Ostfalia
Hochschule für angewandte Wissenschaften

# Module Handbook

(Modulhandbuch)

# Industrial Engineering in Automotive Technology (B.Eng.)

(Wirtschaftsingenieurwesen Automobiltechnologie)

Examination regulations 2019

(Prüfungsordnung 2019)

**Module:** **Fundamentals of Economics**

1. Submodule: Introduction to Business Administration
2. Submodule: Introduction to Economics

**Learning Objectives of the Module**

Students learn the fundamentals of economics. They will be able to clearly identify the factors influencing business and economic decisions and understand the formal and substantive objectives of economics. The module promotes thinking in terms of interrelationships, particularly in an economic context.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. J. Hurth | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Introduction to Business Administration

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. J. Hurth | |

**Course Content**

Classification of business administration within the academic disciplines; formal and substantive objectives of businesses and their measurability through key indicators; factors of production; legal forms of businesses; cooperation and mergers of businesses

**Competency objectives**

Students are familiar with the theoretical approaches and subject matter of general business administration. They are able to evaluate business situations using key performance indicators and understand decision-making processes of a constitutive nature.

**Intended teaching and learning methods/formats**

Lecture with exercise components

**References**

Hentze, J., Heinecke, A., Kammel, A.: General Business Administration, current edition. Jung, H.: General Business Administration, current edition.
Schierenbeck, H.: Introduction to Business Administration, current edition. Wöhe, G.: Introduction to General Business Administration, current edition.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. J. Hurth | German | |

## Submodule: Introduction to Economics

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 75 hours, of which<br>30 hours of contact instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. M. Broer | |

**Course Content**

The Introduction to Economics covers the theory of the firm as well as various market structures (oligopoly, monopoly). It also examines government interventions in the market process, including, for example, the internalization of externalities and minimum and maximum prices.

**Learning Objectives**

The course aims to impart systematic knowledge in the field of economics. Students will be able to identify and describe the fundamental decision-making rules of firms. They will also be able to calculate the profit-maximizing quantity for firms. Furthermore, students will be able to independently explain the characteristics associated with the market forms of oligopoly and monopoly. Students can list, discuss, and evaluate the differences in market outcomes associated with oligopoly and monopoly. The same applies to the evaluation of government intervention in economic activity (including in the form of minimum and maximum prices). Beyond this purely subject-specific focus, students' methodological competence (analytical skills and abstract thinking) is generally enhanced through the use of analytical models.

**Intended teaching and learning methods/formats**

Lecture with exercise components

**Literature**

Mankiw, N.G. / Taylor, M. P. (2018): Principles of Economics, 7th ed., Stuttgart

| Instructor | Language of instruction | Applicability in further studies/in other other degree programs |
|---|---|---|
| T. Volkmann, B.A. in Business Administration | German | |

## Module: Private Commercial Law

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. G. Theis | |

**Course Content**

Distinction between public and private law; public and private laws; civil law, commercial law, and corporate law;
Methodology of legal case analysis using case studies;
Contract law: Formation of contracts, nullity, voidability, rescission; General Terms and Conditions; Consumer protection law and e-commerce law; Representation in legal transactions; Powers of attorney under commercial law (prokura; power of attorney);
Legal rules regarding deadlines and dates; Statute of limitations for claims;
Economically relevant contractual relationships, in particular sale, lease, tenancy, service contracts, and contracts for work and materials;
Breaches of contract, liability for vicarious agents; Warranty law;
Non-contractual liability/tort; liability for vicarious agents;
Product liability law

**Learning Objectives**

Students understand (private) legal contexts and have the ability to address legal issues to answer questions and resolve simple legal cases through the application of the law.

**Intended teaching and learning methods/formats**

Lecture with exercises, application of the law/development of case solutions, discussion of cases from case law

**Literature**

-> current edition
Müssig, Peter: Private Economic Law, Legal Foundations of Economic Activity; Heidelberg Führich, Ernst: Private Economic Law, Civil Law, Commercial Law, Corporate Law, Munich Dietlein, Johannes/Endriss, Dorothee/Feuerborn, Andreas: Fundamentals of Law for Economists, Compact Presentation with Exercises and Solutions, Herne
Ann, Christoph/Hauck, Ronny/Obergfell, Eva Inés: Private Economic Law Compact, Munich
-> from the textbook series “Lernen im Dialog,” Munich, the following four books: Wörlen, Rainer/Metzler-Müller, Karin, BGB-AT,
Wörlen, Rainer/Metzler-Müller, Karin, Law of Obligations (General Part) Wörlen,
Rainer/Metzler-Müller, Karin, Law of Obligations (Special Part) Wörlen,
Rainer/Kokemoor, Axel/Lohrer, Stefan, Property Law
Rudkowski, Lena: Business Law, General Part of the BGB, Law of Obligations, Law of Property, Wiesbaden
Eisenmann, Hartmut/Quittnat, Joachim/Tavakoli, Anusch: Case Studies in Private Commercial Law, Heidelberg, etc.
Eisenmann, Hartmut/Gnauk, Herbert/Quittnat, Joachim: Legal Cases in Private Commercial Law, Heidelberg
Eisenberg, Claudius/Gildeggen, Rainer/Reuter, Andreas/Willburger, Andreas: Product Liability, A Compact Knowledge for Business Administrators, Engineers, and Lawyers, Munich

| Instructor | Language of instruction | Applicability in the further course of study/in other programs |
|---|---|---|
| NN | German | |

## Module: Mathematics for Industrial Engineers I

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

**Module coordinator**

G. Bender, M.S. in Statistics

**Requirements for participation**

**Course Content**

Set theory, equations (including systems of equations), inequalities, functions, differential calculus, integral calculus.

**Learning Objectives**

Students acquire fundamental knowledge of mathematical methods and theories. Students are familiar with the fundamentals of engineering mathematics. They are able to apply the essential tools of algebra and calculus, formulate questions in the context of specific decision-making situations, and develop problem-solving strategies. In this module, mathematics is treated as the foundational science of industrial engineering. The module aims to promote analytical skills, abstract thinking, and creativity in problem-solving, as well as to practice learning and work techniques.

**Intended teaching and learning methods/formats**

Interactive lecture with exercises

Use of computer-based exercises

**Literature**

Lecture notes

Westermann, T.: Mathematics for Engineers: An Application-Oriented Textbook, latest edition Koch, J. and Stämpfle, M.: Mathematics for Engineering Studies, latest edition

Papula, L.: Mathematics for Engineers and Natural Scientists, Volume 1, latest edition

| Instructor | Language of instruction | Applicability to further studies or to other other degree programs |
|---|---|---|
| Dipl.-Stat. G. Bender | German | In all economic and technical subjects that apply mathematical methods. |

**Module:** **Methodological Competence**

1. Submodule: Problem-Solving Skills
2. Submodule: Work and Presentation Techniques
3. Submodule: Scientific Methodology
4. Submodule: Academic Research

**Competency Objectives of the Module**

Students are to be equipped for academic work by writing an academic paper on a topic in general business administration under supervision. In addition, they are to learn and be able to apply work and presentation techniques and develop creative solution strategies when dealing with problems.
The three courses in the module teach rhetorical skills, contextual thinking, and creativity.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Dean of Studies | 7 CP / 210 h | Varies; see below for submodules |

## Submodule: Problem-Solving Skills

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 30 hours<br>12 hours of classroom instruction,<br>18 hours of self-study | 1 | Attendance required and homework |

| Co-instructor | Prerequisites for participation |
|---|---|
| Ms. Strauch, M.Sc. | |

**Course Content**

Orientation tutors from higher semesters cover everything not found in the course schedule during the study group (7 mandatory sessions, including one information session by the examination committee), including:

- Planning your studies
- University IT systems
- Examination procedures at the Faculty of Economics
- Code of Conduct at the Faculty of Economics
- Services available on the Wolfsburg campus
- Find out about support services for students

By working on a group assignment in small groups, students reflect on and develop their own perspectives on the following learning objectives:

- Rules for effective teamwork
- Learning in teams

**Competency Goals**

A study group is led by students for students. First-year students are supported as they begin their studies at the Faculty of Economics during their first semester. Students discover how to quickly find their way around the university independently and become familiar with the academic processes. Their teamwork skills are strengthened.

**Intended teaching and learning methods/formats**

Idea generation methods, literature research, self-reflection and reflection on others

**Literature**

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Ms. Strauch, M.Sc., various tutors | German | for group work (study groups, internships, professional settings)<br>Included in all bachelor's degree programs |

## Submodule: Work and Presentation Techniques

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 60 hours, of which 30 hours of class time, 30 hours of self-study | 2 | Attendance required, presentation |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dean of Studies | |

**Course Content**

Study techniques: Physiological foundations of learning, learning styles, analytical and creative learning techniques, reading phases, reading techniques; Fundamentals of time management (time awareness, time inventory, goal management, time planning methods, time wasters, time management techniques) Presentation techniques: Visualization (design rules, layout, simplicity, clarity, organization, media selection, work steps), communication (communication process, 4 elements of a message, basic rules of communication psychology), Fundamentals of rhetoric (presentation and speaking behavior, rhetorical tools, improving speaking technique) and body language (types of body language, applying body language)

**Learning Objectives**

Students are familiar with work and presentation techniques and can apply them purposefully both in their daily academic life and in professional practice. Students have mastered simple methods for organizing their work, efficient learning and reading techniques, as well as the basics of time management. They apply time management methods and creativity techniques in exemplary ways. They employ various rhetorical devices and have improved their fluency in speech and body language. Students recognize the importance of interpersonal aspects for a successful presentation and create a logically structured presentation that makes use of appropriate media.

