership Skills	Workshop Gear Design	Workshop International Management	Workshop Artificial Intelligence	Company Visit to KRONES	Guided tour at BMW Welt Bavarian Lunch
11:45 am - 01:00 pm	L U N C H B R E A K					Munich City Tour
01:00 pm - 02:30 pm	Workshop Leadership Skills	Individual Study Time	Workshop Industry 1.0 – 4.0	Workshop Artificial Intelligence	Company Visit to KRONES	Free time in Munich
02:45 pm - 04:15 pm	Individual Study Time	Individual Study Time	Workshop Metaverse Applications in Eng.	Individual Study Time	Closing Ceremony	
Evening schedule*	Rosenheim City Tour and Welcome Dinner	Lake Sundowner			Transfer to Munich Check-in at Hostel	

* Time and specific event to be announced.



International Master Summer School

Class B: Sustainability and Circular Economy

Faculty of Wood Technology and Construction

Course Contents

The purpose of the workshop is to familiarise students with sustainability and circular economy - two future challenges. The class will enable students to take sustainability into account in product development, to know about the future challenges and encourages them to bring in their own ideas.

We will start the course with a general introduction, and then move over to the practical aspect how to include sustainability in the process of product development. During our company visit, students will learn how to incorporate the issue into a company's philosophy to offer ecological buildings. We will also look at what has already been achieved in Europe and what the future challenges to solve are. By the end, we will develop and pitch ideas for companies together.



Picture: Max Baudrexl

Recommended Skills

No subject-specific requirements

Learning Outcomes

At the end of the course students should be able to

- understand the meaning of sustainability and circular economy,
- utilize methods to develop sustainable products,
- understand the global context of sustainability,
- recognize the future challenges,
- develop own ideas for implementation in companies.

Academic Contacts

Sessions	Lecturers
Circular 4.0 - Showcase Projects and Challenges of the Future	Ms Marietta Maier (Intereg Alpine Space Funding Project Circular 4.0) Dr. Eva Schichl (UmweltCluster Bayern)
Company Visit	Prof. Andreas Heinzmann
Idea Pitch for Companies	Ms Marietta Maier Dr. Eva Schichl
Introduction to Sustainability and Circular Economy	Prof. Dr. Sandra Krommes
Sustainability in Product Development	Dr. Steinhauer (Burgbad AG)



Recommended Sources

- Edited by Lerwen Liu, Seeram Ramakrishna (2021): *An Introduction to Circular Economy*. Singapore, Springer Singapore. ISBN 9789811585104 (available in the university library).
- Daizhong Su, editor (2020): *Sustainable product development : tools, methods and examples*. Cham, Springer, ISBN: 978-3-030-39148-5 (available in the university library).

Examination

Written Exam: 60 minutes questions and case studies

Programme Schedule

Class contents and times are subject to change. A final schedule will be available prior to the start of the programme. Social activities (evening programme and Saturday programme) are voluntary, while contact hours during classes are mandatory for all participants in order to complete their academic workload.

Sustainability and Circular Economy

Date/ Time	Monday 22 July 2024	Tuesday 23 July 2024	Wednesday 24 July 2024	Thursday 25 July 2024	Friday 26 July 2024	Saturday, 27 July 2024*
08:30 am - 10:00 am	Welcome Session and Campus Tour	Workshop Sustainability in Product Development	Company Visit	Circular 4.0 Showcase Projects	Workshop Idea Pitch for Companies	Munich excursion and weekend trip
10:15 am - 11:45 am	Introduction Sustainability and Circular Economy	Workshop Sustainability in Product Development	Company Visit	Circular 4.0 Showcase Projects	Workshop Idea Pitch for Companies	
11:45 am - 01:00 pm	LUNCH BREAK					Munich City Tour
01:00 pm - 02:30 pm	Introduction Sustainability and Circular Economy	Workshop Sustainability in Product Development	Company Visit	Circular 4.0 Showcase Projects	Written Exam	Free time in Munich
02:45 pm - 04:15 pm	Individual Study Time	Workshop Sustainability in Product Development	Company Visit	Individual Study Time	Closing Ceremony	
Evening schedule*	Rosenheim City Tour and Welcome Dinner	Lake Sundowner			Transfer to Munich Check-in at Hostel	

* Time and specific event to be announced.



International Master Summer School

Class C: Lightweight Design for Additive Manufacturing

Faculty of Engineering

Course Contents

Challenges for engineers and designers to create more efficient parts are rising. One way to address this demand is the use of Lightweight Design for Additive Manufacturing. In recent years, this production method has evolved from prototyping to a serial production process. The most important topic of layer-wise technologies is to take into account the entire end-to-end process.

In this course, the students gain knowledge on this technology and processes. During the week, participants will design and create a device from scratch to take home. Based on practical design and manufacturing lessons in the workshop, all participants get in direct contact with the total process chain.



Recommended Skills

- **Advanced knowledge in 3D-CAD**
- **Basic knowledge in Additive Manufacturing**

Learning Outcomes

At the end of the course students should be able to

- utilize methods in design for layer-wise technology,
- recognize the complete end-to-end process,
- understand the challenges of designing parts and operating machines.

Academic Contacts

Sessions	Lecturer
Additive Production Technology	Prof. Dr.-Ing. Fabian Riß

Recommended Sources

- Gibson, Ian (2015): *Additive manufacturing technologies - 3D printing, rapid prototyping, and direct digital manufacturing*. New York, NY [u.a.], Springer. ISBN: 978-1-4939-2113-3,978-1-4939-2112-6.
- Diegel, Olaf, Nordin, Axel, Motte, Damien (2020): *A Practical Guide to Design for Additive Manufacturing*. Singapore, Springer Singapore. ISBN: 978-981-3294-33-2.
- Gebhardt, A. (2011): *Understanding additive manufacturing - rapid prototyping, rapid tooling, rapid manufacturing*. Munich, Hanser. ISBN: 978-3-446-43162-1,978-3-446-42552-1.

Examination

Written Exam: 60 minutes questions and case studies, 1 handwritten DIN A4 page



Programme Schedule

Class contents and times are subject to change. A final schedule will be available prior to the start of the programme. Social activities (evening programme and Saturday programme) are voluntary, while contact hours during classes are mandatory for all participants in order to complete their academic workload.

Lightweight Design for Additive Manufacturing

Date/ Time	Monday 22 July 2024	Tuesday 23 July 2024	Wednesday 24 July 2024	Thursday 25 July 2024	Friday 26 July 2024	Saturday, 27 July 2024*
08:30 am - 10:00 am	Welcome Session Introduction, Safety Briefing and Lab Tour	Lecture Design for AM – Suitability and Design	Workshop Suitability and Design	Workshop Manufacturing of Parts	Workshop Manufacturing of Parts	Munich excursion and weekend trip
10:15 am - 11:45 am	Lecture Design for AM – Planning and Concept	Workshop Suitability and Design	Workshop Suitability and Design	Workshop Manufacturing of Parts	Lecture Summary and Conclusions	
11:45 am - 01:00 pm	L U N C H B R E A K					Munich City Tour
01:00 pm - 02:30 pm	Workshop Planning and Concept	Workshop Suitability and Design	Lecture Design for AM - Manufacturing	Lecture: Exam preparation, Q&A session	Exam	Free time in Munich
02:45 pm - 04:15 pm	Workshop Planning and Concept	Workshop Suitability and Design	Individual Study Time	Individual Study Time	Closing Ceremony	
Evening schedule*	Rosenheim City Tour and Welcome Dinner	Lake Sundowner			Transfer to Munich Check-in at Hostel	

* Time and specific event to be announced.