Course Handbook Industrial Engineering Master

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Head of Studies	Prof. Dr. Rudolf Friedrich
Deputy Head of Studies	Prof. Dr. Frank Kneip
Chairman of Examination	Prof. Dr. Stefan Georg
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Industrial Engineering Master - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator

(0 modules)

Industrial Engineering Master - optional courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Contracts in Intellectual Property Law, Procurement and Distribution	WiMb19RS100		1	0PA	6	Prof. Dr. Sybille Neumann
Cost Analyses and Control	WiMb19WW101	P520-0044	1	0PA	6	Prof. Dr. Stefan Georg
Industry 4.0 & Hybrid Value Creation	WiMb19IN112		1	0PA	6	Prof. Dr.-Ing. Christian Köhler
Machine Learning and Identification	WiMb19NT108		1	1SU+3PA	6	Prof. Dr. Frank Kneip
Materials Engineering of	WiMb19NT109	P450-0365	-	-	6	Prof. Dr.-Ing. Jan Christoph

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Metals and Plastics						Gaukler
Technology and Innovation Management	WiMb19IN119		-	-	6	Prof. Dr.-Ing. Christian Köhler

(6 modules)

Industrial Engineering Master - mandatory courses

Industrial Engineering Master - optional courses

Contracts in Intellectual Property Law, Procurement and Distribution

Module name (EN): Contracts in Intellectual Property Law, Procurement and Distribution
Degree programme: Industrial Engineering, Master, ASPO 01.10.2019
Module code: WiMb19RS100
Hours per semester week / Teaching method: 0PA
ECTS credits: 6
Semester: 1
Mandatory course: no
Language of instruction: German
Assessment: Project work [*updated 29.04.2024*]
Workload: The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Sybille Neumann

Lecturer:
Prof. Dr. Sybille Neumann

[*updated 07.05.2025*]

Learning outcomes:
After successfully completing this module, students will:
- be familiar with the individual components of intellectual property protection in Germany, including the normative substantive requirements and the official registration procedure for the respective property right
- be familiar with the legal requirements for procurement and distribution contracts (excluding public procurement law)
- have acquired knowledge and skills in business contract management (national and cross-border contracts); and be able to analyze specific contract templates and implement them in the respective business negotiation and contract situation with the help of contract drafting techniques
- be able to draft specific contracts in intellectual property law and on the operational procurement and sales side, also using sample contracts.

[*updated 29.04.2024*]

Module content:
- Intellectual property rights in Germany (especially technical property rights)
- European and international intellectual property rights
- Freedom of contract and limits, drafting contracts in the areas of intellectual property rights, procurement and distribution, special features of transnational contracts and use of general terms and conditions
- Analysis of sample contracts, adaptation to specific business requirements and drafting of specific contractual provisions
- Basics of contract negotiation

[*updated 29.04.2024*]

Teaching methods/Media:
- Independent project work under supervision: students will draft a specific contract (also possible in English) pertaining to a given business situation
- The results of the project work must be documented in a suitable form
- Interactive lecture with case studies

[*updated 29.04.2024*]

Recommended or required reading:
- Bohnstedt, J.: Vertragsrecht im Einkauf. Wiesbaden: Springer Gabler, aktuelle Auflage
- Engels, R.: Patent-, Marken- und Urheberrecht. München: Verlag Franz Vahlen, aktuelle Auflage
- Fisher, R. u. a.: Das Harvard-Konzept. Der Klassiker der Verhandlungstechnik. Frankfurt: Campus, aktuelle Auflage
- Grützmacher u. a. (Hrsg.): Münchener Vertragshandbuch Band 3: Wirtschaftsrecht II. München: C. H. Beck, aktuelle Auflage