**Intended teaching and learning methods/formats**

Seminar with interactive components

**Literature**

Hoffmann, Eberhard/ Löhle, Monika: Successful Learning: Effective Learning and Study Strategies for School, College, and Work, current edition

Metzig, Werner/ Schuster, Martin: Learning to Learn, current edition

Schräder-Naef, Regula: Learning to Learn Efficiently. Advice and Exercises for All Who Are Eager to Learn, current edition
Schulz von Thun, Friedemann: Talking to One Another, Volumes 1–3, current edition Seiwert, Lothar J.: The
Basics of Time Management; current edition
Zelazny, Gene: How Numbers Become Pictures: Presenting Economic Data Convincingly, current edition

| Instructor | Language of Instruction | Applicability in the further course of study/in oth other degree programs |
|---|---|---|
| Various instructors | German | in all degree programs or modules |

## Submodule: Research Methods

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester/once a year | Required | 60 hours, of which<br>24 hours of classroom instruction,<br>36 hours of self-study | 2 | Academic credit pursuant to § 7 (10) (12) BPO |

**Module coordinator**

Prof. Dr. A. Heinecke

**Prerequisites for participation**

**Course Content**

The course covers the fundamentals of the philosophy of science, specifically the scientific approach within critical rationalism and, consequently, the justifications for an eclectic or empirical methodology.

**Learning Objectives**

The course aims to impart systematic knowledge of the philosophy of science and enables students to identify scientific texts and assess the scientific validity of texts and empirical studies (methodological and subject-specific competence).

**Intended teaching and learning methods/formats**

Lectures with integrated exercise components

**Bibliography**

Karl R. Popper: The Logic of Scientific Discovery, 4th ed., (2013)
Karl R. Popper/John C. Eccles: The Self and Its Brain, (2000)

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. B. Breig | German | Preparation for academic work, particularly for the bachelor's thesis. Required in all degree programs. |

## Submodule: Academic Writing

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester/per semester | Required | 60 hours, of which<br>24 hours of classroom instruction,<br>36 hours of self-study | 2 | Term paper |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dean of Studies | Certificate of completion for the submodule "Work and Presentation Techniques" |

**Course Content**

Introduction Planning/Preparation/Research Selection of Materials/Outline Manuscript/Final Draft/Formal Requirements

Common mistakes in academic papers

**Learning Objectives**

Students are familiar with the fundamentals of academic work. They are able to conduct adequate literature reviews and cite sources accurately, and they recognize the importance of a well-structured paper. Building on the theoretical foundations they have acquired, students can independently produce their first academic papers on topics in general business administration while working in small groups.

**Intended teaching and learning methods/formats**

Lecture, discussions, feedback session (term paper)

**Bibliography**

Theisen, M.: Wissenschaftliches Arbeiten, current edition, Munich.
Bänsch, A.: Academic Writing, Seminar and Thesis Papers, current edition, Munich, et al. Stickel-Wolf, Ch.; Wolf, J.: Academic Writing and Study Skills, current edition, Wiesbaden. Chmielewicz, K.: Research Concepts in Economics, current edition, Stuttgart.

| Instructor | Language of Instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Various instructors | German | Preparation for academic work, particularly for the bachelor's thesis.<br>Required in all degree programs. |

**Module:** **English**

1. Submodule: Business English
2. Submodule: Technical English

**Learning Objectives of the Module**

In addition to acquiring subject-specific and general language skills, students gain a foundation in intercultural competence. The materials used in the course enable a situation-based exploration of subject-relevant topics: business organizations, marketing, finance, basics of science (mathematics, physics), materials science, and automotive engineering. The linguistic skills practiced include topics such as commercial correspondence, presentation techniques, process descriptions, and socializing.

| Module Coordinator | Credit / Workload | Exam Format |
|---|---|---|
| J. McPartland | 5 CP / 150 h | Written exam 120 min. |

## Submodule: Business English

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 60 hours, of which<br>24 contact hours<br>36 hours of self-study | 2 | Exam 60 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| J. McPartland | High school English at the university admission level (CEFR B1+/B2) |

**Course Content**

Terminology and linguistic tools from the fields of business administration, corporate structures, marketing, finance, and international trade. Practical exercises on topics such as graph description, applications, and commercial correspondence. Current topics with a professional focus (economic policy decisions, annual reports, etc.) may be incorporated into the course.

**Learning Objectives**

Students will master the linguistic tools necessary for comprehending and actively engaging with the course content.
They are able to express themselves on topics related to specialized studies, corporate structures, marketing, and advertising, as well as other essential elements of their field of study or future professional field, at a language level appropriate for a professional setting. They can incorporate graphical representations (e.g., diagrams, graphs) into presentations and have gained familiarity with various types of correspondence.
Students have the ability to work on content individually and in groups and to present it appropriately.
Students are able to address and present subject-specific issues independently and with critical judgment.
Since English language skills are acquired for the purpose of technical communication and are developed and practiced through relevant content, the module is clearly interdisciplinary.
The following skills are developed:
Social skills, through the development of communication skills;
Methodological competence, by employing various learning and work techniques and striving for contextual thinking as one of the core objectives;
Individual competence, through a clear emphasis on motivation to perform and learn, as well as the promotion of linguistic creativity; and media competence, by placing great emphasis on the use of media, the selection of sources, and their analysis and evaluation in the technical language module.

**Intended teaching and learning methods/formats**

Interactive, seminar-style teaching with skill-based practice sessions
In addition, opportunities to participate in English conversation classes and supplementary courses on general English are offered whenever possible.

**Literature**

Core textbook: Ashford, Stephanie, Smith, Tom, Business Proficiency. Business English for Higher Education and the Workplace. Student's Book with interactive media DVD (Stuttgart: Klett-Verlag, 2017)
- Materials compiled or designed by the instructor

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Instructors of the | English | Self-study when working with English-speaking |

| | |
|---|---|
| Language Center | , familiarity with English-based terminology in the relevant subfields, and an easier transition to a potentially planned study abroad program or an international summer university. The course is offered with slightly varying emphases across several degree programs and is mutually recognized. |

## Submodule: Technical English

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | one semester/once a year | Required course | 90 hours, of which<br>30 contact hours<br>60 hours of self-study | 3 | Exam 60 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| J. McPartland | High school-level English at the university admission level (CEFR B1+/B2) and participation in Business English |

**Course Content**

Terminology and linguistic tools from the fields of manufacturing, energy (generation, alternative energies), quality, materials, internal combustion engines, fuel cells, and project management. Topics related to intercultural competence.

**Learning Objectives**

The competencies acquired in Business English are deepened and expanded based on the areas listed under “Course Content.” Students can handle technical terminology from the fields of Sciences, General Engineering, and Automotive Engineering, and apply it in contexts appropriate to the professional environment and at the corresponding level. They are able to describe technical processes correctly and clearly. In addition, they have engaged with concrete situations from everyday professional life in an intercultural context.
Students can identify and structure connections between the topics covered.
Technical language skills in English enable students to communicate effectively in their field. Skills are developed, reinforced, and deepened through real-world content. The methods used, such as text analysis and text production (written and oral), are transferable to other areas of study and are therefore interdisciplinary.

The following competencies are fostered:

Social competence through the development of communication skills; methodological competence through the use of various learning and work techniques, with systemic, networked thinking pursued as a core objective through the selection and interdependence of learning content; Individual competence through a clear call for a willingness to perform and learn, as well as the promotion of linguistic creativity and media literacy, with great importance placed on the use of a wide variety of teaching and learning media (including print, audio, video, and online learning), the selection of sources, and their analysis and evaluation in the technical language module.

**Intended teaching and learning methods/formats**

Interactive, seminar-style teaching with skill-based practice sessions

In addition, opportunities to participate in English conversation classes and supplementary courses on general English are offered whenever possible.

**Literature**

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Instructors at the Language Center | English | For self-study when working with English-language sources, familiarity with English-based terminology in the relevant subject areas, and an easier transition into a potential study abroad program or an international summer university.<br>This course is only offered in this academic |

**Module:** **Fundamentals of Natural Sciences**

1. Submodule: Physics
2. Submodule: Chemistry

**Learning Objectives of the Module**

Students acquire the necessary scientific foundations for industrial engineering. They understand the fundamental principles of physics, such as forces, energy, and momentum. Students are familiar with the description of oscillations using differential equations, understand basic concepts of wave theory such as frequency, phase velocity, and polarization, and apply these concepts in acoustics and optics. They can classify electromagnetic radiation and explain its generation. They are proficient in solving simple exercises in the areas listed above. Students have a solid foundation in chemistry with a focus on materials science issues. They can grasp the relationships between the composition and structure of a material and its chemical and physical properties.

| Module Coordinator | Credit / Workload | Exam Format |
|---|---|---|
| Prof. Dr. A. Schmiemann | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Physics

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Dr. M. Görling | None |

**Course Content**

Quantities and units;
Forces, moments, momentum, energy;
Conservation laws—Newton's axioms, kinematics of a moving point mass; oscillations, waves;
Optics, laws of lenses, refraction, spectra; Acoustics

**Learning Objectives**

Students can identify and apply fundamental physical principles.

