Technische Hochschule Ingolstadt

Program and Course Description

Automotive Production Engineering

Master of Engineering (M. Eng.)

Study regulation: WS 2020/21

as per: 12-02-2024

Contents

1 Overview

Name of the programme	Automotive Production Engineering
Study type & degree	Consecutive Master of Engineering (full time)
First start date	SS 14/15; Start only in summer semester
Standard period of study	3 semesters (90 ECTS, 48 SWS)
Study location	THI-Campus in Ingolstadt
Language of instruction	English
Cooperation	None
Admission requirement	Bachelor's degree in engineering, English B2 level and additional regulations according to study and exam regulation (see there for additional details)
Capacity	35 students p.a.
Programme director	Prof. Dr.-Ing. Bernhard Axmann Email: bernhard.axmann@thi.de Phone: +49 841 9348-3505

2 Introduction

The text describes the current state of the program modules in the Master´s degree “Automotive Production Engineering” according to the study and examination regulations (“Studien- und Prüfungsordnung”).

The module handbook (“Modulhandbuch”) presents the objectives and contents of the individual compulsory and elective modules and the breakdown of SWS (semester hours per week) per module and semester.

2.1 Objectives

Based on their completed Bachelor's program, graduates acquire and expand their knowledge, skills and competencies in order to understand automotive production systems in their complexity theoretically, technically and practically. Furthermore, they shall understand development processes in product development to be able to plan, develop, implement, operate, and develop such systems further in an entire technical, strategic, and managerial manner.

There is an emphasis on the graduate´s qualification enabling them to in highly linked processes, reccognize, plan, and execute tasks, assess the need and scope for action as well as take part in developingand managing. They can recognize the interdependency of technical, strategic, managerial, social and further non-technical topics and integrate their actions responsibly.

Thus, students are enabled to solve complex problems that require production, engineering, and business skills by being able to develop solution concepts for practice based on scientific knowledge.

2.2 Admission requirements

- Proof of successful completion of a degree program in industrial engineering, mechanical engineering, automotive engineering, or mechatronics from a German university with at least 210 ECTS credits or equivalent or an equivalent successful domestic or foreign degree.
- All foreign applicants must submit their Bachelor's degree to *uni-assist*, which verifies their eligibility and coverts their grades to the German grade system. *uni-assist* will issue a so-called preliminary inspection documentation (VPD), which they must upload to the application portal (like their other documents).
- Applicants must successfully fulfill the regulations of the aptitude test. After submitting the application documents, the assessment process is automatically done by the THI.
- Proof of English proficiency level B2 or higher.

The binding regulations for this curriculum can be found in:

- "Studien- und Prüfungsordnung" (SPO) of Master´s degree "Automotive Production Engineering" of 18.07.2016.
- "Rahmenprüfungsordnung" (RaPO);
- „Allgemeine Prüfungsordnung" (APO) of Technische Hochschule Ingolstadt;
- „Immatrikulationssatzung" of Technische Hochschule Ingolstadt;

The sequence of studies is influenced by the regulations of the study and examination regulations ("Studien- und Prüfungsordnung").

2.3 Target group

The program addresses to prospective students that

- are creative, curious, and enthusiastic about automotive and production as well as engineering and management,
- prefer a master´s programme fully taught in English, like to gain intercultural experience, and go for an international career at home and abroad,
- enjoy questioning things and see themselves as a driver for change,
- are graduates of bachelor's programs or young professionals with a Bachelor´s degree in industrial engineering, mechanical engineering, automotive engineering, mechatronics engineering, engineering, and management, IT, or a degree in another related discipline.

2.4 Structure of the program

The standard period of study for Master´s programs amount to three theoretical semesters, whereby the third semester shall be primarily used for the completion of the Master's thesis. The program is offered as a full-time course. Within the range of subjects, students are conveyed an in- depth and detailed theoretical, technical, and practical understanding of production systems in the automotive sector. This understanding goes beyond the strategic, planning, and operative development processes of these systems regarding product development.

3. Semester					
Master Thesis					
2. Semester					
Automation & Equipment Technologies	Technology Development & Innovationmgm.	Digital Technologies in Engineering	Production System & Plant Design	Group Project	Individual Elective
1. Semester					
Engineering Processes in Automotive Industry	Production & Logistics Networks	Advanced Manufacturing Technologies	Cost Engineering & Riskmgm.	Scientific Research Seminar	Individual Elective

Picture 1: Program structure

In the first semester (see Picture 1), knowledge, skills, and competencies in the field of Engineering Processes in Automotive Industry, Production and Logistics Networks, Advanced Manufacturing Tech nologies, Cost Engineering & Risk Management in Automotive, Scientific Research Seminar and one Individual Elective are conveyed.

The second semester includes following modules: Automation and Equipment Technologies, Technology Development & Innovation Management, Digital Technologies in Engineering, Production System and Plant Design, Group Project and one Individual Elective. In Group Project, students practicing working on a bigger task as part of a project team are given the opportunity to try out all project stages.

The Master´s program concludes with the master's thesis in the third and last semester. The basics for scientific working required for the thesis are taught in the Scientific Research Seminar and the Group Project.

There are practical elements in all modules, stressing the application-oriented profile of this master's program, e.g., by providing project and thesis topics set by partner companies.

Language and culture courses are offered during the semester times. German students can learn another foreign language.

2.5 Prerequisites for advancement

To get the title of master´s thesis requires at least 30 ECTS to be achieved in the sequence of study (compare “Studien- und Prüfungsordnung” as of 18.07.2016).

3 Qualification profile

The study contents have been defined according to the requirements of industry and small and medium-sized companies as well as the qualification framework for German university degrees.

Graduates have acquired in-depth knowledge in the three main knowledge areas of the program:

- Production,
- Engineering &
- Management

and their interfaces in theory and practice.

Production engineering modules are

- Automation & Equipment Technologies
- Production System and Plant Design
- Production and Logistics Networks
- Advanced Manufacturing Technologies

Engineering modules are

- Digital Technologies in Engineering
- Engineering Processes in Automotive Industry

Management modules are

- Cost Engineering & Riskmanagement
- Group Project

Interfaces between management and engineering modules are

- Technology Development & Innovation Management

The two elective subjects can be freely chosen from the three knowledge areas of Production, Engineering & Management or a subject which represents an interface of these knowledge areas.

Considering the specific objectives of the individual modules (see module descriptions in the next chapter), graduates are familiar with the engineering and management methods used in the field of "Automotive Production Engineering" to work adequately.

They can quickly familiarize themselves with operational and strategic tasks in the field of "Automotive Production Engineering" by mastering not only specialist knowledge required for this, but also knowledge of managing employees (e. g. project) and designing or optimizing the necessary operational processes.

Students are especially advised of language training opportunities at Technische Hochschule Ingolstadt.

3.1 Mission statement

We prepare our students for the challenges of the future:

- The master´s programme creates future competence.
- It creates a spirit of innovation and teaches entrepreneurial thinking.
- It is an interdisciplinary programme, which enables students to develop future-oriented solutions for interdisciplinary challenges.
- It qualifies students to help shape social changes such as the digital transformation and technological change. It sensitizes students to the sustainable use of the environment and resources, to socially responsible behaviour and to social commitment.

We enable our students to develop solutions to problems based on scientific knowledge:

- The master´s programme includes a lot of project work. This enables students to acquire applicable problem-solving skills.
- The lecturers transfer their practical experience and teach academic knowledge. They are professionally competent, are constantly developing in their areas of expertise and contribute their research experience to teaching.
- Students acquire professional, methodical, social, and self-competences.

We open outstanding regional and international perspectives for our students:

- The master´s programme is fully taught in English, addresses international students, and creates intercultural competences.
- In this way, the programme contributes to a cosmopolitan, international campus.
- Our numerous cooperation with companies in the region enables our students to start their careers in the best possible way, both regionally and internationally.

We teach and learn through personal exchange:

- Because this is a master’s programme, small groups and seminar-based forms of teaching are set to enable individual exchange with the students.
- The teaching concept offers digitalized courses (e.g., inverted classroom) in combination with many practical project studies to enhance the learning progress.
- The lecturers try out new ways of innovative and experimental teaching. For example, the first half of the semester concentrates on theoretical basics, the second half on practical application.

We help all students discover and realize their individual potential:

- The master´s programme includes a lot of project work. In joint project work, our students gain social skills such as the ability to cooperate and deal with conflict, and leadership skills.
- The master´s programme is international and intercultural. Hence, the programme promotes performance in an appreciative cooperation. We meet each other with tolerance and openness and understand diversity as an opportunity to learn from each other and develop further.

