



Future Challenges in Engineering International Master Summer School

Course Description for Students at TH Rosenheim

This programme is a Master Summer School in Germany for international students who are joined by Master's students from TH Rosenheim.

Date: 24 July to 28 July 2023

Rewards: Certificate + 3 ECTS CP

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

Aims at: Master's students in

- Engineering Sciences (ING-M)
- Management and Engineering (WI-M)
- Wood Technology (HT-M)

Language of instruction: 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 not only technical know-how, but also cross-disciplinary teamwork and good management of our resources. This summer school aims at enablers of technical progress and business innovation. The programme addresses cross-disciplinary competencies in industrial engineering, additive manufacturing and circular economy. In international teams, participants build on their engineering skills, explore the environmental impact of their actions and develop sustainable solutions. Participants get to choose their programme to achieve their desired learning outcome. In each class, the hands-on courses are led by experts from practice who support the students 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: Advanced Design for Additive Manufacturing



Programme	Dates	Certification	Requirements and Examination	Academic workload
Face-to-face Classes in Rosenheim – 1 week Class A or Class B or Class C (Week 1)	24 to 28 July 2023	For HT and WI Master's students: 3 ECTS CP for successful participation in any class For ING Master's students: <ul style="list-style-type: none"> • 2 ECTS CP for successful participation in class A or class B • Class C only as a 5 CP option (see below) 	Being on time and attendance during at least 80 percent of mandatory contact hours (online / in class / laboratories / company visit) Active participation and contribution to the workshops and discussions Individual studies and working on individual and group exercises Students take a written exam at the end of their respective class on Friday, 28 July 2023	32+ contact hours in class / laboratories / company visit + Individual studies + Assigned exercises and preparation for classes and exams
Face-to-face Master Summer School – 2,5 weeks Class C (full)	24 July to 4 August 2023 + 25 and 26 September 2023	5 ECTS CP for successful participation in Class C	Being on time and attendance during at least 80 percent of mandatory contact hours (in class / laboratories) Active participation and contribution to the workshops and discussions Individual studies and working on individual and group exercises Students do a PStA (Practical Study Work) / presentation on Tuesday, 26 September 2023	60+ contact hours in class / laboratories + Individual studies + Assigned exercises and preparation for classes and PStA (Practical Study Work)



Picture Max Baudrexl



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. data analysis), 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 international setting.

Academic Contacts

Sessions	Lecturers
Artificial Intelligence	Prof. Dr. Noah Klarmann
Company Visit	Prof. Dr. Robert Kuttler
Industry 1.0 to 4.0, Data Analysis from Production	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 24 July 2023	Tuesday 25 July 2023	Wednesday 26 July 2023	Thursday 27 July 2023	Friday 28 July 2023	Saturday, 29 July 2023*
08:30 am - 10:00 am	Welcome Session and Campus Tour	Workshop Artificial Intelligence	Workshop International Management	Workshop Gear Design	Written Exam	Munich excursion and weekend trip
10:15 am - 11:45 am	Workshop Leadership Skills	Workshop Artificial Intelligence	Workshop International Management	Workshop Gear Design	Company Visit	BMW Welt Guided Tour 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	Workshop Artificial Intelligence	Workshop Industry 1.0 – 4.0	Individual Study Time	Company Visit	Free time in Munich
02:45 pm - 04:15 pm	Individual Study Time	Individual Study Time	Workshop Data Analysis from Production	Individual Study Time	Closing Ceremony	
Evening schedule*	Rosenheim City Tour and Welcome Dinner	Lake Sundowner				

* 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 to Baufritz	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 24 July 2023	Tuesday 25 July 2023	Wednesday 26 July 2023	Thursday 27 July 2023	Friday 28 July 2023	Saturday, 29 July 2023*
08:30 am - 10:00 am	Welcome Session and Campus Tour	Workshop Sustainability in Product Development	Company Visit to Baufritz	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 to Baufritz	Circular 4.0 Showcase Projects	Workshop Idea Pitch for Companies	
11:45 am - 01:00 pm	LUNCH BREAK					
01:00 pm - 02:30 pm	Introduction Sustainability and Circular Economy	Workshop Sustainability in Product Development	Company Visit to Baufritz	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 to Baufritz	Individual Study Time	Closing Ceremony	
Evening schedule*	Rosenheim City Tour and Welcome Dinner	Lake Sundowner				

* Time and specific event to be announced.



International Master Summer School

Class C: Advanced 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 Advanced Design for Additive Manufacturing (ADAM). 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.

Advanced Design for Additive Manufacturing

Week 1

Date/ Time	Monday 24 July 2023	Tuesday 25 July 2023	Wednesday 26 July 2023	Thursday 27 July 2023	Friday 28 July 2023	Saturday, 29 July 2023*
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	BMW Welt Guided Tour Bavarian Lunch
11:45 am - 01:00 pm	LUNCH BREAK					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				

* Time and specific event to be announced.

Week 2

Class contents and times are subject to change.

Date/ Time	Monday 31 July 2023	Tuesday 1 August 2023	Wednesday 2 August 2023	Thursday 3 August 2023	Friday 4 August 2023
08:30 am - 10:00 am	Introduction	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing
10:15 am - 11:45 am	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing	Workshop / Lecture Design for Additive Manufacturing



Week 3

Class contents and times are subject to change.

Date/ Time	Monday 25. September 2023	Tuesday 26 September 2023
09:00 am - 10:00 am	Introduction	Presentation
10:15 am - 11:45 am	Open Questions	Closing Session