**Intended teaching and learning methods/formats**

Interactive lecture with integrated exercise components

**Literature**

Lecture notes, latest edition
Lindner, H.: Physics for Engineers, Fachbuchverlag Leipzig, current edition.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Dr. M. Görling | German | Foundation for all technical courses; mutual recognition with other degree programs in the Department of Automotive Engineering |

## Submodule: Chemistry

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. A. Schmiemann | |

**Course Content**

Atomic structure, atomic models; properties of gases and liquids; periodic table of elements and chemical bonding; acid-base reactions; redox reactions; fundamentals of chemical thermodynamics; fundamentals of chemical reaction kinetics; metals, semiconductors, ceramic materials, complexes, and inorganic dyes.

**Learning Objectives**

Students are able to recognize and apply fundamental chemical principles.

**Planned teaching and learning methods/formats**

Lecture with integrated exercises

**References**

Kurzweil, P.: Chemistry: Fundamentals, Advanced Concepts, Applications, and Experiments, Springer, 2015 Plewinsky, Hennecke, Oppermann: Engineering Knowledge: Chemistry, Springer, 2014 Lecture notes, latest edition

| Instructor | Language of instruction | Applicability in further studies/in other other degree programs |
|---|---|---|
| Dr. M. Görling Dr. A. Otten | German | Foundation for all technical subjects; mutual recognition with other degree programs in the Department of Automotive Engineering |

**Module:** **Fundamentals of Automotive Engineering, Digital Infrastructures**

1. Submodule: Fundamentals of Automotive Engineering
2. Submodule: Digital Infrastructures

**Learning Objectives of the Module**

Students will be familiar with both the fundamental principles of automotive engineering and digital infrastructures. They will have the basic knowledge required to understand the necessary changes in automotive engineering resulting from the digital transformation in the automotive industry.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. T. Gänsicke | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Fundamentals of Vehicle Engineering

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. T. Gänsicke | None |

**Course Content**

- Definition and structure of vehicles
- Coordinate system and designations of key vehicle dimensions
- Driving resistance equations, driving performance, fuel consumption
- Functions of the vehicle's subsystems: powertrain, body, superstructure, chassis, and electrical systems
- Basic structure of the powertrain, body, superstructure, chassis, and electrical systems; their main functions and major assemblies
- Different types of drive systems and their advantages and disadvantages
- Consumption measurement, driving cycles, and energy-saving measures

**Learning Objectives**

Students have a basic understanding of automotive engineering and acquire the ability to explain the fundamental principles of driving physics and calculate the required drive power of a vehicle. They are familiar with the division of the vehicle into technical groups and the most important assemblies and components of each technical group. Students are able to assign vehicle functions to the technical groups and assemblies and distinguish between the primary and secondary functions of the vehicle.

**Intended teaching and learning methods/formats**

Lecture with peer review using clickers

**References**

Pischinger, S., Seiffert, U.: Vieweg Handbook of Automotive Engineering, Springer Verlag, 8th edition, 2016

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Ch. Kage, M.Eng. | German | Foundation for all technical subjects; mutual recognition with other degree programs in the Department of Automotive Engineering |

## Submodule: Digital Infrastructures

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 1 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | PA |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. S. Steiner | |

**Course Content**

Actors, communication protocols, services, platforms, data organization, and rights management in digital infrastructures using selected examples.
Introduction to distributed development using a configuration management system, illustrated by a markup language.

**Learning Objectives**

Students gain an in-depth understanding of the essential components of digital infrastructures and how they interact. In particular, students become familiar with a markup language and develop the ability to work systematically in a distributed team and manage versions using a configuration management system. In particular, teamwork skills, creativity, and attention to detail are enhanced.

**Intended Teaching and Learning Methods/Forms**

Programming exercises with accompanying lecture

**References**

Course-specific handouts, tutorials, and websites

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. S. Steiner | German | Foundation for all technical subjects |

**Module:** **Corporate Finance**

1. Submodule: Accounting and Financial Statements
2. Submodule: Financing and Investment

**Learning Objectives of the Module**

Students are familiar with the typical objectives, tasks, and tools in the fields of accounting, financial statements, financing, and investing. They are able to critically discuss key theoretical aspects. In given situations, they can independently select the appropriate tools and apply them effectively.

| Module Coordinator | Credit / Workload | Exam Format |
|---|---|---|
| Dipl.-Kfm. T. Volkmann | 5 CP / 150 h | Written exam, 90 min. |

**Submodule:** **Accounting and Financial Statements**

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester/once a year | Required | 75 hours, of which<br>30 hours of in-person instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Dipl.-Kff. C. Kunst | None |

**Course Content**

Fundamentals of bookkeeping and financial reporting, double-entry bookkeeping system, recording of business transactions, closing entries, valuation of selected balance sheet items of fixed and current assets according to the German Commercial Code (HGB) and the German Income Tax Act (EStG).

**Learning Objectives**

Students are familiar with the financial accounting system and the fundamentals of financial reporting, can independently record individual business transactions, and can solve and evaluate tasks and issues related to external accounting.

**Intended Teaching and Learning Methods/Forms**

Interactive lecture with integrated exercises; a tutorial is also offered

**Literature**

Bornhofen/Busch: Accounting 1, current edition Bornhofen/Busch: Accounting 2, current edition

Meyer, C.: Accounting under Commercial and Tax Law, current edition (HBG and EStG)

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Claudia Kunst, B.A. in Business Administration | German | Controlling |

## Submodule: Finance and Investment

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dipl.-Kfm. T. Volkmann | |

**Course Content**

Safe investing, equity and debt financing, leverage effect, financial analysis from the perspectives of annual financial statements and cash flow, simultaneous investment and financing planning, dealing with taxes and uncertainty

**Learning Objectives**

Students can quantitatively evaluate investment decisions by calculating and interpreting appropriate dynamic investment theory metrics, as well as applying and evaluating static calculation methods. They understand the impact of taxes and uncertainty.
Students are familiar with the basic hedging, interest, and repayment options for loans, can derive specific payment schedules themselves, and compare alternatives.
They understand the difference and significance between simultaneous and separate investment and financing planning.
Students can discuss and evaluate which legal form is advantageous or disadvantageous for a shareholder when founding a company.
They are able to explain typical items in a cash flow statement.

**Intended teaching and learning methods/formats**

Interactive lecture with integrated exercises

**Literature**

Däumler, Klaus-Dieter/ Grabe, Jürgen: Fundamentals of Investment and Profitability Analysis, 13th ed., Herne 2014.
Gräfer, Horst/ Schiller, Bettina/ Rösner, Sabrina: Financing: Fundamentals, Institutions, Instruments, and Capital Market Theory, 8th ed., Berlin 2014.
Kruschwitz, Lutz: Investment Analysis, 14th ed., Munich 2014.
Perridon, Louis/ Steiner, Manfred/ Rathgeber, Andreas W.: Corporate Finance, 17th ed., Munich 2017.

| Instructor | Language of Instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Thomas Volkmann, B.B.A. | German | Controlling |

## Module: Mathematics for Industrial Engineers II

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dipl.-Stat. G. Bender | |

**Course Content**

Functions of several variables, linear algebra, complex numbers, ordinary differential equations

**Learning Objectives**

Students acquire fundamental knowledge of mathematical methods and theories. Students are familiar with the basics of engineering mathematics. They are able to apply the essential tools of algebra and calculus, formulate questions in specific decision-making situations, and develop problem-solving strategies. In this module, mathematics is treated as a foundational science of industrial engineering. The module is designed to promote analytical skills, abstract thinking, and creativity in problem-solving, as well as to practice learning and work techniques.

**Intended teaching and learning methods/formats**

Interactive lecture with exercises

Use of computer-based exercises

**Literature**

Lecture notes

Westermann, T.: Mathematics for Engineers: An Application-Oriented Textbook, latest edition Koch, J. and Stämpfle, M.: Mathematics for Engineering Studies, latest edition

Papula, L.: Mathematics for Engineers and Natural Scientists, Volume 2, latest edition

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Dipl.-Stat. G. Bender | German | In all economic and technical subjects that apply mathematical methods. |

## Module: Statistics for Industrial Engineers

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dipl.-Stat. G. Bender | |

**Course Content**

Descriptive statistics (basic concepts, measures of central tendency, analysis of multiple characteristics), probability theory (basic concepts, random experiments, random variables, probability theory, special distributions), inferential statistics (basic concepts, estimation theory, confidence intervals, tests).

**Learning Objectives**

Students acquire fundamental knowledge of relevant statistical methods and theories. Students are able to identify the appropriate method for simple practical problems, apply it, and interpret the results. They are able to statistically substantiate their own arguments and critically evaluate the arguments of others.

**Intended Teaching and Learning Methods/Forms**

Interactive lecture with exercises

Use of computer-based exercises

**Literature**

Lecture notes

Bourier, G.: Descriptive Statistics, latest edition

Bourier, G.: Probability Theory and Inferential Statistics, latest edition Bourier, G.: Statistics Exercises, latest edition

Arrenberg, J.: Economic Statistics for Undergraduates, latest edition

Papula, L.: Mathematics for Engineers and Natural Scientists, Volume 3, latest edition

| Instructor | Language of Instruction | Applicability in further studies/in other other degree programs |
|---|---|---|
| Dipl.-Stat. G. Bender | German | In all economics courses that use statistical methods, e.g., market research<br>Data analysis in the bachelor's thesis |

## Module: Introduction to Computer Science

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Project work |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. S. Steiner | None |

**Course Content**

Historical development of computer science; subfields; programming languages; specification, algorithms, programs; number systems and their representation; Boolean operators; variables and expressions, data and data structures; core elements of imperative programming languages; iterative and recursive functions and procedures; selected examples of sorting algorithms, finite-state machines, and graphs. Introduction to the selected development environment; lexical elements; data types; program execution; expressions and statements; input and output; files; plotting functions; graphical user interface

**Learning Objectives**

Students will be familiar with the fundamentals of programming in theory and practice using a programming language in a suitable IDE. Upon successful completion of the course, students will be able to implement simple problems—from specification to algorithm—into executable programs using the core elements of imperative languages within the development environment used in the lab session.