3.2 Study objectives

3.2.1 Subject-specific competences of the study program

The graduates:

- are able to analyze complex tasks/problems in the area of complex production systems and their development, to identify their key factors and to carry out evaluations as well as hedgings,
- are able to solve problems relating to the development and operation of production systems, which are incompletely defined and demonstrate competing requirements by using scientific, theoretical as well as application-oriented methods,
- master the rules of project and process management, production systems planning, development and operation as well as their use on technical, strategic, planning, and economic problems and questions in practice, especially in the automotive production including suppliers,
- can use tried-and-tested and new production, planning, engineering, procurement, logistics, project management and staff management methods, and apply them successfully in production systems development and operation,
- are aware of digital technologies with a focus of office automation and their impact on the future work life in industrial companies.

3.2.2 Interdisciplinary competences of the study program

Methodical competences:

The graduates are able:

- to work scientifically,
- to assess holistically and systematically digital technologies,
- to plan, compile and lead projects,
- to apply methods of foresight and methods of innovation and technology management,
- to develop business models methodically, to evaluate business scenarios, to apply methods of change management, risk management and technology assessment,
- to analyze interdisciplinary problems, to recognize comprehensive correlations, to transfer learned competences to new tasks and to evaluate the technical, economic, and social impact of compiled solutions.

Social competences:

The graduates are able:

- to compile complex tasks in cross-functional and international teams, to solve conflicts in teams and to lead teams,
- to speak English fluently (including technical terms),
- to react sensitively in intercultural situations,
- to communicate their competencies and to communicate generally,
- to convince and become accepted.

Personal competences:

The graduates:

- are able to organize themselves and to manage their time,
- have analytical and outcome-oriented intellectual power,
- work target-oriented and autonomously,
- are able to present results and themselves.

3.2.3 Examination concept of the study program

The focus of the selection of examination forms is on the best possible assessment of the achievement of the set learning objectives - accordingly, there is a variety of different examination forms ranging from oral and written examinations, project work and study papers as well as presentations.

Also, a project is included in the program where students learn to put theoretical knowledge into practice and to deepen it in a team. The examination form "Project" is a group work to which each student must contribute individually and whose results are presented orally or in writing.

For the form of examinations, please refer to “Studien- und Prüfungsordnung”, Appendix 1, which can be found on the website of the study program.

3.2.4 Application of the study program

The study program "Automotive Production Engineering" has a strong application relevance as it is developed in close coordination with industry practice. It offers interdisciplinary competence teaching with an application reference, where students can participate in networking and learn how to deal with conflicts in a practical setting. The program includes practice and transfer projects during the study, and master's thesis topics are often drawn from professional practice.

The program equips graduates with the skills and knowledge to take on qualified specialist and management roles in the field of production, factory planning, or technology development. The Scientific Research Seminar and Group Project provide students with exposure to industrial problems and scientific working methods. Overall, the study program has high relevance to the practical needs of the industry, and graduates are well-prepared for a range of career options.

3.2.5 Contribution of individual modules to the objectives of the program

Module	Professional competence	Methodology	Social competence	Personal competence
Technology Development & Innovation Management	+	++	o	o
Advanced Manufacturing Technologies	++	+	+	+
Cost Engineering & Risk Management	++	++	o	o
Engineering Processes in Automotive Industry	++	+	o	o
Production System and Plant Design	++	+	o	o
Production and Logistics Networks	++	+	o	o
Automation and Equipment Technologies	++	+	o	o
Digital Technologies in Engineering	++	++	+	+
Group Project	++	++	++	++
Electives	depends on the elective			
Scientific Research Seminar	++	++	+	+
Master's Thesis	++	++	++	++

3.3 Possible professional fields

Graduates of the Master program Automotive Production Engineering have all skills enabling them to work as an engineer in the development of a production system at the company at their disposal. These skills enable them to work as production planner (with strategic, technological, managerial and process-related focus), plant engineer/engineer for equipment technologies as well as plant developer, planning/production manager and manufacturing developer.

Graduates of Automotive Production Engineering are in great demand. There is a wide field of application in specialist or management roles in national or international companies and organizations.

They are especially well prepared to take on specialist and management roles in the following areas:

- Engineer in the development of a production system
    - Plant & Production Engineer
    - Production & Quality Controlling
    - Planning/production manager
    - Manufacturing developer
    - Engineer for Equipment Technologies
- Quality Engineer & Manager
- Project Management
- Product and Technology Management
- Creativity and Innovation Management
- Business Development & Entrepreneurship

Graduates are also particularly well qualified for these tasks in an international context. Typical industries for the graduates of this program are:

- Automotive & Mobility Industry
- Mechanical and Electrical Engineering
- IT
- Services
- Consultancy
- Research & Education.

4 Description of Modules

4.1 Compulsory Modules

Technology Development & Innovation Management

Module abbreviation:	TDevInnM_M-APE	**SPO-No.:**	1
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Schwarz, Jan Oliver
Lecturers:	Ruppert, Max; Schropp, Theresa; Schwarz, Jan Oliver
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Technology Development & Innovation Management (TDevInnM_M-APE)
Lecture types:	SU/Ü-Lecture with integrated exercises
Examinations:	schrP90 – written exam, 90 min. (TDevInnM_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

Students

- know the significance, methods, elements and processes of innovation and technology management;
- understand the involvement in corporate and product development processes;
- can independently use methods of innovation and technology management;
- can install processes suited for systematic technology development and use methods;
- know about the significance, effects and limits of IP protection (Intellectual Property) and its targeted application as well as patenting processes.

Content:

- Technology and innovation management
- Technology development: processes, methods, examples
- Benchmarking

Literature:

- BESSANT, John R. und Joseph TIDD, 2015. *Innovation and Entrepreneurship*. Chichester: Wiley. ISBN 978-1-119-08943-8
- BIAZZO, Stefano, FILIPPINI, Roberto, 2021. *Product Innovation Management: Intelligence, Discovery, Development* [online]. Cham: Springer PDF e-Book. ISBN 978-3-030-75011-4. Verfügbar unter: Online verfügbar unter: https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=6661653.

- CORSTEN, Hans und andere, 2016. *Grundlagen des Technologie- und Innovationsmanagements*. 2. Auflage. München: Verlag Franz Vahlen. ISBN 978-3-8006-5132-0, 3-8006-5132-7. Online verfügbar unter https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=6991130
- GRASHILLER, M., LUEDEKE, T., VIELHABER, M., 2017. Integrated Approach to the Agile Development with Design Thinking in an Industrial Environment. In: *21. ICED, THE UNIVERSITY OF BRITISH COLUMBIA, Vancouver*.
- KELLEY, Braden, 2016. *Charting Change: A Visual Toolkit for Making Change Stick* [online]. New York, NY: Palgrave Macmillan PDF e-Book. ISBN 978-1-137-53697-6, 978-1-137-53695-2. Verfügbar unter: https://doi.org/10.1057/9781137536976.
- MERTINS, Kai, 1995. *Benchmarking: Praxis in deutschen Unternehmen*. Berlin [u.a.]: Springer. ISBN 3-540-58685-7, 978-3-642-79394-3
- PORTER, Michael E., 2004. *Competitive strategy: techniques for analysing industries and competitors*. New York: Free Press. ISBN 0-7432-6088-0, 978-0-7432-6088-6
- SAVOIA, Alberto, 2019. *The right it: why so many ideas fail and how to make sure yours succeed*. New York, NY: HarperOne. ISBN 978-0-06-288465-7, 978-0-06-288466-4
- SCHUH, Günther, 2011. *Handbuch Produktion und Management*. Berlin: Springer.
- SCHWARZ, Jan-Oliver, 2023. *Strategic Foresight: An Introductory Guide to Practice.* London: Routledge.
- TIDD, Joseph und John R. BESSANT, 2021. *Managing innovation: integrating technological, market and organizational change*. Hoboken, NJ: Wiley. ISBN 978-1-119-71330-2
- TROTT, Paul, 2021. *Innovation management and new product development*. Harlow, England; London; New York; Munich: Pearson. ISBN 9781292251547
- WEINBERG, Ulrich, 2015. *Network Thinking: was kommt nach dem Brockhaus-Denken?* Hamburg: Murmann. ISBN 978-3-86774-469-0, 3-86774-469-6

Additional remarks:

No remarks.

