Contents

Contact & Imprint

HECTOR School of Engineering and Management, Karlsruhe Institute of Technology (KIT)

Schlossplatz 19, 76131 Karlsruhe/ Germany

Managing Director: Dr.-Ing. Judith Elsner

Phone: +49-(0)721 608 47880, website: ***www.hectorschool.com***

1 Foreword

Added value of a Master of Science in "Management of Product Development" for prospective executives

The Master Program considers itself as a mixture of applied scientific research and application-oriented development in the areas of methods and processes of product development and systems and components of drive train engineering and mechatronics. Our objective is to find innovative solutions by the means of team-oriented work, based on performance and commitment of each member of the board. Thereby we teach reliability and effectiveness. Students must commit themselves to keeping with the approved scientific customs of the German Science Foundation, as well as the individual reliability of the results of our work. The dedication of all our individuals and precise specification of our business processes assure the quality of our work.

The basis of our cooperation is the individual self-commitment to performance, tolerance, dedication and mutual support.

Innovation, that is, the overcoming of instilled trails of thought, new approaches and solutions, and the implementation of these in successful products is our driving force.

Prof. Dr.-Ing. Dr. h.c. Albert Albers

Program Director of Management of Product Development

2 Program Director

Title/Name	Prof. Dr.-Ing. Dr. h.c. Albert Albers
Phone	+49 (0)721 608 42371
E-Mail	***Albert.Albers@kit.edu***

Affiliation	Institute of Product Development, Karlsruhe Institute of Technology (KIT) Kaiserstr. 12, 76128 Karlsruhe
Current Position	Director of the Institute of Product Development, KIT

Vita

1987	Ph.D. (Dr.-Ing) Universität Hannover
1986 - 1988	Chief Engineer Universität Hannover
1989 - 1995	LUK, member of the board
1996 - today	Appointed full professor Karlsruhe Institute of Technology (KIT) and director of the Institute of Product Development, KIT
1998 – 2004	Deputy director of the Institute for Ceramics, KIT
2000	Honorary doctorate of the Technical University of Baku, Azerbaijan
2007 - today	Guest professorship at the Chinese-German Hochschulkolleg (CDHK) at the Tongji University in Shanghai
2008 - today	Guest professorship at the Shanghai Jioa Tong University (STJU)

Fields of Interest

- Power trains of automotive systems
- Innovation management
- Humanoid robots
- Properties of engineered ceramic materials
- Frictional systems
- Simulation - Optimization
- Micro technology

Memberships & Awards

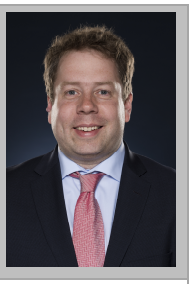
1981 - today	VDI elected member of several working groups
1996 - today	WGMK, since 2010 chairman
1998 - today	Scientific forum for product development e.V. Berlin
2000 - today	Deputy speaker DFG-special research field 483 and project lead as well as member of the colloquium of the DFG-special research field 483
2001 - today	Project lead and member of the colloquium of the DFG-special research field 588
2004 - 2006	Member of the scientific board of the ARGE competence network “Power engines of the future”
2005 - today	Foundation director of the Automotive Engineering Network Southwest (AEN)
2006 - today	Board member FNT KG Freudenberg-Technology KG

	2006 - today	Second director of the scientific association for “Maschinenelemente, Konstruktionstechnik und Produktentwicklung e.V.”
	2008 - today	Speaker DFG-special research field 483
	2008 - today	President of the “Allgemeinen Fakultätentags” (AFT)
	Associate of Mechanical Engineering and Chemical Engineering Departments of Germany	