**Intended Teaching and Learning Methods/Forms**

Programming exercises with accompanying lectures

**Literature**

Gumm/Sommer: Introduction to Computer Science, Oldenbourg, current edition Stein, Introduction to Programming with MATLAB, current edition Course-specific handouts;

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. S. Steiner | German | Applicable to all technical subjects |

## Module: Mechanics

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 2 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. D. Schulze | None |

**Course Content**

Plane and spatial statics with equilibrium conditions for general force systems, center of gravity calculation, types of supports and intermediate supports, static determinacy, support reactions, trusses, static and sliding friction, internal forces in beams

**Learning Objectives**

Students will develop a fundamental understanding of forces and moments, enabling them to confidently apply their knowledge of statics. This includes, in particular, the determination of forces and moments at supports and intermediate supports, friction and adhesion, trusses, and the loads within long structural members.

**Intended Teaching and Learning Methods/Forms**

Lecture with a significant proportion of exercises and homework assignments to encourage self-study

**Literature**

Lecture notes
Assmann, B.: Technical Mechanics, Volume 1 (Statics). 2009 Hibbeler, R. C.: Technical Mechanics 1 – Statics. 2018

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. D. Schulze | German | In all subjects where the determination of loads is required, e.g., strength of materials, machine elements, design |

**Module:** **Operations Management**

1. Submodule: Procurement and Production
2. Submodule: Decision Theory / OR

**Learning Objectives of the Module**

Students will be familiar with the fundamentals of procurement and production and will be able to apply and evaluate key tools and methods in specific decision-making situations. To this end, they will acquire basic knowledge in the formalization and solution of decision-making problems and situations using mathematical models and apply these to simple practical problems.
In addition to the fundamental relationships in procurement and production, quantitative methods of operations research are taught in particular. Students are trained in analytical skills as well as abstract and networked thinking.

| Module Coordinator | Credit / Workload | Exam Format |
|---|---|---|
| Prof. Dr. K.-H. Lüke | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Procurement and Production

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 3 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. K.-H. Lüke | |

**Course Content**

Fundamentals and typology of industrial production, production and cost models with limitational and substitutional production conditions, production program planning, program-oriented demand planning.

**Learning Objectives**

Students are familiar with the fundamentals of procurement and production. They are able to describe real-world examples of industrial production based on characteristics or their specific manifestations. Students can apply and evaluate key tools and methods of materials planning and production scheduling in the context of specific decision-making situations.

**Intended teaching and learning methods/formats**

Lecture with exercise components

**References**

Blohm, H., Beer, T., Seidenberg, U., Silber, H.: Production Management, current edition. Corsten, H.: Production Management, current edition.
Domschke, W. et al.: Introduction to Operations Research, current edition. Dyckhoff, H., Spengler, T.: Production Management, current edition.
Günther, H.-O., Tempelmeier, H.: Production and Logistics: Supply Chain and Operations Management, current edition.
Steffen, R., Schimmelpfeng, K., Production and Cost Theory, current edition.

| Instructor | Language of Instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. K.-H. Lüke | German | Production Module<br>Procurement Module |

## Submodule: Decision Theory / OR

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 3 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dipl.-Stat. G. Bender | |

**Course Content**

Introduction to decision theory, linear optimization (introduction, graphical solution, primal and dual simplex algorithms, duality, special cases of linear optimization), integer and combinatorial optimization, dynamic optimization.

**Learning Objectives**

Students acquire fundamental knowledge in the formalization and solution of decision-making problems and situations using mathematical models and can apply this knowledge to simple practical problems.

**Intended Teaching and Learning Methods/Forms**

Lecture with exercises

**References**

Bamberg, G., Coenenberg, A.: Business Decision-Making, current edition. Domschke, W., Drexl, A.: Introduction to Operations Research, current edition.
Hillier, F., Liebermann, G.: Operations Research, current edition.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| G. Bender, M.A. in Statistics | German | Production Module<br>Procurement Module |

## Module: Controlling

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 3 | One semester / once a year | | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| H. Palabiyik, M.A. | |

**Course Content**

Fundamentals of Controlling, strategic and operational controlling and their tools, cost and performance accounting, fundamentals of cost accounting, cost element accounting, cost center accounting, cost object accounting, income statement, full-cost accounting, partial-cost accounting, contribution margin accounting

**Learning Objectives**

Students are familiar with the operational and strategic approaches of management accounting. They can assess the management accounting structure within a company and provide operational guidance as consultants. Students have mastered the essential operational tools of management accounting and can apply them appropriately to specific situations. In particular, cost and performance accounting is viewed as an information and control system within management accounting. Students are familiar with the concepts, tasks, methods, and systems of cost and performance accounting. They are able to apply the knowledge they have acquired to practical accounting problems. Students can evaluate issues in the field of cost and performance accounting and derive appropriate decisions from them. In addition to imparting knowledge, methodological competence is expanded. In particular, analytical skills and networked thinking—or thinking in terms of interrelationships—are fostered.

**Planned teaching and learning methods/formats**

Interactive lecture with integrated exercises

**Literature**

Däumler/Grabe; Cost Accounting 1, current edition
Heinhold, Michael; Cost and Income Accounting in Case Studies, current edition Hummel/Männel; Cost Accounting 1, current edition
Schmidt; Cost Accounting, current edition

| Instructor | Language of instruction | Applicability in further coursework/in other other degree programs |
|---|---|---|
| Dipl.-Ök.<br>H. Palabiyik, M.A. | German | |

## Module: Applied Mathematics

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 3 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Project work |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. Dr. K.-K. Kunze | Mathematics for Industrial Engineers |

**Course Content**

Analytical Geometry, Differential Equations, Systems of Differential Equations, Functions of Several Variables (partial derivatives, total differential, multiple integrals), Power and Fourier Series, Integral Transformations. Numerical integration, differentiation, solving ODEs. Applications in computer graphics (2D and 3D) and sound processing, introduction to a computer language.

**Learning Objectives**

Students are familiar with key applications of engineering mathematics. They are able to solve problems and use mathematical software in specific decision-making situations. They recognize the connection between theory and application in the context of complex applications.

**Intended Teaching and Learning Methods/Forms**

Interactive lecture with integrated exercise components; use of the JavaScript programming language. Development of a 3D game or browser-based simulation incorporating physical effects, development of components of a *physics engine*, selection and use of appropriate libraries with documentation of the functionality utilized.

**References**

Millington, I.: Game Physics Engine Development, current edition Millington, I. and Funge, J.: Artificial Intelligence for Games, current edition Strom, Ch.: 3D Game Programming for Kids, current edition Turner, W.: JavaScript for Sound Artists, current edition Kanber, B.: Machine Learning with JavaScript, current edition Dunn, F. and Parberry, I.: 3D Math Primer for Graphics and Game Development, current edition Ramtal, D. and Dobre, A.: Physics for JavaScript Games, Animation, and Simulations, current edition Papula, Lothar: Mathematics for Engineers and Natural Scientists, Volumes 1 & 2, current edition

| Instructor | Language of Instruction | Applicability to further studies or to other other degree programs |
|---|---|---|
| Prof. Dr. Dr. K.-K. Kunze | German | - all technical subjects |

## Module: Design Methodology

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 3 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr.-Ing. I. Johannsen | None |

**Course Content**

**Course *in Technical Drawing and Descriptive Geometry*:** a) Fundamentals of technical systems, functions, and causal relationships; b) Illustrative representation methods and fundamentals of technical drawing (formats, lines, standard notation, projection, sections, dimensions); c) Introduction to descriptive geometry and abstract representation methods of technical systems.

**Course: *Product Development***: a) Definition of the product development process (PDP) and methods in the development and design process, e.g., according to VDI 2222, requirements for design and development, and connections to related fields (e.g., production, logistics, service, environmental protection), analytical methods, creative methods, morphological methods; b) systems thinking based on structural, functional, and systemic relationships; modeling of technical systems; design and construction using methodological and creative approaches; c) consideration of corporate and personal work cultures; d) introduction to selection and evaluation methods, e.g., utility analysis, value analysis, target costing, and benchmarking.

**Competency Objectives**

Students are familiar with the essential processes and activities involved in design and development, particularly for the product development process (PDP). They understand intuitive, systematic, and discursive idea-generation methods as well as the systematic design method. Students can think in terms of systems, model systems, and break them down into meaningful assemblies and elements. In doing so, they take input and output variables, requirements, and functions into account to evaluate the designs. With knowledge of technical, organizational, and economic evaluation methods, students can represent simple components in a manner suitable for their function and manufacturing.

**Intended teaching and learning methods/formats**

Lecture with exercises

**References**

Hoischen, Hesser: Technical Drawing; current edition Viebahn: Technical Freehand Drawing; current edition Labisch/Wählisch: Technical Drawing; current edition Klein: Introduction to DIN Standards; current edition Pahl/Beitz: Design Theory, Springer Verlag; current edition
Naefe: Introduction to Methodical Design; current edition Lecture notes

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr.-Ing. U. Becker Prof. Dr.-Ing. T. Gänsicke | German | Foundation for all technical subjects, mutual recognition with other degree programs in the Department of Automotive Engineering |

## Module: Materials Science

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 3 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. J.-F. Lass | None |

**Course Content**

Fundamentals of metallic materials: materials testing, bonding, unit cells and crystal structures, plastic deformation, lattice defects, solidification, phase diagrams, iron-carbon diagram, heat treatment of steel, production and further processing, steel casting and cast iron, non-ferrous metals, corrosion

**Learning Objectives**

In the course Materials Science and Manufacturing Processes, students will be enabled to characterize metallic materials based on their properties and to select materials from various perspectives.
Students will be familiar with the most important testing methods for automotive materials and will be able to apply them. To this end, they will independently conduct, record, and evaluate laboratory experiments and discuss the results.