- Hasselblatt, G. (Hrsg.): Münchener AnwaltsHandbuch Gewerblicher Rechtsschutz. München: C. H. Beck, aktuelle Auflage
- Hoffmann-Becking M./Gebele, A. (Hrsg.): Beck sches Formularbuch Bürgerliches, Handels- und Wirtschaftsrecht. München: C. H. Beck, aktuelle Auflage
- Junker, A./Kamanabrou, S.: Vertragsgestaltung. München: C. H. Beck, aktuelle Auflage
- Martinek, M. u.a. (Hrsg.): Handbuch des Vertriebsrechts. München: C. H. Beck, aktuelle Auflage
- Lettl., T.: Gewerblicher Rechtsschutz. München: C. H. Beck, aktuelle Auflage
- Triebel, V.: Englisch als Vertragssprache. München: C. H. Beck, aktuelle Auflage
- Walz, R. (Hrsg.): Beck sches Formularbuch Zivil-, Wirtschafts- und Unternehmensrecht Deutsch-Englisch. München: C. H. Beck, aktuelle Auflage

[*updated 29.04.2024*]

Cost Analyses and Control

Module name (EN): Cost Analyses and Control

Degree programme: Industrial Engineering, Master, ASPO 01.10.2019

Module code: WiMb19WW101

Hours per semester week / Teaching method:
0PA

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Tests (question catalogue) as a prerequisite for admission to the final assignment

[*updated 08.05.2023*]

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Stefan Georg

Lecturer:
Prof. Dr. Stefan Georg

[*updated 21.03.2020*]

Learning outcomes:
After successfully completing this module students will:
be able to determine cost structures and data as they relate to an operational functional area,
be able to derive typical problems from the field of cost management,
be able to apply methods for operational cost control and cost analysis,
be able to apply methods for operational cost control and cost analysis,

[*updated 08.05.2023*]

Module content:
Basics of Cost Management
Operational cost management
Procurement cost management
Personnel cost management
Inventory cost management
Energy cost management
Logistics cost management
Advertising cost management
Project cost management
Strategic cost management:
Fixed cost management
Target cost management
Process cost management
Lifecycle cost management

[*updated 08.05.2023*]

Teaching methods/Media:
Expert talks and discussions
The following book will be made available for the course: Cut! Rezepte für ein wirkungsvolles Kostenmanagement (Georg, S., Verlag Vahlen, ISBN 978-3-8006-5114-6)

[*updated 08.05.2023*]

Recommended or required reading:
Georg, S: Kostensteuerung und Kostenanalyse, Onlinequelle: https://wiin-kostenmanagement.de
Joos, T.: Controlling, Kostenrechnung und Kostenmanagement, Springer Gabler, 2014.
Kremin-Buch, B.: Strategisches Kostenmanagement, Gabler, 2012.
Schwarzmaier, U./Mayr, Chr.: Übungsbuch Controlling, Kiehl, 2018.

[*updated 08.05.2023*]

Industry 4.0 & Hybrid Value Creation

Module name (EN): Industry 4.0 & Hybrid Value Creation

Degree programme: Industrial Engineering, Master, ASPO 01.10.2019

Module code: WiMb19IN112

Hours per semester week / Teaching method:
0PA

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam or term paper or case study

[*updated 14.06.2021*]

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
WiMb19IN119 Technology and Innovation Management

[*updated 31.10.2022*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Christian Köhler

Lecturer:
Prof. Dr.-Ing. Christian Köhler

[*updated 20.03.2020*]

Learning outcomes:
After successfully completing this module, students will:
be familiar with the Industry 4.0 vision and examples of its implementation,
be able to assess the requirements, opportunities, risks and limitations of implementing Industry 4.0,
be able to apply strategies and process models for identifying the potential of Industry 4.0 and for operational implementation, taking into account the factors technology, organization and human resources,
be familiar with the concept and the economic, as well as ecological benefits of hybrid value creation,
be able to apply strategies and procedures for the implementation of hybrid value creation processes and business models.