Advanced Manufacturing Technologies

Module abbreviation:	AdManT_M-APE	**SPO-No.:**	2
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Bednarz, Martin
Lecturers:	Bednarz, Martin
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Advanced Manufacturing Technologies (AdManT_M-APE)
Lecture types:	SU/Ü - Lecture with integrated exercises
Examinations:	Seminar paper (8-15 pages) with presentation (AdManT_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

- The students understand typical industry application;
- They can analyse advantages and disadvantages of different manufacturing technologies;
- They gain process know-how and understand the physical working principles of the technologies;
- They research new trends in the industry and apply this knowledge in a paper.

Content:

Advanced Manufacturing Technologies e.g.:

- Additive Manufacturing
- Laser Technologies
- Technologies for Battery production
- Manufacturing Technologies for fibre reinforced plastics

Literature:

- GROOVER, Mikell P., 2013. *Fundamentals of modern manufacturing: materials, processes, and systems*. 5. Auflage. Hoboken, NJ: Wiley. ISBN 978-1-118-231463
- BRECHER, Christian, 2015. *Advances in production technology* [online]. Cham [u.a.]: Springer PDF e-Book. ISBN 978-3-319-12304-2, 978-3-319-12303-5. Verfügbar unter: http://dx.doi.org/10.1007/978-3-319-12304-2.

• KALPAKJIAN, Serope und Steven R. SCHMID, 2014. *Manufacturing engineering and technology*. 7. Auflage. Singapore [u.a.]: Pearson. ISBN 978-0-13-312874-1, 978-981-06-9406-7
Additional remarks:
No remarks.

Cost Engineering & Riskmanagement

Module abbreviation:	CostERiskM_M-APE	**SPO-No.:**	3
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Hecht, Dirk
Lecturers:	Hecht, Dirk; Horák, Jiří; Ruppert, Max
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Cost Engineering & Risk Management (CostERiskM_M-APE)
Lecture types:	SU/Ü- Lecture with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (CostERiskM_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- get to know the importance of cost engineering methods in cross functional teams;
- can recognise, assess and include in their work interactions between cost engineering, innovations and product development;
- can handle and apply tools of cost engineering projects and processes;
- understand cost levers within different technologies (Assembly, Moulding, Die Casting, Software);
- understand the importance of Risk Management;
- present the classic models of Risk Management and are able to apply those;
- portray the stages of Risk Management and design specific, interdisciplinary practical cases and are able to comprehend the overall context;
- analyse certain situations regarding the applicability of the methods of Risk Management.
- combine Risk Management with technical design and mathematical calculations

Content:

- Cost engineering, methods and tools
- Calculation within various technologies
- Cost Engineering as part of innovations and Project Management
- Classic Risk Management methods and case studies in specific technologies

- Alternative methods of Risk Management and mathematical application

Literature:

- VDI, 2011. *Wertanalyse - das Tool im Value Management*. 6. Auflage. Berlin [u.a.]: Springer. ISBN 978-3-540-79516-2, 978-3-540-79517-9
- VENKATARAMAN, Ray R. und Jeffrey K. PINTO, 2008. *Cost and value management in projects*. Hoboken, N.J.: John Wiley & Sons. ISBN 978-0-470-06913-4, 0-470-06913-9
- HECHT, Dirk, 2017. *Modernes Beschaffungsmanagement in Lehre und Praxis*. Berlin: Uni-Edition. ISBN 978-3-944072-88-3, 3-944072-88-X
- WOLKE, Thomas, 2008. *Risikomanagement*. 2. Auflage. München [u.a.]: Oldenbourg. ISBN 978-3-486-58714-2, 3-486-58714-5
- KEITSCH, Detlef, 2007. *Risikomanagement*. Stuttgart: Schaeffer-Poeschel. ISBN 978-3-7910-2713-5, 3-7910-2713-1
- HOPKIN, Paul, 2013. *Risk Management*. London; Philadelphia, PA: Kogan Page Ltd. ISBN 978-0-7494-6839-2, 0-7494-6839-4
- BABBAGE, Charles, 2010. *On the economy of machinery and manufactures*. Memphis, Tenn.: General Books. ISBN 978-0-217-26690-1

Additional remarks:

No remarks.

Engineering Processes in Automotive Industry

Module abbreviation:	EngineeProcAuto_M-APE	**SPO-No.:**	4
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only summer term

Responsible for module:	Meyer, Roland
Lecturers:	Meyer, Roland; Neumann, Alexander
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Engineering Processes in Automotive Industry (EngineeProcAuto_M-APE)
Lecture types:	SU/Ü - Lecture with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (EngineeProcAuto_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- know the strong networked and parallel processes in the product and process development of automobiles;
- can recognise, assess and include in the work interactions between production and product;
- know the significance and working methods of Simultaneous Engineering (SE) including the involvement of suppliers in product design and product and process quality to meet the requirements of production;
- can handle tools of project and process management and know the working methods and processes (e.g., for networking, decision-making, escalation, etc.) in large automotive and supplier companies;
- know the significance of prototype, pilot production and release processes and here applied tools;
- know about the significance of lean development methods and cost management.

Content:

- Product and process development in the automotive industry
- Automotive project- and process-management and according methods
- Requirements and quality management tools
- Pre-series process
- Cost management

- Lean development

Literature:

- STAMATIS, Diomidis H., 2001. *Advanced quality planning: a commonsense guide to AQP and APQP*. 1. Auflage. New York, NY: Productivity Press. ISBN 1-56327-258-X
- COOPER, Robert G., 2017. *Winning at new products: creating value through innovation*. New York, NY: Basic Books. ISBN 0-465-09332-9, 978-0-465-09332-8
- WOMACK, James P., Daniel T. JONES und Daniel ROOS, 2007. *The machine that changed the world: [how lean production revolutionized the global car wars]*. London [u.a.]: Simon & Schuster. ISBN 978-1-84737-055-6, 1-8473-7055-1
- WOMACK, James P. und Daniel T. JONES, 2003. *Lean thinking: banish waste and create wealth in your corporation*. London [u.a.]: Simon & Schuster. ISBN 978-0-7432-3164-0
- ROTHER, Mike und John SHOOK, 2009. *Learning to see: value-stream mapping to create value and eliminate muda*. Version 1. Auflage. Cambridge, Mass.: Lean Enterprise Inst. ISBN 978-0-9667843-0-5, 0-9667843-0-8
- MORGAN, James M. und Jeffrey K. LIKER, 2006. *The Toyota product development system: integrating people, process, and technology*. New York, NY: Productivity Press. ISBN 1-56327-282-2, 978-1-563-27282-0
- REINERTSEN, Donald G., 2009. *The principles of product development flow: second generation lean product development*. Redondo Beach, Calif: Celeritas. ISBN 978-1-935401-00-1, 1-935401-00-9
- CHANG, Kuang-Hua, 2013. *Product manufacturing and cost estimating using CAD/CAE*. Amsterdam [u.a.]: Elsevier. ISBN 978-0-12-401745-0
- MITAL, Anil, 2014. *Product development: a structured approach to consumer product development, design, and manufacture*. 2. Auflage. Amsterdam [u.a.]: Elsevier. ISBN 978-0-12-799945-6

Additional remarks:

Bonus system:

In the course, tasks can be set that lead to bonus points for the examination performance for each qualitatively completed task. The maximum crediting of bonus points takes place according to the APO.

Production System and Plant Design

Module abbreviation:	PSPD_M-APE	**SPO-No.:**	5
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Meyer, Roland
Lecturers:	Meyer, Roland
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Production System and Plant Design (PSPD_M-APE)
Lecture types:	SU/Ü - Seminar with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (PSPD_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Center).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

After this lecture subject, students are able to:

- understand and apply basics of production systems in the automotive industry
- asses and design processes, structures and elements of production systems
- understand, rate and apply variables and aims of design and control (added value, motivation, workload, ergonomics, etc.)
- handle necessary basics and implement methodical approaches (MTM, REFA)
- understand and use procedures and methods of manufacturing planning;
- determine and optimize flow production
- investigate workplaces and apply basics methods of ergonomics (e.g., workplace design)
- get around and understand modern leadership

Content:

- Basics of modern production systems
- Process orientation
- Shopfloor management
- Machine tools in production systems
- Technical capacity, MTM, REFA target time determination
- Design for manufacturing and assembly (DFMA)

- Manufacturing planning
- Industry 4.0 applications in production systems
- Lean Leadership
- Production training

Literature:

- BOKRANZ, Rainer und Kurt LANDAU, 2006. *Produktivitätsmanagement von Arbeitssystemen: MTM-Handbuch*. Stuttgart: Schäffer-Poeschel. ISBN 3-7910-2133-8, 978-3-7910-2133-1
- DINIS-CARVALHO, José, 2023. *Continuous Improvement in Organizations* [online]. Gistrup, Denmark: River Publishers PDF e-Book. ISBN 9788770227971, 8770227977. Verfügbar unter: https://ieeexplore.ieee.org/book/9903506.