Title/Name Prof. Dr. Martin Klarmann

Phone +49 (0)721 608 43278

E-Mail ***Martin.Klarmann@kit.edu***



Affiliation	Karlsruhe Institute of Technology (KIT), Institute of Information Systems and Marketing (IISM)
Current Position	Professor of Marketing, Head of the Marketing & Sales Research Group, Co-Director of Institute
Vita	Martin Klarmann is currently Professor of Marketing at the Karlsruhe Institute of Technology (KIT). He is head of the Marketing & Sales Research Group and co-director of the Institute of Information Systems and Marketing (IISM). Before, he worked as Professor of Marketing and Innovation at the School of Business and Economics at the University of Passau. After studying Business Administration in Hamburg, Lyon, and Mannheim, Martin Klarmann obtained his doctoral degree in Marketing at the University of Mannheim, where he also worked for nearly two years as an Assistant Professor of Empirical Research Methods. Martin Klarmanns research focuses on marketing methods, marketing strategy, and sales management. His research has been published in several leading journals of the field, including the Journal of Marketing, the Journal of Marketing Research, the Journal of the Academy of Marketing Science, and the International Journal of Research in Marketing. Moreover, he has received several awards for his research, including an overall best paper award at the American Marketing Association’s Winter Educators’ Conference. Martin Klarmann has taught classes on a variety of subjects related to marketing and sales in Germany, France, Switzerland, and Hungary. He is an active teacher at the undergraduate, graduate, executive, and Ph.D. level. Martin Klarmann has been recognized several times for teaching excellence. Before embarking on his academic career, Professor Klarmann worked for two years at the Heinrich Bauer Verlag, a major German publishing house. Moreover, he has consulted with numerous companies in the automotive, mechanical engineering, and media industries.
Fields of Interest	B2B Marketing, Innovation Marketing, Marketing Methods, Marketing Strategy, Sales Management,
Memberships & Awards	Verband der Hochschullehrer für Betriebswirtschaft (VHB), American Marketing Association (AMA), European Marketing Academy (EMAC), Institute for Operations Research and the Management Sciences (informs)

3 Organization of the Executive Program

3.1 Program Structure and Curriculum

Excellence in Technology Management: Seven Executive Master Programs are offered by the HECTOR School of Engineering and Management. The school – named after Dr. h.c. Hans-Werner Hector, the co-founder of the software company SAP – is run in cooperation with four University Departments. The programs are offered in

- Electronic Systems Engineering and Management (ESEM)
- Energy Engineering and Management (EEM)
- Financial Engineering (FE)
- Green Mobility Engineering (GME)
- Management of Product Development (MPD)
- Production and Operations Management (POM)
- Service Management and Engineering (SME)

The concurrently taught Executive Master Programs are designed for working professionals. Block lectures scheduled at intervals allow participants to continue with demanding careers while acquiring new skills. The course program officially begins in October of each year and lasts 15 months. After this the Master Programs will be completed with a Master Thesis. Courses are divided into 10 intensive modules of 10 days each, following a timetable of monthly intervals. Each participant will take the same sequence of courses throughout the program. The two-week block lectures allow a complete immersion into the academic environment without long interruption of existing work-related responsibilities.

The following table (Tab. 3-1) shows the sequence of the modules in and the curriculum of the program.

# of Module	Type of Module	Name of Module	Course
1	EM1	Design and Validation Process and Information Systems for Product Development	1. Mission and Vision in Product Development
			2. Information Systems I
			3. Test Based Development
			4. Methods of Simulation
2	EM2	Integrated Product Development	1. Integrated Product Development
			2. Information Systems II

# of Module	Type of Module	Name of Module	Course
			3. Industrial Design Engineering
3	MM1	International Project Management	1. Project Management
			2. Multi-Project Management in an International Setting
			3. Development Management
			4. Intercultural Management
4	MM2	Finance for Executives	1. Introduction to Finance and Accounting
			2. Financial Accounting
			3. Fundamentals of Finance
5	EM3	Success Factors in Product Development	1. Strategic Product Portfolio Generation
			2. Target Costing
			3. Variables for Efficiency Improvement in Product Development
			4. Information Systems III
			5. Production Engineering
			6. Lightweight Design
6	MM3	Management Accounting, Marketing and Strategy	1. Business Strategy
			2. Management Accounting
			3. Marketing
7	EM4	Systems and Cases	1. Systems Engineering
			2. Eco-Design
			3. Case Study in Product Development
8	EM5	Multi-Technological Systems and Workshops	1. Introduction and Application to SysML
			2. Patent Strategy in Industry
			3. Quality Management
			4. Workshop in Product Development
9	MM4	Human Resource Management	1. Human Resource Management
			2. Leadership and Conflict Management
			3. Management Training
10	MM5	Law and Contracts	1. Decisions, Contracts, Markets and Trade
			2. International Law – The Law of Business Organizations
			3. International Intellectual Property Law