**Intended Teaching and Learning Methods/Forms**

Lecture, self-study units, laboratory

**Literature**

Lecture notes
Bargel, Hans-Jürgen: Materials Science, Springer Verlag, current edition

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. J.-F. Lass | German/English | |

**Module:** **Fluid Mechanics and Thermodynamics**

1. Submodule: Fluid Mechanics
2. Submodule: Thermodynamics

**Learning Objectives of the Module**

Students acquire fundamental knowledge of the behavior of fluids. This includes, on the one hand, mechanical behavior both at rest (hydrostatics) and in motion (fluid flow), and, on the other hand, thermal behavior, which is particularly pronounced in gases. Students understand the significance of energy and the conversion of energy, e.g., heat into work, which is of particular importance in thermal behavior.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. D. Schulze | 5 credits / 150 hours | Exam: 90 min. |

**Submodule:** **Fluid Mechanics**

| Semester | Duration / Frequency Type Frequency | Workload | Credits | Exam format |
|---|---|---|---|---|
| 3 | One semester/once a year | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. D. Schultze | Fundamentals of Mechanics, Physics |

**Course Content**

Properties of fluids, viscosity, hydrostatics, static buoyancy, incompressible flows, continuity equation, energy equation, momentum theorem, dimensionless parameters (e.g., Reynolds number), frictional flow through pipes, pipe components, flow around bodies, flow resistance

**Learning Objectives**

Students will recognize and understand the behavior of fluids at rest and in motion. This includes the ability to estimate systems using calculations based on reasonable simplifying assumptions (e.g., frictionless flow processes) as well as to understand and evaluate technical processes.

**Intended teaching and learning methods/formats**

Lecture with exercises and homework assignments to encourage self-study

**References**

Bohl, W.: Technical Fluid Mechanics, Vogel Buchverlag, 10th edition or later
Kümmel, W.: Technical Fluid Mechanics, G.B. Teubner Publishers, 1st edition and later

| Instructor | Language of instruction | Applicability in further studies/in other other degree programs |
|---|---|---|
| Prof. Dr. D. Schulze | German | Process Engineering, Plastics Engineering |

## Submodule: Thermodynamics

| Semester | Duration / Frequency Type Frequency | Workload | Credits | Exam format |
|---|---|---|---|---|
| 3 | One semester/once a year | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. D. Schulze | Chemistry, Physics |

**Course Content**

SI System, fundamental quantities for describing fluids (amount, temperature, pressure, volume), equations of state for gases, liquids, and solids, energy, internal energy, enthalpy, the first law of thermodynamics, heat capacity, calorimetric equations of state, melting and vaporization, reversibility and dissipation, changes of state (isobaric, isothermal, isochoric, reversible adiabatic)

**Learning Objectives**

Students will recognize and understand the fundamental mechanisms of thermodynamic processes. They will have the ability to estimate systems and to understand and evaluate technical processes using calculations based on reasonable simplifying assumptions (e.g., reversibility in thermodynamic processes).

**Intended teaching and learning methods/formats**

Lecture with exercises and homework assignments to encourage self-study

**References**

Cerbe, G.; Hoffmann, H.-J.: Introduction to Thermodynamics, Carl Hanser Verlag, 10th edition or later

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. D. Schulze | German | Process Engineering, Plastics Engineering |

**Module:** **Marketing**

1. Submodule: Sales/Marketing
2. Submodule: Market Research

**Learning Objectives of the Module**

Students are familiar with the basic concepts of marketing and market research, as well as the subject areas of strategic and operational marketing and market research. They are able to apply the knowledge they have acquired to questions arising in marketing practice and answer them independently. The aim of the course is to select and apply a wide variety of marketing and market research analytical methods to practical operational examples.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. I. Bormann | 5 CP/ 150 h | Exam (90 min.) |

## Submodule: Sales/Marketing

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. I. Bormann | |

**Course Content**

Definitions, marketing objectives, marketing strategies, marketing tools (product, pricing, distribution, and communication policies)

**Learning Objectives**

Students will be familiar with the fundamental concepts of marketing, as well as the subject areas of strategic and operational marketing. They will be able to apply the knowledge they have acquired to questions arising in marketing practice and answer them independently. The aim of the course is to select and apply a wide variety of marketing analysis methods to practical operational examples.

**Intended teaching and learning methods/formats**

Lecture with case studies and exercises

**Bibliography**

Bormann, Ingrid; Hurth, Joachim: Manufacturer and Retail Marketing, Kiehl, 2014

| Instructor | Language of instruction | Applicability in further studies/in other their degree programs |
|---|---|---|
| Prof. Dr. I. Bormann | German | |

## Submodule: Market Research

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. I. Bormann | |

**Course Content**

Fundamentals of market research, including statistical fundamentals, data collection methods (surveys, observation, panel surveys, and experiments), and data analysis methods

**Learning Objectives**

Students will be familiar with the basic concepts of market research. They will be able to independently develop a questionnaire, conduct data collection, and apply data analysis methods. The goal of the course is to enable students to independently conduct empirical studies.

**Intended Teaching and Learning Methods/Forms**

Lecture with case studies and exercises, introduction to the IBM SPSS statistical software

**Literature**

Bormann, Ingrid; Hurth, Joachim: Manufacturer and Retail Marketing, Kiehl, 2014

| Instructor | Language of instruction | Applicability in further coursework/in other other degree programs |
|---|---|---|
| Prof. Dr. I. Bormann | German | |

**Module:** **Production**

1. Submodule: Production Management
2. Submodule: Quality Management

**Learning Objectives of the Module**

Students are familiar with the relevant fundamentals, concepts, methods, and tools of industrial production and quality management.
Through the close interconnection of the tasks involved in industrial production and quality management, students understand the integrative relationship between these two subject areas. They are trained in analytical skills as well as abstract and networked thinking.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. K.-H. Lüke | 5 CP/ 150 h | Presentation and 60-minute exam |

## Submodule: Production Management

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Requirements for participation |
|---|---|
| Prof. Dr. K.-H. Lüke | |

**Course Content**

Production and cost models with indirect input-output relationships, scheduling and sequencing decisions in batch production and make-to-order production.

**Learning Objectives**

Students are familiar with selected production and cost models involving indirect production factor-product relationships. They can understand specific problems associated with Type A and Type B production functions and solve related problems. They are able to apply and evaluate selected tools and methods for program and sequence planning in batch production and make-to-order production.

**Intended Teaching and Learning Methods/Forms**

Lecture with exercise components

**References**

Blohm, H., Beer, T., Seidenberg, U., Silber, H.: Production Management, current edition. Corsten, H.: Production Management, current edition.

Domschke, W., Scholl, A., Voß, S.: Production Planning, current edition.
Günther, H.-O., Tempelmeier, H.: Production and Logistics: Supply Chain and Operations Management, current edition.
Dyckhoff, H., Spengler, T.: Production Management, current edition.
Steffen, R., Schimmelpfeng, K., Production and Cost Theory, current edition.

| Instructor | Language of Instruction | Applicability to further studies or to other other degree programs |
|---|---|---|
| Prof. Dr. K.-H. Lüke | German | |

## Submodule: Quality Management

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Presentation and exam 15 min. |

| Module Coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. J. Walther | |

**Course Content**

QM-system-relevant regulations across various industrial sectors, tools for systematic problem-solving and root cause analysis, 7 Tools, 7 new Tools, FMEA, process interaction analysis.

**Learning Objectives**

Students will learn and apply the fundamentals, concepts, methods, and instruments of industrial quality management. They will understand topics related to the development of integrated, process-oriented management systems, which are discussed across industries based on various regulations and requirements catalogs. Students will acquire methodological knowledge for structured root cause analysis and the development of sustainable corrective actions and will be able to apply this knowledge to specific problem situations.

**Intended Teaching and Learning Methods/Forms**

Lecture with practical exercises

**Literature**

Schmitt, R., Pfeifer, T.: Masing Handbook of Quality Management, current edition. EFQ, EFQM Model for Excellence.

ISO/TS 16949:2009.

Meyer, U. B., Creux, S. E., Weber, A. K.: Graphical Methods of Process Analysis, Munich, Vienna 2005. VDA Volume 4, FMEA.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. J. Walther / Dr. F.-U. Brückner | German | |

**Module:** **Project and Process Management**

1. Submodule: Project Management
2. Submodule: Process Management

**Learning Objectives of the Module**

Students learn the fundamentals of project and process management. They will be able to understand and classify project and process management methods and clearly identify decision-making factors.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. D. Royer | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Project Management

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. D. Royer | |

**Course Content**

Tasks and methods of project management, roles and responsibilities in projects, project structuring and milestone planning, quality and risk management. The course also addresses the agilization of project processes,

**Learning Objectives**

Students will become familiar with appropriate methods and approaches in project management, and will be able to describe and apply them. They will be able to plan tasks and roles in projects, as well as prepare and present project results.

**Intended teaching and learning methods/formats**

Lecture with practical exercises

**References**

Bea, F., Scheurer, S., Hesselmann, S.: Project Management, current edition. Dräther, R., Koschek, H., Sahling, C.: Scrum – Short & Sweet, current edition.