Additional remarks:

Bonus system:

In the course, tasks can be set that lead to bonus points for the examination performance for each qualitatively completed task. The maximum crediting of bonus points takes place according to the APO.

Production and Logistics Networks

Module abbreviation:	ProdLogis_M-APE	**SPO-No.:**	6
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Jattke, Andreas
Lecturers:	Jattke, Andreas
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Production and Logistics Networks (ProdLogis_M-APE)
Lecture types:	SU/Ü - Lecture with integrated exercises
Examinations:	mdlP – oral examination 15-20 min. (ProdLogis_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Center).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- get to know the significance, elements, basic structure, design and execution of production and logistic networks in the automotive industry;
- can capture and assess interactions between production network, location factors, suppliers, logistics network, own/external skills, own manufacturing penetration, product design/technologies, production design/technologies etc.
- get to know possible production strategies, their effects on the production and logistics network including suppliers' environment and can systematically assess and develop different production strategies;
- can design skills strategies in conjunction with the production strategy and hence derive and establish skills development including supplier development;
- get to know procurement, intra/production and distribution logistics systems used in the automotive industry (e.g., JIT, milkrun, supermarket, kanban concept, single/multi-level, combined logistics systems etc.);
- can assess and fundamentally calculate the effects of different logistics concepts;
- can optimize supply chains (specific design, KPI, transport- and warehousing strategies, make or buy decisions, etc.).

Content:

- Production networks and skills strategies

- Logistics systems and networks
- Logistics concepts in manufacture (intralogistics)
- Supply Chain management design methodologies
- Supply Chain KPIs
- SCM Simulation - case study
- Supply chain management in line with industry 4.0 (digitalisation)

Literature:

- ERRASTI, Ander, 2013. *Global production networks: operations design and management*. 2. Auflage. Boca Raton, FL: CRC Press. ISBN 978-1-4665-6294-3, 1-4665-6294-3
- ZHENG, Li und Frank POSSEL-DÖLKEN, 2002. *Strategic production networks: with 17 tables*. Berlin [u.a.]: Springer. ISBN 3-540-43162-4, 978-3-642-07734-0
- ABELE, Eberhard, Ulrich NÄHER und Gernot STRUBE, 2007. *Global production: a handbook for strategy and implementation*. 1. Auflage. Berlin: Springer Berlin. ISBN 978-3-540-71652-5, 3-540-71652-1
- STADTLER, Hartmut, 2015. *Supply chain management and advanced planning: concepts, models, software, and case studies*. 5. Auflage. Berlin [u.a.]: Springer. ISBN 978-3-642-55308-0, 3-642-55308-7

Additional remarks:

No remarks.

Automation and Equipment Technologies

Module abbreviation:	A&ET_M-APE	**SPO-No.:**	7
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Großmann, Daniel	
Lecturers:	Feistle, Martin; Großmann, Daniel	
Credit points / SWS:	5 ECTS / 4 SWS	
Workload:	Contact hours:	47 h
	Self-study:	78 h
	Total workload:	125 h
Subjects of the module:	Automation and Equipment Technologies (A&ET_M-APE)	
Lecture types:	SU/Ü-Lecture with integrated exercises	
Examinations:	schrP90 – written exam, 90 Min. (A&ET_M-APE)	
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).	

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- get to know the fields of application of automation technologies in automotive production including suppliers. They can determine suitable application-oriented levels of automation (economic and technological);
- know the structure and individual components of automation systems and their interaction in automotive production (amongst others, steerings, software, clamping systems, robots, transport technology, systems, factory);
- can derive and assess interactions between automation technology and manufacturing technology/processes, product design, production design, productivity/availability etc.
- can interpret robot systems in particular (single robot, robotic cells and gardens) mathematically and with planning (possibly do it themselves and programme using exercises/practical exercises in the lab?);
- know the planning and development processes of automation systems and equipment in automotive production (e.g. robot offline programming, accessibility simulations, virtual commissioning, tooling methods planning, forming simulation etc.) and their involvement in product/production development processes;
- know the involvement, processes and technology of equipment manufacture for the development, construction and production of tools and systems;
- learn the methods for the construction, commissioning and quality optimisation of systems and tools in conjunction with the production start-up processes;

- get to know the tool machines used in automotive production and can assess these both technologically and economically (e.g., for procurement processes).

Content:

- Robotics, automation and control technology in automotive manufacturing
- Equipment manufacturing: system manufacturing, tool and mould making, tool machines

Literature:

- JOHN, Karl-Heinz und Michael TIEGELKAMP, 2010. *IEC 61131-3: programming industrial automation systems: concepts and programming languages, requirements for programming systems, decision-making aids*. 2. Auflage. Berlin: Springer. ISBN 978-3-642-43694-9, 3-642-43694-3
- LAMB, Frank, 2013. *Industrial automation: hands on*. New York, N.Y.: McGraw-Hill Education LLC.
- BARTELT, Terry, 2011. *Industrial automated systems: instrumentation and motion control*. Clifton, NY: Delmar Cengage Learning. ISBN 978-1-4354-8888-5, 1-4354-8888-1
- STEPHENS, Matthew P. und Fred E. MEYERS, 2013. *Manufacturing facilities design and material handling*. West Lafayette, Indiana: Purdue University Press. ISBN 978-1-61249-272-8
- THIEDE, Sebastian, 2012. *Energy efficiency in manufacturing systems*. Heidelberg: Springer. ISBN 978-3-642-25914-2, 978-3-642-25913-5
- HOFFMAN, Edward G., 2004. *Jig and fixture design*. 5. Auflage. New York: Thomson. ISBN 1-4018-1107-8
- GIBSON, Ian, David ROSEN und Brent STUCKER, 2015. *Additive manufacturing technologies: 3D printing, rapid prototyping, and direct digital manufacturing*. 2. Auflage. New York, NY [u.a.]: Springer. ISBN 978-1-4939-2112-6, 1-4939-2112-6
- 2011. *Cyber-Physical Systems: Driving force for innovation in mobility, health, energy and production*. Berlin, Heidelberg: Springer Berlin Heidelberg. ISBN 978-3-642-29090-9
- UHL, Axel, 2016. *Digital enterprise transformation: a business-driven approach to leveraging innovative IT*. London: Routledge, Taylor & Francis Group. ISBN 978-1-4724-4854-5
- BAUERNHANSL, Thomas, Michael TEN HOMPEL und Birgit VOGEL-HEUSER, 2014. *Industrie 4.0 in Produktion, Automatisierung und Logistik: Anwendung, Technologien, Migration*. Wiesbaden: Springer Vieweg. ISBN 978-3-658-04681-1, 3-658-04681-3

Additional remarks:

No remarks.

Digital Technologies in Engineering

Module abbreviation:	DigiTEng_M-APE	**SPO-No.:**	8
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Bednarz, Martin
Lecturers:	Basta, Georg; Landesberger, Martin; Lerher, Tone; Schönbach, Eva
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Digital Technologies in Engineering (DigiTEng_M-APE)
Lecture types:	SU/Ü-Lecture with integrated exercises
Examinations:	Seminar paper (8-15 pg.) with presentation (DigiTEng_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Center).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- can assess the considerable significance of PLM/PDM as a means of communication in the product development process;
- are familiar with the management of product and production data in the engineering process;
- know and understand models, concepts and methods of PLM/PDM;
- can handle exemplary, specific PLM/PDM systems;
- get to know and understand CAx strategies (amongst others, for CAD, CAQ, CAE, CAM, DMU etc.) and their interactions on corporate processes;
- know possibilities and systems of the “digital factory“ for production and factory design, planning and development, in particular for Simultaneous Engineering, and their involvement in the product development process;
- understand the theory behind different simulation methods such as discrete event simulation, continuous simulation, FEM simulation as well as the according modelling steps;
- can handle exemplary, specific systems of the digital factory (e.g., system layout, process/availability simulation, robot offline programming, system simulation, assembly and ergonomics simulation);
- know foundations (FEM methodology) and different systems of (physical) manufacturing process simulation (e.g., forming simulation, casting simulation, joining simulation, painting simulation etc.) and their fields of application as well as limits.