Tab. 3-1 Sequence of the modules and curriculum of the program in MPD

3.2 Academic Calendar Intake 2015

October 2015

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			01	02	03	04
EM 1		07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November 2015

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
EM 2		18	19	20	21	22
23	24	25	26	27	28	29
30						

December 2015

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

January 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				01	02	03
04	05	06	07	08	09	10
MM 1		13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	MM 2					

March 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				01	02	03
04	05	06	07	08	09	10
EM 3		13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
MM 3		25	26	27	28	29
30	31					

June 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				01	02	03
04	05	05	07	08	09	10
EM 4		13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			01	02	03	04
EM 5		07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
MM 4		26	27	28	29	30
31						

November 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December 2016

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			01	02	03	04
MM 5		07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MM Management Modules

EM Engineering Modules

CC Crash Course in Probability and Statistics

Date t.b.a.; 2-day seminar for the programs Financial Engineering, Service Management & Engineering and Production & Operations Management.

HECTOR School Master Programs 2015:

- Electronic Systems Engineering & Management
- Energy Engineering & Management
- Green Mobility Engineering
- Management of Product Development
- Production & Operations Managment
- Service Management & Engineering
- Financial Engineering

3.3 Teaching Structure

HECTOR School's programs are more than typical MBA programs. The primary goal is to enable young professionals to take a holistic approach when managing highly interdependent processes. Leadership for engineers in today's fast changing and complex environment does imply technological and organizational responsibilities and requires economical accountability and human resource management know-how. Therefore all programs are based on 5 Management Modules where the participants are provided with general knowledge in Finance, Accounting, Marketing, Multi-Project Management and International Law so they can consider commercial consequences of business decisions.

The engineering emphasis of each Master Program is laid on 5 Engineering Modules adapted to each specialization. The lectures in the Masters-specific field provide insight into the newest research topics. They convey current and state-of-the-art methodology necessary to master the scope of innovative technologies. These engineering lectures also comprise the theoretical background necessary to model and analyze key decision problems in manufacturing sites.

Workshops and case studies allow ample opportunity to explore the direct applications of the modules simulating the real business environment. The programs conclude with a Master thesis which allows the participants to work on a research project reflecting their own company's needs and its specific business environment. The final title bestowed after having successfully completed the programs is the Master of Science (M.Sc.) of the Karlsruhe Institute of Technology (KIT).

3.4 Credit Points

The awarded credit points during our part-time Master of Science Program are distributed as follows (for further information on the ECTS System please see chapter 9.1.):

Module	Hours in class	Credit Points (ECTS)	
		POM, MPD, ESEM, GME, EEM	FE, SME
MM1	75	6	6
MM2	75	6	6
MM3	75	6	6
MM4	75	6	6
MM5	75	6	6
EM1	75	6	8
EM2	75	6	8
EM3	75	6	8
EM4	75	6	8
EM5	75	6	8
Master Thesis	600/900	30	20
Total		90	90

3.5 Lecturers

3.5.1 Management Modules

Name	Institute
Program Director	
Prof. Dr. Martin Klarmann	Institute of Information Systems and Marketing, KIT
Module Supervisors	
Prof. Dr. Stefan Nickel	Institute for Operations Research, KIT
Prof. Dr. Martin E. Ruckes	Institute for Finance, Banking and Insurance, KIT
Prof. Dr. Martin Klarmann	Institute of Information Systems and Marketing, KIT
Prof. Dr. Petra Nieken	Chair of Human Resource Management, KIT
Prof. Dr. Clemens Puppe	Institute of Economic Theory and Statistics, KIT
Lecturers in Alphabetical Order	
Prof. Dr.-Ing. Dr. h.c. Albert Albers	Institute of Product Development, KIT
Dipl.-Inform. Abilio Avila	Institute of Entrepreneurship, Technology Management and Innovation
Dr. Michael A. Buchmann	IMTEAM Intercultural Management Team
Prof. Dr. Barbara Deml	Institute for Industrial Science and Business Organization (ifab)
Dr. Kerstin Fehre	Institute of Applied Business Studies and Management, KIT
Sven Jacobs	Norton Rose Fulbright LLP
Prof. Dr. Anja Kern	Cooperative State University, DHBW Mosbach
Dr.-Ing. Robert Landwehr	Daimler AG
Prof. Dr. Hagen Lindstädt	Institute of Applied Business Studies and Management, KIT
Dr. Torsten Lüdecke	Institute for Finance, Banking and Insurance, KIT
Prof. Dr. Martin Schulz	German Graduate School of Management and Law
Prof. Dr. Orestis Terzidis	Institute of Entrepreneurship, Technology Management and Innovation
Prof. Dr. Berthold Wigger	Institute for Economic Policy Research, KIT