Olfert, K.: Project Management, current edition.

Reichert, T.: Project Management: Leading Projects to Success, current edition. Zirkler, B., Nobach, K., Hofmann, J., Behrens, S.: Project Controlling, current edition.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. D. Royer | German | |

## Submodule: Process Management

| Semester | Duration / Frequency frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. D. Royer | |

**Course Content**

Tasks and objectives of process management, analysis and modeling of processes, relationships between processes, IT, and project management.

**Learning Objectives**

Students learn the fundamentals of process management. They understand the tasks and objectives and are able to identify and evaluate basic processes within an organization. Students are familiar with appropriate methods and tools for process modeling and can apply and evaluate them.

**Intended teaching and learning methods/formats**

Lecture with practical exercises

**Literature**

Gadatsch, A.: Introduction to Business Process Management: Methods and Tools for IT Practice, current edition.
Scheer, A.-W.: ARIS – From Business Process to Application System, current edition. Schmelzer, H., Sesselmann, W.: Business Process Management in Practice, current edition.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. D. Royer | German | |

## Module: Manufacturing Engineering

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | one semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. J.-F. Lass | Materials Science with Lab |

**Course Content**

Theoretical foundations of manufacturing processes: forming, reshaping, joining, cutting, and modifying material properties, as well as gaining familiarity with various examples from the respective main groups.

**Learning Objectives**

Students develop an understanding of the various manufacturing processes and their complex interrelationships and dependencies. They are able to select suitable manufacturing processes from technical and economic perspectives.

**Intended Teaching and Learning Methods/Forms**

Lecture, self-study units

**Literature**

Lecture notes
Fritz, A. H.: Manufacturing Technology, Springer Verlag, current edition

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. J.-F. Lass | German | |

**Module:** **Electrical Engineering and Process Engineering**

1. Submodule: Electrical Engineering
2. Submodule: Process Engineering

**Learning Objectives of the Module**

Students are familiar with the essential fundamentals of electrical engineering and can apply them.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. P. Köhring | 5 CP / 150 h | Written exam, 90 min. |

## Submodule: Electrical Engineering

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. P. Köhring | |

**Course Content**

Fundamentals of DC technology: electric current field, electrostatic field, and the steady-state magnetic field

Terms: Resistance, Capacitance, Inductance, Power, Work
Methods: Ohm's law, linear sources, loop theorem, node theorem

**Learning Objectives**

Students can apply the fundamental laws of electrical engineering to technical problems.

**Intended teaching and learning methods/formats**

Interactive lecture with integrated exercise components

**References**

Lindner, H.: “Elektroaufgaben” Volume 1, Hanser Verlag, current edition

Führer, A.; Heidemann, K.; Nerreter, W.: “Grundgebiete der Elektrotechnik,” Volume 1, Hanser Verlag, current edition

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. P. Köhring | German | The skills acquired here can be applied in the Aftersales and Mobility module. |

## Submodule: Process Engineering

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dipl.-Chem. K. Bolze | |

**Course Content**

This course provides fundamental knowledge regarding the acquisition of measurement data, as well as regulation and control technology.
Measurement Technology:
Topics covered include the structure of the measurement chain, potential errors, and the digitization of measured values. Typical problems are explained using examples from process engineering (temperature, pressure, humidity, level, weight).

Control Technology:

The concepts of electrical, pneumatic, and hydraulic control systems are explained using typical tasks. The specific advantages and disadvantages of these technologies are discussed. Control Theory:
Based on descriptions of systems and controllers using transfer functions, typical control engineering tasks are discussed. Additional concepts (on-off controllers, sampling controllers, adaptive controllers, fuzzy controllers) are also briefly introduced using application examples.

**Learning Objectives**

Students are able to apply the fundamental laws of electrical engineering to technical problems.

**Planned teaching and learning methods/formats**

Interactive lecture with integrated exercises

**References**

Hildebrand, Walter, Introduction to Control Engineering: Fundamentals for Bachelor's Programs in All Engineering Disciplines and Industrial Engineering, Springer Verlag, current edition

Lecture notes

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Dipl.-Chem. K. Bolze | German | |

## Module: Plastics Engineering

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. A. Schmiemann | None |

**Course Content**

Materials Science of Polymers

- Structures of Thermoplasts, Thermosets, and Elastomers
- Chemical and thermal properties of polymers
- Mechanical properties of polymer materials
- Plastics analysis

Plastics processing

- Extrusion and related processes (film blowing, blow molding, profile extrusion)
- Injection molding (machine technology, tools, process and parameters, special processes)
- Joining of plastics (bonding, welding, riveting)
- Coating and finishing (printing, metallization, painting)
- Manufacturing of composite materials

Designing with plastics

- Dimensioning of plastic components
- Manufacturing considerations, fundamentals of injection mold design
- Material- and stress-appropriate design
- Structural reinforcements (ribs, beads)
- Lightweight construction with plastics, joining techniques
- Hybrid designs

**Competency objectives**

Students are familiar with the structure of thermoplastics, thermosets, and elastomers, as well as their chemical, thermal, and mechanical properties. They are also familiar with the most important manufacturing processes for thermoplastic and thermoset materials. They can select suitable plastics and manufacturing processes for given problems and evaluate design solutions. They are able to comprehensively analyze a component (material, manufacturing, design), evaluate it, and, if necessary, develop modifications. In the product development process, they are able to create and evaluate concepts for components and processes.

**Intended Teaching and Learning Methods/Forms**

Lecture with illustrative examples (components, demonstrators), instructional videos

**Literature**

Lecture notes,
Ehrenstein; “Designing with Plastics,” Erhard; “Designing with Plastics,” Kaiser, Wolfgang; “Plastics Chemistry for Engineers,” Hanser Verlag, 4th edition, 2015

| Instructor | Language of instruction | Applicability in further studies/in other other degree programs |
|---|---|---|
| Prof. Dr. A. Schmiemann Prof. Dr M. Ehleben<br>Dr. A. Otten<br>K. Bolze, B.S. in Chemistry | German | |

**Module:** **Procurement**

1. Submodule: Procurement Management
2. Submodule: Logistics Management

**Learning Objectives of the Module**

The objective of the module is to teach students the fundamentals of procurement and logistics management. They will understand the tasks, objectives, and organization of materials management, as well as the methods and tools of materials planning and purchasing. They will be familiar with selected strategic aspects of industrial procurement. The fundamentals of logistics management will be taught. Students will be familiar with current logistics requirements and potential solutions. They will be able to apply and evaluate specific tools and methods of logistics management in concrete decision-making situations.
Global sourcing, in particular, requires a high degree of consideration of logistical aspects in order to make sound business decisions. The module's content is designed to address these requirements. You will be trained in analytical skills as well as abstract and networked thinking.

| Module Coordinator | Credit / Course Load | Exam Format |
|---|---|---|
| Prof. Dr. K.-H. Lüke | 5 CP/ 150 h | Presentation and 60-minute exam |

## Submodule: Procurement Management

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Presentation and exam 30 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. K.-H. Lüke | |

**Course Content**

Fundamentals of procurement management (technical and economic tasks, objectives, organization), materials planning (material classification, material requirements planning, order calculation, order date calculation), materials purchasing (procurement marketing, purchasing processing), strategy formulation (procurement strategies, sourcing concepts and strategies).

**Learning Objectives**

Students learn the fundamentals of procurement management. They understand the tasks, objectives, and organization of materials management and can apply and evaluate the methods and tools of materials planning and materials purchasing. Students also gain knowledge of selected strategic aspects of industrial procurement.

**Intended Teaching and Learning Methods/Forms**

Lecture with practical exercises

**Literature**

Blohm, H., Beer, T., Seidenberg, U., Silber, H., Production Management, current issue.
Garica Sanz, F.J., Semmler, K., Walther, J. (Eds.), The Automotive Industry on the Path to Global Network Competence, current issue.
Jünemann, R., Material Flow and Logistics, current edition. Pfohl, H.-Ch., Logistics
Systems, current edition.
Schulte, C., Logistics, current edition.
Schulte, G., Materials and Logistics Management, current edition.

| Instructor | Language of instruction | Applicability in further coursework/in other other degree programs |
|---|---|---|
| Dr. Franz | German | |

## Submodule: Logistics Management

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester/once a year | Required | 75 hours, of which<br>30 hours of contact instruction<br>45 hours of self-study | 2.5 | Presentation and exam 30 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. K.-H. Lüke | |

**Course Content**

Fundamentals of logistics management (concept, tasks, objectives, systems, processes), Beer Game, graph theory, transport planning, round-trip planning, route planning.

**Learning Objectives**

Students learn the fundamentals of logistics management. They are familiar with current logistics requirements and potential solutions. Students are able to apply and evaluate specific tools and methods of logistics management in concrete decision-making situations. They are trained in analytical skills as well as abstract and networked thinking.