Content:

- Product Life Cycle Management (PLM)
- Product Data Management (PDM)
- CAx strategies
- Digital factory (planning) and manufacturing (process) simulation

Literature:

- HIRZ, Mario, 2013. *Integrated computer-aided design in automotive development: development processes, geometric fundamentals, methods of CAD, knowledge-based engineering data management*. Berlin [und 4 weitere]: Springer. ISBN 978-3-642-11939-2, 978-3-642-11940-8
- VAJNA, Sándor, 2009. *CAx für Ingenieure: eine praxisbezogene Einführung* [online]. Berlin: Springer Berlin PDF e-Book. ISBN 978-3-540-36038-4, 978-3-540-36039-1. Verfügbar unter: http://deposit.d-nb.de/cgi-bin/dokserv?id=2842151&prov=M&dok_var=1&dok_ext=htm.
- BRAESS, Hans-Hermann, SEIFFERT, Ulrich, 2003. *Vieweg Handbuch Kraftfahrzeugtechnik* [online]. Wiesbaden: Vieweg+Teubner Verlag PDF e-Book. ISBN 978-3-663-11757-5, 978-3-663-11758-2. Verfügbar unter: http://dx.doi.org/10.1007/978-3-663-11757-5.
- AHMED, Sayed und Wolf-Heinrich HUCHO, 2008. *Aerodynamik des Automobils: Strömungsmechanik, Wärmetechnik, Fahrdynamik, Komfort*. 5. Auflage. ISBN 978-3-528-03959-2
- SEIFFERT, Ulrich, 2008. *Virtuelle Produktentstehung für Fahrzeug und Antrieb im Kfz: Prozesse, Komponenten, Beispiele aus der Praxis* [online]. Wiesbaden: Vieweg + Teubner PDF e-Book. ISBN 978-3-8348-0345-0, 978-3-8348-9479-3. Verfügbar unter: http://dx.doi.org/10.1007/978-3-8348-9479-3.
- CANETTA, Luca, 2011. *Digital factory for human-oriented production systems: the integration of international research projects* [online]. London [u.a.]: Springer PDF e-Book. ISBN 978-1-84996-172-1, 978-1-84996-171-4. Verfügbar unter: http://dx.doi.org/10.1007/978-1-84996-172-1.
- WESTKÄMPER, Engelbert, 2013. *Digitale Produktion* [online]. Berlin: Springer PDF e-Book. ISBN 978-3-642-20259-9, 978-3-642-20258-2. Verfügbar unter: http://dx.doi.org/10.1007/978-3-642-20259-9.
- BRACHT, Uwe, GECKLER, Dieter, WENZEL, Sigrid, 2011. *Digitale Fabrik: Methoden und Praxisbeispiele* [online]. Berlin: Springer PDF e-Book. ISBN 978-3-540-89038-6, 978-3-540-88973-1. Verfügbar unter: http://dx.doi.org/10.1007/978-3-540-88973-1.

Additional remarks:

No remarks.

Group Project

Module abbreviation:	Project_M-APE	**SPO-No.:**	9
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Axmann, Bernhard
Lecturers:	Axmann, Bernhard; Hecht, Dirk; Ruppert, Max
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Group Project (Project_M-APE)
Lecture types:	S-Seminar
Examinations:	Project work with presentation (15 min.) and written paper (5 - 25 pages) (Project_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- can successfully work on and solve a complex, professional task in a team during the course of a semester;
- can independently learn the ropes of a new, demanding professional theme, unfamiliar to them, and work on this using academic methods and engineering and economic expert knowledge gained so far;
- can competently discuss and convincingly present the obtained project results and document these according to the technical and academic standards;
- can develop interdisciplinary connections and understand the interaction of different specialist disciplines in engineering;
- has distinctive methodological and social skills in areas such as teamwork, communication, leadership, creative techniques, project management and time management.

Content:

- Working on a project task in a team during a semester; the project tasks differ from semester to semester.
- The project is generally a complex task from the area of production systems and their development processes and is carried out in small teams with divided responsibilities, put together by the students themselves.

• In this type of work, knowledge acquired so far can be practically implemented by means of a practical task. • In addition, the ability of the students to organise, carry out, document and present a project is promoted. • Key qualifications in the area of teamwork, project management as well as social skills are consolidated.
Literature:
Will be specified at the beginning of the course.
Additional remarks:
No remarks.

Scientific Research Seminar

Module abbreviation:	SciResSem_M-APE	**SPO-No.:**	12
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Axmann, Bernhard
Lecturers:	Axmann, Bernhard
Credit points / SWS:	5 ECTS / 2.5 SWS
Workload:	Contact hours: 30 h Self-study: 95 h Total workload: 125 h
Subjects of the module:	Scientific Research Seminar (SciResSem_M-APE)
Lecture types:	S-Seminar
Examinations:	LN – Seminar paper (10-15 pages) without presentation (SciResSem_M-APE)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Center).

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- can successfully process a complex technical task within one semester;
- are able to work independently into a new, challenging theme;
- are able to document and present their project results;
- have strong methodological and social competency in areas such as communication, project management and time management.

Content:

Processing of a semester-accompanying scientific question differ from semester to semester. Several topics are offered, from which one can be selected. The task is a scientific question and is handled by the student on his own responsibility. At the end of the semester, the results are summarized in the form of a report (approx. 10-15 pages).

Literature:

Will be specified at the beginning of the course.

Additional remarks:

Seminar paper (10-15 pages)

Master's Thesis

Module abbreviation:	Ma_Thes_APE	**SPO-No.:**	13
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Compulsory module	3
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Axmann, Bernhard	
Lecturers:		
Credit points / SWS:	30 ECTS / 0 SWS	
Workload:	Contact hours:	0 h
	Self-study:	750 h
	Total workload:	750 h
Subjects of the module:	Master´s Thesis (Ma_Thes_APE)	
Lecture types:	MA	
Examinations:	Master graduation thesis (Ma_Thes_APE)	
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Centre).	

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

Acquisition and proof of the ability to work independently on complex problems from the field of Automotive Production Engineering to a high academic level using the expert knowledge gained as well as academic methods and knowledge within a specified period.

The master's students are furthermore able to classify results in a professional and interdisciplinary context and present them in the form of an academic piece of work.

Content:

- Analysis of the problem and definition of the theme
- Literature/patent research
- Formulation of the approach/methods
- Determination of a solution/approach
- Planning and development of the solution, analysis of results
- Classification of references to professional sources and other non- subject related references

Use of academic work methods and methodology, i.e., proceeding systematically, analytically and using correct methodology, forming arguments logically and concisely, as well working in a targeted manner and time critically and presenting results in a formally correct manner

Literature:
Will be specified at the beginning of the course.
Additional remarks:
For dual students: The master thesis is to be written in cooperation with the respective dual company. The details of the content and the scientific standard are ensured in cooperation between the company's supervisor and the first examiner at Ingolstadt University of Applied Sciences.

4.2 Individual Electives

Advanced Economics

Module abbreviation:	Adv_Econ_M-EGM	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	winter and summer term

Responsible for module:	Eisenberg, Andrea
Lecturers:	Eisenberg, Andrea
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Advanced Economics (Adv_Econ_M-EGM)
Lecture types:	SU/Ü-Seminar with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (Adv_Econ_M-EGM)
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students get to:

- understand the importance of global economic system and problems for strategic business decisions in globally active companies;
- be able to evaluate challenges resulting from globalization and growing international business transactions;.
- understand global economic problems, international economic relations and economic policy;
- understand how the international monetary system works;
- achieve an in-depth understanding of micro- and macroeconomic interrelationships.

Content:

- Advanced Microeconomic theory: supply and demand, economic actors
- Advanced Macroeconomics: inflation, unemployment, economic growth
- Institutional economics and international economic organizations
- International trade and globalization
- Interest rates, international monetary policy and currency systems

Literature:
• MANKIW, Nicholas Gregory und Mark P. TAYLOR, 2020. *Economics*. 5. Auflage. Andover, Hampshire: Cengage. ISBN 9781473768628 • MCDOWELL, Moore, 2012. *Principles of economics*. 3. Auflage. London [u.a.]: McGraw-Hill Higher Education. ISBN 978-0-07-712169-3, 0-07-712169-4 • TAYLOR, Timothy, 2022. *Principles of Economics. PDF* [online]. PDF e-Book.
Additional remarks:
No remarks.