[*updated 14.06.2021*]

Module content:

Basics and overall potential of Industry 4.0
Basic tools for technology management
Identifying potentials of Industry 4.0 in companies
Implementing Industry 4.0 in companies
Basics of hybrid value creation / (industrial) product service systems
Hybrid value creation as a business model for Industry 4.0
Hybrid value creation as a business model for circular value creation (Circular economy)
Designing and implementing hybrid value creation business models

[*updated 14.06.2021*]

Teaching methods/Media:

Expert talks / Coaching
Current specialist articles
Self-study materials and case studies

[*updated 14.06.2021*]

Recommended or required reading:

Lucks, K.: Praxishandbuch Industrie 4.0 : Branchen - Unternehmen - M & A, Schäffer-Poeschel, 2017

Vogel-Heuser, B., Bauernhansl, T., ten Hompel, M. (Hrsg.): Handbuch Industrie 4.0, Band 1-4, SpringerVieweg, 2017

Jahn, M.: Industrie 4.0 konkret, SpringerGabler, 2017

Bauernhansl, T., ten Hompel, M., Vogel-Heuser, B. (Hrsg.): Industrie 4.0 in Produktion, Automatisierung und Logistik, SpringerVieweg, 2014

Wagner, R.: Industrie 4.0 für die Praxis, SpringerGabler, 2018

Köhler, C.: Produktionsoptimierung mit Wertstromworkshops Leitfaden zur zielorientieren Optimierung und Gestaltung von Produktionsflüssen, ePubli, 2017

Aurich, J.C., Clement, M.H.: Produkt-Service Systeme: Gestaltung und Realisierung, Springer, 2010

Aurich, J.C., Koch, W., Kölsch, P., Herder, C. (Hrsg.): Entwicklung datenbasierter Produkt-Service Systeme: Ein Ansatz zur Realisierung verfügbarkeitsorientierter Geschäftsmodelle, SpringerVieweg, 2019

Meier, H., Uhlmann, E. (Hrsg.): Industrielle Produkt-Service Systeme Entwicklung, Betrieb und Management, SpringerVieweg, 2017

[*updated 14.06.2021*]

Machine Learning and Identification

Module name (EN): Machine Learning and Identification

Degree programme: Industrial Engineering, Master, ASPO 01.10.2019

Module code: WiMb19NT108

Hours per semester week / Teaching method:
1SU+3PA (4 hours per week)

ECTS credits:
6

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

[*updated 21.06.2021*]

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 6 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
WiMb19NT106

[*updated 10.02.2021*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Frank Kneip

Lecturer:
Prof. Dr. Frank Kneip

[*updated 10.02.2021*]

Learning outcomes:
After successfully completing this moduel, students will be familiar with machine learning and identification.
They will have in-depth knowledge about parameter and state estimation procedures.
They will be able to determine states of a system (e.g. a technical machine or an economic system) and/or its parameterization uisng the available data sets.

[*updated 21.06.2021*]

Module content:
Linear regression
Iterative methods
Parameter identification method
State estimates of a dynamic system

[*updated 21.06.2021*]

Teaching methods/Media:
Lecture introduction to machine learning and identification (esp. state and parameter estimation)

Independent project work/case studies under supervision
Discussions between students and lecturers
The results of the students' project work must be documented in a suitable form (written paper and presentation).

[*updated 21.06.2021*]

Recommended or required reading:
Will be announced at the beginning of the module.

[*updated 21.06.2021*]

Materials Engineering of Metals and Plastics

Module name (EN): Materials Engineering of Metals and Plastics

Degree programme: Industrial Engineering, Master, ASPO 01.10.2019

Module code: WiMb19NT109

Hours per semester week / Teaching method:
-

ECTS credits:
6

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:

[*updated 22.05.2023*]

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jan Christoph Gaukler

Lecturer: Prof. Dr.-Ing. Jan Christoph Gaukler

[*updated 19.07.2021*]

Learning outcomes:
After successfully completing this module, students will be familiar with the way alloying elements work in Fe, Al, Ti, Cu and Ni and will be able to draw conclusions about the processing and service properties of low-alloy and high-alloy steels as well as Al, Ti, Cu and Ni alloys on the basis of the chemical composition. In addition, they will understand the alloy concepts of the steels commonly used in mechanical engineering as well as of Al, Ti, Cu and Ni materials, be able to describe their structure and properties and be familiar with their applications.
Students will be given an overview of the technically important polymer materials with regard to structural principles, thermal state ranges and deformation behavior and will be familiar with important processes in plastics technology.