3.5.3 Engineering Modules

Name	Institute
Program Director	
Prof. Dr.-Ing. Dr. h.c. Albert Albers	Institute of Product Development, KIT
Module Supervisors	
Prof. Dr.-Ing. Dr. h.c. Albert Albers	Institute of Product Development, KIT
Prof. Dr. Dr.-Ing. Dr. h. c. Jivka Ovtcharova	Institute for Information Management in Engineering, KIT
Lecturers in Alphabetical Order	
Prof. Dr.-Ing. Dr. h.c. Albert Albers	Institute of Product Development, KIT
Dr.-Ing. Matthias Behrendt	Institute of Product Development, KIT
Dipl.-Ing. Norbert Burkardt	Institute of Product Development, KIT
Prof. Dr.-Ing. Gisela Lanza	Institute of Production Science
Prof. Dr.-Ing. Thomas Maier	Institute for Industrial Design Engineering, University of Stuttgart
Dipl.-Ing. Sascha Ott	Institute of Product Development, KIT
Prof. Dr. Dr.-Ing. Dr. h. c. Jivka Ovtcharova	Institute for Information Management in Engineering, KIT
Dr.-Ing. Markus Schmid	Institute for Industrial Design Engineering, University of Stuttgart
Dipl.-Ing. Frank Zacharias	Dr.-Ing. h.c. F. Porsche AG
Dr. sc. techn. Rainer Züst	ETH Zürich

4 Qualification Objectives

4.1 Qualification Objectives at Program Level

All seven executive master programs of the HECTOR School of KIT have the following qualification objectives in common:

1. Enabling the graduates to operate in an analytical and scientifically sound way
2. Enabling the graduates to independently apply and further develop methods and technologies in the areas of research and development
3. Enabling the graduates to perform successful, self-dependent, and innovative work which is related to their occupational fields in their respective areas of the specialization
4. Enabling the graduates to work on complex topics in the pursued specialization
5. Enabling the graduates to apply methods both in economic and in management-related issues
6. Enabling the graduates to assume leadership positions in the field of their chosen specialization, also in international contexts

4.2 Qualification Objectives for Management of Product Development

The specific qualification objectives for the executive master program MPD are the following:

1. Using the research- and application-oriented methods and processes acquired in the Master Program, the graduates are able to independently analyze, plan, manage and implement product development in their companies.
2. Based on the integrated approach towards product development processes, they can successfully generate ideas for product innovations in teams and realize them in competitive products. Essential criteria in this case are, for example, customized product solutions, reducing product development costs and an optimization of quality standards.
3. Graduates are able to successfully meet the challenges of increasing performance density and systemic complexity in the products, reduced development time and shortened product life cycles with appropriate methods and techniques. In this context, the graduates have learned to examine their knowledge in realistic scenarios.
4. They are further able to analyze and evaluate technological problems in the context of product development under economics aspects.
5. They are able to thoroughly understand the approach in the internal and external financial reporting and to apply it in the corporate context.
6. Furthermore, they are familiar with approaches to preparing and optimizing a company's strategic decisions.
7. They have mastered the essential skills of project management in an international context and, through their interdisciplinary training, can actively integrate those from various fields, hierarchical levels and cultural backgrounds and thus prepare and implement decisions concerning corporate strategy.
8. They are able to understand marketing, human resource management, and legal issues approaches in the technological context, to recognize and evaluate interconnections and thus on this basis to evaluate the effectiveness of strategies. Recommendations for action can be derived on the basis of this analysis.