Business Analytics & Artificial Intelligence

Module abbreviation:	BusAn_AI_M-EGM	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	winter and summer term

Responsible for module:	Bock, Jürgen
Lecturers:	Bock, Jürgen; Radtke, Max
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Business Analytics & Artificial Intelligence (BusAn_AI_M-EGM)
Lecture types:	SU/Ü-Lecture with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (BusAn_AI_M-EGM)
Usability for other study programs:	Please see the subject recognition list of SCS (Study Service Center)

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students are able to

- explain the various conflict of objectives of supervised learning;
- apply different models of supervised learning;
- assess the quality of different models of supervised learning;
- apply different clustering methods;
- practically implement various machine learning methods using common software libraries;
- distinguish between different areas of artificial intelligence and select suitable technologies for specific fields of application;
- explain the basic principles and special concepts of formal knowledge representation;
- transfer concrete domain knowledge into a formal knowledge model and provide added value through automatic reasoning.

Content:

- Linear regression
- Various classification algorithms
- Various clustering techniques
- Artificial Neural Networks

• Implementation of Machine Learning algorithms using suitable software tools and libraries • Definition of Artificial Intelligence and overview over subdisciplines • Formal knowledge representation and automatic reasoning
Literature:
• JAMES, Gareth und andere, 2021. *An introduction to statistical learning: with applications in R*. S. Auflage. New York, NY: Springer. ISBN 978-1-0716-1417-4, 1-0716-1417-7 • HASTIE, Trevor, Robert TIBSHIRANI und Jerome H. FRIEDMAN, 2017. *The elements of statistical learning: data mining, inference, and prediction*. Second edition, corrected at 12. Auflage. New York, NY: Springer. ISBN 978-0-387-84857-0, 0-387-84857-6
Additional remarks:
No remarks.

Cost Benchmarking and Data Driven Product Optimization

Module abbreviation:	WMod_CoBench_M-EGM	**SPO-No.:**	11
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Hecht, Dirk
Lecturers:	Hartmann, Matthias; Hecht, Dirk
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 79 h Total workload: 126 h
Subjects of the module:	Cost Benchmarking and Data Driven Product Optimization (WMod_CoBench_M-EGM)
Lecture types:	SU/Ü - seminaristischer Unterricht/Übung (WMod_CoBench_M-EGM)
Examinations:	LN – oral exam, 15 minutes
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- understand the principles of cost analysis and implement them using the example of a drive unit
- practice the physical structure of a cost structure, bill of materials and photo documentation in the laboratory
- become familiar with common scientific approaches to successful benchmarking
- can implement learned theories for product optimization and deepen them in practical exercises
- understand the approaches of AI for parametric cost evaluation

Content:

- Cost Analysis of ID 3 Drive Unit
- Work at Lab
- Develop Cost Structure of various technologies
- Benchmarking with other concepts
- Parametric Costing incl. AI
- Scenario analytic
- Software Costing

• Creative Thinking / Idea Generation – Tools & Methods (incl. AI)
Literature:
• GROOVER, Mikell P., 2021. *Fundamentals of modern manufacturing: materials, processes, and systems*. Singapore: Wiley. ISBN 978-1-119-70642-7 • JAMES, Gareth und andere, 2021. *An introduction to statistical learning: with applications in R*. S. Auflage. New York, NY, USA: Springer. ISBN 978-1-0716-1417-4, 978-1-0716-1420-4 • STADTLER, Hartmut, KILGER, Christoph, MEYR, Herbert, 2015. *Supply chain management and advanced planning: concepts, models, software, and case studies* [online]. Berlin, Heidelberg: Springer Berlin Heidelberg PDF e-Book. ISBN 978-3-642-55309-7. Verfügbar unter: https://doi.org/10.1007/978-3-642-55309-7
Additional remarks:
No remarks.

Design and modelling with CATIA

Module abbreviation:	WMod_DesModellCatia_M-APE	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	winter and summer term

Responsible for module:	Basta, Georg
Lecturers:	Basta, Georg
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Design and modelling with CATIA (WMod_DesModellCatia_M-APE)
Lecture types:	SU/Ü-Seminar with integrated exercises
Examinations:	LN – Project paper (WMod_DesModellCatia_M-APE)
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

Students are able to

- develop components in Part-Design and Generative Shape Design
- create single part drawings and assembly drawings
- organize themselves with several people in the design process

Content:

- Working on a constructive student research project in a team
- Learn working with CATIA and practice by modelling components
- Part design
- Assembly design
- Drawings from single parts and assemblies

Literature:

Will be specified at the beginning of the course.

Additional remarks:
No remarks.

Entrepreneurship Coaching

Module abbreviation:	MVM_EC	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	Deutsch/English	1 Semester / 1 semester	Winter- und Sommersemester / Winter and summer term

Responsible for module:	Bader, Martin
Lecturers:	Bader, Martin
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Kontaktstunden/Contact hours: 47 h Selbststudium/Self-study: 78 h Gesamtaufwand/Total workload: 125 h
Subjects of the module:	Entrepreneurship Coaching (MVM_EC)
Lecture types:	SU/Ü-Seminar with integrated exercises
Examinations:	Proj – Projektarbeit / Project work (MVM_EC)
Usability for other study programs:	Keine/None

Prerequisites according examination regulation:

Keine/None

Recommended prerequisites:

Keine/None

Objectives:

After successful participation in the module course, students are able to:

- develop and evaluate a business idea themselves and differentiate it into a consistent business plan.
- identify the success factors for certain types of business and derive appropriate measures for implementation.
- consistently prepare the implementation and initiate or introduce the business idea to the market by founding a company.
- prepare specifically for participation in start-up competitions and fulfil the challenges that arise there.

Content:

- Ideation
- Value Proposition Design
- Business Model Canvas
- Business Model Innovation
- Minimal Viable Product & Preto-/Prototyping
- Business Planning

Literature:

- AULET, Bill, Thomas DEMMIG und Marius URSACHE, 2013. *Disciplined entrepreneurship: 24 steps to a successful startup*. Hoboken, NJ: Wiley. ISBN 978-1-118-69228-8, 978-1-118-72088-2
- BAYSTARTUP GmbH, 2022. Handbuch Businessplan-Erstellung, Der Weg zum erfolgreichen Unternehmen. [online]. https://www.bay-startup.de/startups/handbuch-businessplan-erstellung: BayStartUP GmbH, 18.07.2022 [Accessed on: 18.07.2022]. Available via: https://www.bay-startup.de/fileadmin/Dokumente/Downloads/Handbuch_Businessplan_Erstellung.pdf
- KAWASAKI, Guy, 2015. *The art of the start 2.0: The time-tested, battle-hardened guide for anyone starting anything*. London: Portfolio Penguin. ISBN 978-0-241-18726-5, 978-1-59184-811-0
- RIES, Eric, 2017. *The lean startup: how today's entrepreneurs use continuous innovation to create radically successful businesses*. New York: Currency. ISBN 978-1-5247-6240-7
- FUEGLISTALLER, Urs, FUST, Alexander, MÜLLER, Christoph, MÜLLER, Susan, ZELLWEGER, Thomas, 2019. *Entrepreneurship: Modelle – Umsetzung – Perspektiven: Mit Fallbeispielen aus Deutschland, Österreich und der Schweiz* [online]. Wiesbaden: Springer Gabler PDF e-Book. ISBN 978-3-658-26800-8. Verfügbar unter: https://doi.org/10.1007/978-3-658-26800-8.
- GASSMANN, Oliver, Karolin FRANKENBERGER und Michaela CSIK, 2017. *Geschäftsmodelle entwickeln: 55 innovative Konzepte mit dem St. Galler Business Model Navigator*. 2. Auflage. München: Hanser. ISBN 978-3446451759
- GASSMANN, Oliver, Karolin FRANKENBERGER und Michaela CHOUDURY, 2020. *Business Model Navigator: The Strategies Behind the Most Successful Companies*. 2. Auflage. Harlow: Pearson. ISBN 978-1292327129
- OSTERWALDER, Alexander und Yves PIGNEUR, 2010. *Business Model Generation: Ein Handbuch für Visionäre, Spielveränderer und Herausforderer*. ISBN 978-3-593-39474-9
- OSTERWALDER, Alexander und Yves PIGNEUR, 2014. *Value Proposition Design: How to Create Products and Services Customers Want*. ISBN 978-1118968055

Additional remarks:

Coaching is carried out (where possible) in cooperation with a business partner as a business mentor. Through this co-operation, each team receives a business mentor in addition to support from the THI lecturer.