**Intended Teaching and Learning Methods/Forms**

Lecture with practical exercises

**References**

Domschke, W.: Logistics: Round Trips and Routes, current edition.
Domschke, W., Scholl, A.: Fundamentals of Business Administration, current edition. Domschke, W. et al.: Introduction to Operations Research, current edition.
Küpper, H.-U., Helber, S.: Process Organization in Production and Logistics, current edition.
Günther, H.-O., Tempelmeier, H.: Production and Logistics: Supply Chain and Operations Management, current edition.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. K.-H. Lüke | German | |

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## Module: Business Organization

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

**Module coordinator )**

Prof. Dr. H.-R. Hoffmann

**Prerequisites for participation**

**Course Content**

Macro- and Microprocess Planning, Industrial Engineering (IE) Management, Process Management, Management of Labor, Resources (BM), and Work Objects (AG), Factory Planning, Introduction to Fixed-Time Systems (FTE) e.g., MTM, methods of work organization (e.g., REFA work system, work data management (ADM), time studies), cost accounting, leadership, and law

**Competency Objectives**

Students are introduced to the technical and methodological aspects of work organization, process management, and the planning of personnel, resources, and work objects, extending to factory planning

**Intended teaching and learning methods/forms**

Lectures, self-study modules, and case studies

**Bibliography**

Heeg F.J.: Modern Work Organization, Munich: Hanser, current edition REFA: Methodology of Work Organization, Munich: Hansa, current edition

Binner H.: Integrated Organization and Process Management, Munich: Hansa, current edition

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. H.-R. Hoffmann | German | Preparation for WPF Work Organization with Laboratory (REFA GA 2.0), MTM-Basic, and REFA Engineer with Model Factory |

**Module:** **Vehicle Concepts and Design**

1. Submodule: Lightweight Vehicle Concepts
2. Submodule: Product Design

**Competency Objectives of the Module**

Students acquire the ability to design and evaluate vehicle concepts. They are familiar with the main assemblies of various vehicle concepts, their characteristics, and their arrangements. They can apply key performance indicators such as the lightweight construction index, specific power-to-weight ratio, and specific fuel consumption. Students understand the fundamental importance of sustainability and lightweight construction for product development. They can evaluate concepts and develop and evaluate their own concepts according to specifications.

| Module Coordinator | Credit / Workload | Exam Format |
|---|---|---|
| Prof. Dr. T. Gänsicke | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Lightweight Vehicle Concepts

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam Format |
|---|---|---|---|---|---|
| 5 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr.-Ing. T. Gänsicke | None |

**Course Content**

- Principles and methods of lightweight construction: Material, form, manufacturing, and environmental lightweight construction
- Lightweight construction materials: Criteria and application
- Structural optimization, thin-walled profiled members, sandwich elements, stiffeners
- Application examples

**Learning Objectives**

Students will be familiar with the various lightweight construction strategies and will be able to apply them to different problems. To achieve weight-optimized design and construction, students learn the various lightweight construction strategies in automotive engineering, taking into account available lightweight materials such as aluminum, magnesium, plastics, fiber-reinforced composites, etc. Students are familiar with the principles and methods of lightweight construction. They can develop a design proposal for simple problems with regard to technology, cost, and weight.

**Intended Teaching and Learning Methods/Forms**

Lecture with integrated exercises

**References**

Klein, B.: Lightweight Construction, Springer Verlag, 10th edition, Wiesbaden 2013 Wiedemann, J.: Lightweight Construction, Springer Verlag, 3rd edition, Berlin Heidelberg New York 2007
Friedrich, H. E. (ed.): Lightweight Construction in Automotive Engineering, Springer Verlag, 2nd edition, Wiesbaden 2017

| Instructor | Language of instruction | Applicability in further studies/in other other degree programs |
|---|---|---|
| Prof. Dr.-Ing. Gänsicke | German | |

## Submodule: Product Design

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. Johannsen | None |

**Course Content**

Definition, fundamentals, concepts (materials, design, production, service life, quality, recycling, disposal), examples of technical implementations and products.
Practical in-depth study of: presentation techniques, design development, CA styling, project planning, design skills

**Learning Objectives**

Students understand the relevance of design in product development. They can analyze contemporary problems and are able to formulate product ideas based on them. Through iterative design work, experimentation, reflection, and team discussion, they can develop the generated concept ideas into a concise, formally high-quality design.

**Intended Teaching and Learning Methods/Forms**

Lecture with integrated exercises

**Literature**

Lecture notes, latest edition

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. Johannsen | German | |

**Module:** **Quality Management in the Product Life Cycle**

1. Submodule: Product and Quality Monitoring
2. Submodule: Document Management and Security

**Learning Objectives of the Module**

Students will be able to evaluate and apply key quality management tools throughout the entire product life cycle.

| Module Coordinator | Credits / Workload | Exam format |
|---|---|---|
| Prof. Dr. K. Wundram | 5 CP/ 150 h | Written exam, 90 min. |

## Submodule: Product and Quality Monitoring

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. K. Wundram | None |

**Course Content**

Students are introduced to methods for monitoring products in global distribution, taking into account geographical and cultural aspects. Furthermore, fundamental relationships in product monitoring from a quality perspective in the market are taught, and the results of such analyses are demonstrated through practical examples. In addition, basic knowledge of product liability is provided.
Topics:

- Distribution of Product and Quality Monitoring
- Control options
- Customer input variables
- Impact on CoO/serviceability
- Types of defects (design, production, and instruction defects)
- Replacement parts: New parts and counterfeits
- Warranty for new and used cars
- Warranty and mobility guarantee; goodwill
- Product liability and recalls
- Burden of proof and reversal of the burden of proof

**Learning Objectives**

- Understanding and analyzing technical and interdisciplinary fundamentals and constraints
- Distinguishing between essential and non-essential information
- Recognizing cross-disciplinary connections
- Establishing mutual connections between theory and practice

**Intended teaching and learning methods/formats**

Lecture with integrated exercise components

**Bibliography**

Masing, W.: Handbook of Quality Management. 6th ed., Munich, Vienna: Carl Hanser Verlag, 2014 Linß, G.: Quality Management for Engineers. Munich: Hanser Verlag, 2018.
Richter, J.: The Warranty as a Marketing Tool in the Automotive Industry. Münster: Lit Verlag, 1997 Eisenberg, C.: Product Liability: A Concise Guide for Business Administrators, Engineers, and Lawyers. Munich: Oldenburg Verlag, 2014
Brückner, C. et al: Quality Management: The Practical Handbook for the Automotive Industry. Munich: Hanser, 2019

| Instructor | Language of instruction | Applicability in the further course of study/in other programs |
|---|---|---|
| Prof. Dr. K. Wundram | German | |

## Submodule: Document Management and Security

| Semester | Duration / Frequency frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 5 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. S. Goß | None |

**Course Content**

In the lecture "Data Management and Security," students learn the systematic specification of documents and data, as well as process-oriented handling.
To this end, control elements, redundancy avoidance, and data protection procedures are introduced. Furthermore, requirements and change management procedures are taught both theoretically and through exercises.
Topics:

- Data and Documents: Structures and Content
- Information content of data and data protection
- Requirements management
- Change management as a result of quality defects and market requirements
- Release and Distribution: Customer Service Processes
- Data integrity and security

**Competency objectives**

- Understanding and analyzing technical and interdisciplinary fundamentals and constraints.
- Distinguishing between material and non-material information.
- Organizing relevant information.
- Establishing connections between theory and practice.

**Intended teaching and learning methods/formats**

Lecture

**Bibliography**

Bodendorf, F.: Data and Knowledge Management, Berlin: Springer Verlag, 2006
Schläger, U. et al: Handbook of Data Protection and IT Security. Berlin: Erich Schmidt Verlag, 2018

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. S. Goß | German | |

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## Module: Technology and Innovation Management

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 6 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Cumulative exam |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. K.-H. Lüke | None |

**Course Content**

Tasks and objectives of technology and innovation management, selected methods of technology and innovation management, technology and innovation diffusion, evaluation approaches

**Learning Objectives**

Technology and innovation management is an interdisciplinary management task that encompasses activities aimed at maintaining and improving a company's competitiveness. Students will become familiar with fundamental methods of technology and innovation management. Students will gain an integrated understanding from both engineering and management perspectives and will be able to apply this knowledge to specific problem situations.

**Intended teaching and learning methods/formats**

Lecture with exercise components

**Literature**

Bullinger, H.-J.: Focus on the Technology Market, current edition.
Gerpott, T. J.: Strategic Technology and Innovation Management, current edition. Hauschildt, J.; Salomo, S.: Innovation Management, current edition.
Schuh, G.; Klappert, S. (Eds.): Technology Management – Handbook of Production and Management, current edition.
Schuh, G. (ed.): Innovation Management – Handbook of Production and Management, current edition. Wördenweber, B., Wickord, W., Eggert, M., Größer, A.: Technology and Innovation Management in the Enterprise, current edition.

| Instructor | Language of Instruction | Applicability in the further course of study/in oth other degree programs |
|---|---|---|
| Prof. Dr. K.-H. Lüke | German | |

## Module: Interdisciplinary Project

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 6 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Project work |

| Module coordinator | Prerequisites for participation |
|---|---|
| Instructor | |

**Course Content**

At the start of the project, students receive the specifications in the form of a project brief. The team is responsible for organization, scheduling, securing resources, and reviewing project goals. The interdisciplinary project is supervised and evaluated by a faculty member acting as a mentor. Participants document the interdisciplinary project in a final report and present it to a larger audience in a presentation.

**Learning Objectives**

The goal is for students to work on a completed project within a larger group. In doing so, they should apply the knowledge they have already acquired, particularly in the areas of team and project management. Through collaboration with students from other degree programs and other faculties at the university, the aim is specifically to improve students' interdisciplinary and social competencies.