[*updated 22.05.2023*]

Module content:
- Review of the structure and properties of steels
- Steels (unalloyed, low-alloyed and high-alloyed) and their application in mechanical, automotive and apparatus engineering
- Non-ferrous metals: Al, Ti, Cu and Ni materials
- Polymeric materials
  - Thermoplastics (amorphous, crystalline), duromers, elastomers, thermoplastic elastomers, fluidoplastics
  - Thermal state ranges and mechanical properties
  - Plastics technology

[*updated 22.05.2023*]

Teaching methods/Media:
- Lecture, exercises, discussions
- Documents, exercises

[*updated 22.05.2023*]

Recommended or required reading:
W. Bergmann: Werkstofftechnik 1 und 2 (Carl Haser Verlag)
E. Roos, K. Maile, M. Seidefuß: Werkstoffkunde für Ingenieure
G. W. Ehrenstein, Polymerwerkstoffe, Hanser-Verlag
G. Menges: Menges Werkstoffkunde Kunststoffe, Carl Hanser Verlag GmbH & Co.KG

[*updated 22.05.2023*]

Technology and Innovation Management

Module name (EN): Technology and Innovation Management

Degree programme: Industrial Engineering, Master, ASPO 01.10.2019

Module code: WiMb19IN119

Hours per semester week / Teaching method:
-

ECTS credits:
6

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:

conditions are fixed at the beginning of the lecture

[*updated 26.01.2023*]

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
WiMb19WW105

[*updated 31.10.2022*]

Recommended as prerequisite for:
WiMb19IN112 Industry 4.0 & Hybrid Value Creation

[*updated 31.10.2022*]

Module coordinator:
Prof. Dr.-Ing. Christian Köhler

Lecturer: Prof. Dr.-Ing. Christian Köhler

[*updated 19.07.2021*]

Learning outcomes:
After successfully completing this module, students will have received in-depth insight into the management of technologies and innovations. Students that have completed this module will:
... be aware of the sustainable importance of technologies and innovations.
... be familiar with the objectives, fields of activity and processes associated with strategic and tactical/operational technology and innovation management.
... be able to analyze technologies in a targeted manner, evaluate them on the basis of various factors and create application scenarios.
... be able to design and control innovation processes from initial ideas to diffusion, taking into account cultural and organizational influences.
... be able to apply selected innovation methodologies and tools (e.g. design thinking).

[*updated 26.01.2023*]

Module content:
Overall principles:
Basics of technology and innovation management
Goals and tasks of strategic and tactical/operational technology management

Innovation Management:
Initiating innovations
Developing innovations
Implementing innovations
Innovation controlling
Innovation organization & innovation culture

Technology Management:
Life cycle models
Process and methods of early technology detection
Process and methods for planning technology
Process and methods for developing technology
Exploiting and protecting technology
Assessing the impact of technology

[*updated 26.01.2023*]

Teaching methods/Media:
Lecture with exercises
The innovation management section is accompanied by a practical design thinking short project.
The technology management section will include case studies.

[*updated 26.01.2023*]

Recommended or required reading:
Corsten / Gössinger / Müller-Seitz / Schneider: Grundlagen des Technologie- und Innovationsmanagements. 2. Auflage, Vahlen, 2016
Hauschildt / Salomo / Schultz / Kock: Innovationsmanagement, Vahlen, 2016
Müller-Roterberg: Management-Handbuch Innovation. BoD, 2018
Schuh / Klappert (Hrsg.): Handbuch Produktion und Management 2 Technologiemanagement. 2. Auflage, Springer, 2011
Vullings / Heleven: Not invented here - Cross-Industry-Innovation, Hanser, 2016
Müller-Prothmann / Dörr: Innovationsmanagement - Strategien, Methoden und Werkzeuge für systematische Innovationsprozesse, Hanser, 2009
Lewrick / Link / Leifer: Das Design Thinking Playbook, Vahlen, 2018

[*updated 26.01.2023*]