Project work
The aim is, among other things, to use the various media in the further development of business models and for the final presentation.

Future Business Modelling

Module abbreviation:	FuBuMo_M-GFT	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	winter and summer term

Responsible for module:	Wrobel, Stefanie
Lecturers:	Wrobel, Stefanie
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Future Business Modelling (FuBuMo_M-GFT)
Lecture types:	SU/Ü-Seminar with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (FuBuMo_M-GFT)
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students

- are familiar with entrepreneurship-related theories, models, and ideas, and can reflect on what entrepreneurship is and what it means to develop an entrepreneurial mindset and culture
- know and can discuss the relationship and meaning of technological, social and environmental trends and scenarios with regard to business model development and innovation as well as the meaning of sustainability in the context of business development and risk management
- are familiar with digital, sustainable, disruptive and forward-looking business models, can explain the special features of each and give examples of successful business models
- know concepts of organisational resilience and can explain and discuss resilience in the context of entrepreneurship, business success and business modelling
- know the entrepreneurship process, business modelling tools and key factors of successful business models
- are able to develop future oriented business models by using different tools and methods
- know the meaning of uncertainty for corporates and entrepreneurs and approaches and methods to deal with uncertainty in the business context
- know the requirements for risk management and the four phases of risk management
- can apply selected risk management tools and methods in the context of future oriented business modelling and develop an enterprise risk management system

- can evaluate business models qualitatively and quantitively

Content:

General introduction

- Business Development, sustainability and future orientation of corporates

Introduction into Entrepreneurship

- development of entrepreneurship as a research discipline
- types of entrepreneurships
- entrepreneurial mindset and culture
- entrepreneurship process
- business opportunities

Future oriented business modeling and business modeling tools

- types of different business models (social, sustainable, digital, disruptive business models, business model patterns)
- sources of business ideas, ideation, ideation tools
- business modelling, business model innovation
- business model evaluation
- business planning
- aspects of finance and accounting
- risk management

Business environment and business organization

- economic systems
- technical, social and environmental environment
- traditional and alternative business forms

Trends in Entrepreneurship

- dealing with global challenges, megatrends, VUCA and uncertainty (design thinking, lean startup approach, effectuation)
- data driven business models
- disciplined entrepreneurship

Literature:

- GEDEON, S., 2010. What is entrepreneurship? In: *Entrepreneurial Practice Review*. **1(3)**, S.16-35.
- GASSMANN, Oliver, Karolin FRANKENBERGER und Michaela CHOUDURY, 2020. *The business model navigator: the strategies behind the most successful companies*. Harlow, England: Pearson. ISBN 978-1-292-32712-9, 1-292-32712-X
- OSTERWALDER, Alexander und Yves PIGNEUR, 2010. *Business model generation: a handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley. ISBN 978-0-470-87641-1, 0-470-87641-7
- RIES, Eric, 2019. *The lean startup: how constant innovation creates radically successful businesses*. London [u.a.]: Penguin Business. ISBN 978-0-670-92160-7
- SARASVATHY, Sara, 2001. Causation and effectuation: Toward a theoretical shift from economic in-evitability to entrepreneurial contingency. http://entrepreneurscommunicate.pbworks.com/f/2001_Sarasvathy_Causation+adn+effectuation.pdf. In: *Academy of Management Review*. **26**(2), S.243-263.
- HAHN, Rüdiger, 2022. *Sustainability management: global perspectives on concepts, instruments, and stakeholders*. Fellbach: Rüdiger Hahn. ISBN 978-3-9823211-0-3, 3-9823211-0-7
- DUCHNEK, Stephanie, 2020. Organizational resilience: a capability-based conceptualization. In: *Business Research*. (13), S.215-246.
- AULET, Bill, 2013. *Disciplined entrepreneurship: 24 steps to a successful startup*. Hoboken, NJ: Wiley. ISBN 978-1-118-69228-8, 978-1-118-72088-2

- HUNZIKER, Stefan, 2021. *Enterprise Risk Management: Modern Approaches to Balancing Risk and Reward* [online]. Wiesbaden: Springer Gabler PDF e-Book. ISBN 978-3-658-33523-6. Verfügbar unter: https://doi.org/10.1007/978-3-658-33523-6.
- OSTERWALDER, Alexander und andere, 2014. *Value proposition design: how to create products and services customers want*. Hoboken, NJ: Wiley. ISBN 978-1-118-96805-5, 1-118-96805-0
- SCHIRMER, J., R. EBER und I. BOURDON, 2021. 32 ways to innovate business models through data: Emerging data-driven solution business model patterns from a study of 471 late-stage data-driven startups. (https://scholarspace.manoa.hawaii.edu/handle/10125/71226). In: *Proceedings of the 54th Hawaii International Conference on System Sciences*, S. 4996-5005.
- UEBERNICKEL, Falk und andere, 2020. *Design thinking: the handbook*. Singapore: World Scientific. ISBN 978-981-120-214-8, 978-981-12-0350-3
- VANINI, Ute, RIEG, Robert, 2021. *Risikomanagement: Grundlagen - Instrumente - Unternehmenspraxis* [online]. Stuttgart: Schäffer-Poeschel Verlag PDF e-Book. ISBN 978-3-7910-4527-6, 978-3-7910-4526-9. Verfügbar unter: https://doi.org/10.34156/9783791045269.
- BULIGA, Oana, SCHEINER, Christian W., VOIGT, Kai-Ingo, 2016. Business model innovation and organizational resilience: towards an integrated conceptual framework. In: *J Bus Econ (2016) 86:* (86), S.647–670.
- SOLTANIFAR, Mariusz, HUGHES, Matthew, GÖCKE, Lutz, 2021. *Digital entrepreneurship: impact on business and society* [online]. Cham, Switzerland: Springer PDF e-Book. ISBN 978-3-030-53914-6. Verfügbar unter: https://doi.org/10.1007/978-3-030-53914-6.
- ZUCCHELLA, Antonella, URBAN, Sabine, 2019. *Circular Entrepreneurship: Creating Responsible Enterprise* [online]. Cham: Palgrave Macmillan PDF e-Book. ISBN 978-3-030-18999-0. Verfügbar unter: https://doi.org/10.1007/978-3-030-18999-0.

Additional remarks:

Additional literature and self-study resources will be announced and provided throughout the course.

Integrated Safety and Assistance Systems

Module abbreviation:	IAE_ISAS	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	winter and summer term

Responsible for module:	Botsch, Michael
Lecturers:	Botsch, Michael; Dirndorfer, Tobias
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Integrated Safety and Assistance Systems (IAE_ISAS)
Lecture types:	SU/Ü-Seminar with integrated exercises
Examinations:	schrP90 – written exam, 90 minutes (IAE_ISAS)
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

After successfully completing the module the students are able

- to explain basic vehicle components that are required for driver assistance systems and for vehicle integrated safety functions
- to analyze and evaluate state of the art driver assistance systems
- to describe testing procedures that are used for vehicle active safety functions
- to explain mathematically the concepts for motion planning that are used in algorithms for driver assistance systems and integrated safety functions
- to implement basic trajectory planning algorithms in Matlab.

Content:

- Introduction to IS & DAS
- Examples of Driver Assistance and Integrated Vehicle Safety Systems: Parking Systems, Adaptive Cruise Control, Autonomous Emergency Braking
- Position and Orientation: Pose, Representing Pose in 2-D and in 3-D
- Time and Motion: Generation of Trajectories, Rate of Change and Inverse Problem
- Vehicle Motion Models: Decoupled X- and Y-Dynamics, Constant Velocity Model, Constant Steering Angle and Velocity Model, Constant Turn Rate and Acceleration Model, One-Track Model, Two-Track Model

• Navigation and Localization
Literature:
• KELLY, Alonzo, 2013. *Mobile robotics: mathematics, models, and methods*. 1. Auflage. New York, NY: Cambrige Univ. Press. ISBN 978-1-107-03115-9 • HEIßING, Bernd, 2016. *Chassis Handbook: Fundamentals, Driving Dynamics, Components, Mechatronics, Perspectives* [online]. Wiesbaden: Vieweg+Teubner PDF e-Book. ISBN ISBN-10: 3663205193; ISBN-13: 978-3663205197. • WINNER, Hermann, HAKULI, Stephan, LOTZ, Felix, SINGER, Christina, 2019-. *Handbook of Driver Assistance Systems: Basic Information, Components and Systems for Active Safety and Comfort* [online]. Cham: Springer International Publishing PDF e-Book. ISBN 978-3-319-09840-1. Verfügbar unter: https://doi.org/10.1007/978-3-319-09840-1. • BOTSCH, Michael, UTSCHICK, Wolfgang, 2020. *Fahrzeugsicherheit und automatisiertes Fahren: Methoden der Signalverarbeitung und des maschinellen Lernens* [online]. PDF e-Book. ISBN 978-3-446-46804-7.
Additional remarks:
No remarks.