**Planned teaching and learning methods/formats**

Independent work and project coordination

**Literature**

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Various courses /lecturers | German | |

**Module:** **After-Sales and Mobility**

1. Submodule: Aftersales: Technology and Processes
2. Submodule: Mobility Concepts

**Learning Objectives of the Module**

Students are familiar with both the fundamental concepts of aftersales and mobility. They are able to identify interdisciplinary connections as well as the interrelationships between theory and practice.

| Module Coordinator | Credits / Workload | Exam Format |
|---|---|---|
| Prof. Dr. K. Wundram | 5 CP / 150 h | Cumulative exam |

## Submodule: After-Sales: Technology and Processes

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 6 | one semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>45 hours of self-study | 2.5 | Exam 45 min. |

| Co-instructor | Prerequisites for participation |
|---|---|
| Prof. Dr. K. Wundram | Business Administration |

**Course Content**

Introduction to the tasks and responsibilities (worldwide) of after-sales

Relationships between the technical characteristics of products and the process requirements at automotive manufacturers and in the retail sector.

Topics include:

- Objectives and Key Performance Indicators
- Responsibilities
- Organization
- Tasks/Functions at the dealership/after-sales (service, workshop, parts department, genuine parts)
- Market support, monitoring
- Workshop equipment & diagnostic tools
- Customer support
- Processes (launch process, core service processes, after-sales fault rectification process)
- Service standards, service training, service literature
- IT Systems Customer Service
- Genuine Parts & Logistics Management

**Learning Objectives**

Students master the fundamental concepts of after-sales service and understand the relationship between the technical characteristics of products and the process requirements at automotive manufacturers and in the retail sector. Additional competencies include understanding and analyzing technical and interdisciplinary fundamentals and constraints, distinguishing between essential and non-essential information, and grasping cross-disciplinary connections.
Students can establish reciprocal connections between theory and practice.

**Intended Teaching and Learning Methods/Forms**

Lecture, laboratory

**References**

Diez, W. et al: Fundamentals of the Automotive Industry. Springer Fachmedien München GmbH 2016 Ebel, B.; Hofer, M.: Automotive Management. Springer, Berlin 2014
Pischinger, S; Seiffer, U.: Vieweg Handbook of Automotive Engineering. Springer-Verlag, Wiesbaden 2016

| Instructor | Language of instruction | Applicability in the further course of study/in other programs |
|---|---|---|
| Prof. Dr. K. Wundram | German | |

## Submodule: Mobility Concepts

| Semester | Duration / Frequency frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 6 | One semester/once a year | Required | 75 hours, of which<br>30 hours of classroom instruction<br>60 hours of self-study | 2.5 | Cumulative exam<br>. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. K. Wundram | None |

**Course Content**

- Mobility: Introduction and Terminology
- Examples of mobility concepts worldwide
- Influencing factors (natural conditions, weather, raw materials, culture, settlement types & sizes
- Evaluation criteria / efficiency (direct/indirect costs, capacities, flexibility, environmental aspects
- Potential resulting from technological change
- Future concepts

**Competency goals**

Students understand and compare existing and potential mobility concepts. An evaluation of these concepts from various perspectives—such as cost, environmental impact, or land requirements—forms the basis for the evidence-based development or selection of suitable concepts for specific urban areas.

- Use of knowledge and information for the comprehensive, critical, and fact-based development of foundational principles and constraints.
- Distinguishing between essential and non-essential information.
- Understanding interdisciplinary relationships.
- Ability to collaborate on the development of joint solutions.

**Intended teaching and learning methods/formats**

Lecture, seminar, project work, presentation

**References**

Wagner, H.; Kabel, S.: Mobility 4.0 – New Business Models for Product and Service Innovations. Wiesbaden: Springer Gabler, 2018
Proff, H.; Fojcek, Th.: National and International Trends in Mobility. Wiesbaden: Springer Gabler 2016
Rid, W. et al: Car Sharing in Germany: Potential and Challenges, Business Models, and Electromobility. Wiesbaden: Springer Vieweg 2018

| Instructor | Language of instruction | Applicability in the further course of study/in other programs |
|---|---|---|
| Prof. Dr. K. Wundram | German | |

## Module: Sustainability and Recycling

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 6 | One semester / once a year | Required | 150 hours, of which<br>60 hours of classroom instruction<br>90 hours of self-study | 5 | Exam 90 min. |

| Module coordinator | Prerequisites for participation |
|---|---|
| Prof. Dr. J. Schmidt | Knowledge of the fundamentals of natural sciences, materials science, and manufacturing technology |

**Course Content**

Environmental context, environmental strategies, and sustainability principles; environmental indicators; life cycle thinking and life cycle assessment; resource efficiency in production; energy-efficient production processes; resource-efficient products; environmentally and recycling-friendly product development; environmental assessment of products; resource-efficient use of products; recycling loops (circular economy); Principles and technologies for processing secondary raw materials, refining metallic and non-metallic materials into secondary raw materials.

**Learning Objectives**

Students will gain in-depth knowledge of the environmental impacts of technical and industrial processes and will be able to assess these using environmental indicators and life cycle assessment methodology. They will be able to evaluate efficiency and sustainability strategies using examples and environmental assessment methods. Students recognize recycling processes and recycling strategies as essential pillars of environmental sustainability. With the knowledge they have acquired, students are able to apply fundamental working techniques for environmentally and recycling-friendly product development in practice.

**Intended teaching and learning methods/formats**

Lecture with exercises and case studies

**References**

Schmidt, J.: Compendium for the Lecture on Sustainability and Recycling VDI 2243: Recycling-Oriented Product Development

VDI 2343: Recycling of Electrical and Electronic Equipment

VDI 4042: Automotive Recycling

VDI 4605: Sustainability Assessment

VDI 4800: Resource Efficiency: Methodological Foundations, Principles, and Strategies DIN Technical Report 108: Guidelines for the Consideration of Environmental Aspects in Product Standardization and Development.

| Instructor | Language of instruction | Applicability in the further course of study/in other other degree programs |
|---|---|---|
| Prof. Dr. J. Schmidt | German | |

## Module: Study Abroad

| Semester | Duration / Frequency frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 4 | One semester/once a year | Required for study abroad | 180 hours, of which<br>48 hours of classroom instruction<br>132 hours of self-study | 6 | Project report (consisting of<br>1. Exam 50%<br>2. Practical 50%) |

| Module Coordinator | Prerequisites for participation |
|---|---|
| E. Uta, M.A. | Confirmation of a semester abroad / Self-organized semester abroad in the 5th semester |

**Course Content**

- Culture: Definition and Concepts
- Intercultural competence
- Cultural Standards According to Thomas
- Cultural dimensions according to Hofstede, Trompenaars, and GLOBE
- Intercultural Communication
- Perception cycles and action strategies
- Faculty Internationalization Strategy
- Sharing one's own study abroad experience

**Competency Goals**

Students who will be spending a semester abroad in the following semester are made aware of the requirements and conditions of studying abroad. They reflect on themselves and their behavior in a different cultural environment. Participants will engage with their own cultural background, other cultures, diversity, and the misunderstandings that may arise from these. They will learn coping strategies that they can apply both during their studies abroad and in their future personal and professional lives.

**Intended teaching and learning methods/formats**

Lecture with integrated exercises

The course concludes with a written exam. After the study abroad period, students share their own experiences abroad with other students in the form of a multi-part project.

**Bibliography**

Erl, A. / Gymnich, M. (2014): Intercultural Competence, 5th edition, Stuttgart
Hofstede, G. (2017): Think Locally, Act Globally: Intercultural Cooperation and Global Management, 6th edition, Wiesbaden
Kutschker, M. / Schmid, S. (2011): International Management, 7th edition, Munich
Schulz von Thun, F. / Kumbier, D. (2008): Intercultural Communication, 2nd edition, Hamburg. Trompenaars, F. / Hampden-Turner, C. (2009): Riding the Waves of Culture: Understanding Cultural Diversity in Business, 2nd edition, London.
Lüsebrink, H.-J. (2012): Intercultural Communication, 3rd edition, Stuttgart Schroll-Machl, S. (2013): The Germans – We Germans, 4th edition, Göttingen
Thiagarajan, S. / van der Bergh, S. (2008): Interactive Training Methods, 2nd edition, Reinbeck

| Instructor | Language of instruction | Applicability in the further course of study/in other programs |
|---|---|---|
| E. Uta, M.A. | German | |

## Module: Practicum

| Semester | Duration / Frequency Frequency | Type | Workload | Credits | Exam format |
|---|---|---|---|---|---|
| 7 | One semester / once a year | Required | 540 hours | 18 | Practicum Semester Report |

| Module coordinator | Prerequisites for participation |
|---|---|
| Dean of Studies | 90 CP |

**Course Content**

Activities during the practical phase should take place within the framework of a clearly defined company project, whereby the integration of students into the corporate organization should particularly promote the mutual exchange of experience and knowledge between the university and the professional field.
To the extent that the subject matter permits, students should be introduced to necessary interdisciplinary approaches. In this context, students should also address organizational, group-oriented, and social issues within the company.
The practical phase involves business administration or technical-business administration activities, still largely under the guidance of the host company and the university.

**Competency Goals**

The goal of the practical phase is to establish a close connection between academic study and professional practice and to introduce students to application-oriented activities. This gives students the opportunity to apply the knowledge and skills acquired in various disciplines to complex practical problems under supervision. In doing so, students are expected to become familiar with various aspects of corporate decision-making processes and their interactions, and to gain in-depth insights into the technical, organizational, economic, legal, and social contexts of business operations.
The practical work experience fosters students' ability to successfully apply scientific knowledge and methods in concrete practical situations and contributes to a more intensive integration of theory and practice in their education.

**Intended Teaching and Learning Methods/Forms**

Professional practice/project

**Literature**

-

| Instructor | Language of instruction | Applicability to further studies or to other other degree programs |
|---|---|---|
| Dean of Studies | Acting Dean | Bachelor's thesis |