Internationales Projekt

Module abbreviation:	InternProj_M-WI	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	2
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	Deutsch/English	1 Semester / 1 semester	Winter- und Sommersemester / Winter and summer term

Responsible for module:	Hecht, Dirk
Lecturers:	Hecht, Dirk; Schwandner, Gerd
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Kontaktstunden/Contact hours: 47 h Selbststudium/Self-study: 78 h Gesamtaufwand/Total workload: 125 h
Subjects of the module:	Internationales Projekt (InternProj_M-WI)
Lecture types:	SU/Ü-Seminaristischer Unterricht/Übung Lecture with integrated exercises
Examinations:	Project work with oral presentation (15 minutes) and written paper (5 - 25 pages) (InternProj_M-WI)
Usability for other study programs:	Keine/Noe

Prerequisites according examination regulation:

Keine/None

Recommended prerequisites:

Keine/None

Objectives:

Die Studierenden können selbstständig ein abgegrenztes Thema aus dem internationalen Kontext nach wissenschaftlichen Anforderungen bearbeiten und Lösungsvorschläge präsentieren.

Content:

Die Inhalte werden jeweils an das entsprechende Land adaptiert und mit aktuellen Aspekten der Internationalität bzw. Globalisierung abgerundet.

Literature:

Wird zu Beginn bekannt gegeben.

Additional remarks:

Keine Anmerkungen. / No remarks.

Software Engineering

Module abbreviation:	WMod_SWEng_M	**SPO-No.:**	10
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	1
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	Deutsch/Englisch	1 Semester / 1 semester	nur Wintersemester / only winter term

Responsible for module:	Bock, Jürgen
Lecturers:	Bock, Jürgen; Radtke, Max
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Kontaktstunden/Contact hours: 47 h Selbststudium/Self-study: 78 h Gesamtaufwand/Total workload: 125 h
Subjects of the module:	Software Engineering (WMod_SWEng_M)
Lecture types:	SU/Ü-Seminaristischer Unterricht/Übung Lecture with integrated exercises
Examinations:	LN - Seminararbeit mit Präsentation vor PC (WMod_SWEng_M) Seminar work with presentation on PC
Usability for other study programs:	Keine/None

Prerequisites according examination regulation:

Keine/None

Recommended prerequisites:

Keine/None

Objectives:

Nach Teilnahme an dem Modul sind die Studierenden in der Lage,

- die Grundlagen des Softwareengineerings zu erläutern
- Softwareanforderungen zu ermitteln und zu strukturieren
- Softwarekomponenten und Schnittstellen formal zu beschreiben
- einfache Softwarekomponenten anhand von Modellen in einer höheren Programmiersprache zu entwickeln, zu testen und zu dokumentieren
- Entwicklungswerkzeuge (Softwareengineering Tool-Chain) effektiv anzuwenden
- problemorientiert in Teams und über Teamgrenzen hinweg bei der Erstellung von Softwareanwendungen zusammenzuarbeiten

Content:

- Grundlagen des Softwareengineerings
- Systematisches Erfassen von Softwareanforderungen
- Modellierung von Anforderungen und Komponenten eines Softwareprodukts
- Spezifikation und Dokumentation von Komponentenschnittstellen

• Entwicklung von Softwaremodulen in Teams einschließlich Test und Dokumentation • Konsequente Anwendung von Softwareengineering-Tools (IDE, Sourcecode-, Build-, Artifact-Management)
Literature:
• RUPP, Chris und Stefan QUEINS, 2012. *UML 2 glasklar: Praxiswissen für die UML-Modellierung*. 4. Auflage. München: Hanser. ISBN 3-446-43057-1, 978-3-446-43057-0 • THOMAS, David und Andrew HUNT, 2020. *The pragmatic programmer: your journey to mastery*. 20. Auflage. Boston: Addison-Wesley. ISBN 978-0-13-595705-9, 0-13-595705-2 • GAMMA, Erich und andere, 2016. *Design patterns: elements of reusable object-oriented software*. Uttar Pradesh, India: Pearson. ISBN 978-93-325-5540-2
Additional remarks:
Seminararbeit/Seminar work

Advanced Theories and Methods of Sustainability Management in a Globalized Economy

Module abbreviation:	WMod_ATMSM_M-EGM	**SPO-No.:**	11
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Schneider, Yvonne
Lecturers:	Schneider, Yvonne
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 79 h Total workload: 126 h
Subjects of the module:	Advanced Theories and Methods of Sustainability Management in a Globalized Economy (WMod_ATMSM_M-EGM)
Lecture types:	SU/Ü – Lecture with integrated exercises (WMod_ATMSM_M-EGM)
Examinations:	LN – oral examination, 15 minutes
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

By actively participating in this course, students

- will get an understanding of sustainability management and its opportunities to achieve a competitive advantage in business;
- will analyze companies upon the basis of measurement tools and KPIs for actions in the field of sustainability;
- will be familiar with the theoretical basis of sustainability through applied examples and concepts.

Major theories, cases, examples, and calculation exercises are integrated through the course to reinforce and to clarify major topics.

Content:

This module provides a deeper understanding of theory, methods, and challenges of sustainability. Among others, the following aspects will be discussed:

- Advanced theories and methods of sustainability and in particular sustainability strategies for international companies.
- Influence of a globalized economy on sustainability and vice versa.
- Sustainability in business and the TBL influence on companies' organizations and strategies.

• Applied stakeholder management perspectives.
Literature:
• JONKER, Jan, FABER, Niels, 2021. *Organizing for sustainability: a guide to developing new business models* [online]. Cham, Switzerland: Palgrave Macmillan PDF E-Book. ISBN 978-3-030-78157-6. Verfügbar unter: https://doi.org/10.1007/978-3-030-78157-6. • HAHN, Rüdiger, 2022. *Sustainability management: global perspectives on concepts, instruments, and stakeholders*. Fellbach: Rüdiger Hahn. ISBN 978-3-9823211-0-3, 3-9823211-0-7 • RITZ, Aixa A., RIMANOCZY, Isabel, 2021. *Sustainability mindset and transformative leadership: a multidisciplinary perspective* [online]. Cham, Switzerland: Palgrave Macmillan PDF E-Book. ISBN 978-3-030-76069-4. Verfügbar unter: https://doi.org/10.1007/978-3-030-76069-4.
Additional remarks:
No remarks.

Optimization opportunities for vehicle fleets using telemetry data

Module abbreviation:	WMod_OptiVehicle_M-APE	**SPO-No.:**	11
Curriculum:	**Programme**	**Module type**	**Semester**
	Automotive Production Engineering (SPO WS 20/21)	Individual Elective	
Module attributes:	**Language of instruction**	**Duration of module**	**Frequency of offer**
	English	1 semester	only winter term

Responsible for module:	Großmann, Daniel
Lecturers:	Großmann, Daniel
Credit points / SWS:	5 ECTS / 4 SWS
Workload:	Contact hours: 47 h Self-study: 78 h Total workload: 125 h
Subjects of the module:	Optimization opportunities for vehicle fleets using telemetry data (WMod_OptiVehicle_M-APE)
Lecture types:	SU/Ü – Lecture with integrated exercises (WMod_OptiVehicle_M-APE)
Examinations:	LN – Project work
Usability for other study programs:	None

Prerequisites according examination regulation:

None

Recommended prerequisites:

None

Objectives:

The students:

- learn the technology foundation for telemetry data acquisition in mobility applications;
- analyse operational processes such as depot management, fleet management, charging management (electric buses) etc.;
- describe opportunities for operational optimization based on real time telemetry data for mixed bus fleets.

Content:

To be determined.

Literature:

Will be specified at the beginning of the course.

Additional remarks:

None