5 Description of the Management Modules

5.1 International Project Management

International project management is one of the crucial key qualifications for employees in an internationally acting company. In order to acquire this important competency, the participants receive an introduction to project management that aims at being able to identify and apply goals and quantitative methods of project planning. The participants realize how they can analyze and steer projects. Special emphasis of the module is laid on the pervasion and creation of project-network and Gantt-diagrams, heuristic solution processes and “change management” in the project. Furthermore the calculation approaches in time- and resource-limited projects as well as risk and cost management approaches are in focus. For this purpose methodological competence is conveyed in the areas of modeling, planning and disposition of projects. The final focus is on the international diversity of management cultures, their impact on different understandings and practices in project management and on ways to successfully manage international projects.

Module Name: International Project Management

Module Supervisor: Prof. Dr. Stefan Nickel

Type of Module: Management Module 1 (MM1)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Project Management	30	42
Multi-Project Management in an International Setting	15	21
Development Management	15	21
Intercultural Management	15	21

Major Learning Results (LR):

LR-1: Knowledge of the principles and various instruments of project management and project planning and the acquisition of abilities to plan projects and create controlling systems.

LR-2: Analysis of various methods and procedures of multi-project management and project controlling in a global context.

LR-3: Knowledge of the product development process as well as important parameters of product development and development methods in the context of project management.

LR-4: Understanding of cultural issues in project management and application of ways to mitigate cross-cultural risks and leverage cultural differences.

Performance appraisal for this Module:

Within the first Management Module the performance appraisal consists of three written exams and a graded project work. For the course *Intercultural Management* performance appraisal will be based on a case study and class room participation.

Credit Points: 6

5.1.1 Project Management

Lecturer	Prof. Dr. Orestis Terzidis, Dipl.-Inform. Abilio Avila, Prof. Dr. Stefan Nickel
Content	▪ Introduction to Project Management and to a project case ▪ Project planning cycle and project characteristics ▪ Project innovation through Design Thinking ▪ Bridging discipline and innovation ▪ Organizational structures ▪ Project objectives, initiation and planning ▪ Activity-on-Node Networks ▪ Structural and Time Analysis ▪ Stochastic Time Analysis ▪ Project Execution ▪ Project Monitoring and Controlling ▪ Project Closing ▪ Teamwork ▪ Stakeholder Management ▪ Project Communication ▪ Risk Management ▪ Cost & budget ▪ Quality Management ▪ Traditional Project Management vs. Agile Project Management ▪ Bridging Discipline and Agility
Course Objectives	Understand the general approach in project management and know-how to plan, initiate and execute projects.
Learning Targets/ Skills	The Participant ▪ gains competencies of the principles and instruments of project management. ▪ gains skills to plan, initiate and execute projects. ▪ learns how to manage competing objectives and stakeholders.
Pre-Requisites	none

Teaching Method	The course consists of introductory lectures, accompanying exercises, cases and discussions. The overall teaching approach is based on action learning / experiential learning.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	25%
Project Work	-	25%
Exam	50%	-

Course Material	Slides, templates, checklists
Literature	• A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition, Project Management Institute • The Fast Forward MBA in Project Management, Eric Verzuh • Agile Product Management with Scrum: Creating Products That Customers Love, Addison-Wesley, Roman Pichle • Scrum Guide 2013, Ken Schwaber, Jeff Sutherland • Designing for Growth: A Design Thinking Tool Kit for Managers (Columbia Business School Publishing), Jeanne Liedtka, Tim Ogilvie • Operations Research, Stefan Nickel, Oliver Stein, Karl-Heinz Waldmann, 2014, Springer-Lehrbuch
Contact Lecturer	Prof. Dr. Orestis Terzidis, E-Mail: ***Orestis.Terzidis@kit.edu*** Prof. Dr. Stefan Nickel, E-Mail: ***Stefan.Nickel@kit.edu*** Dipl. Inform. Abilio Avila, E-Mail: ***Abilio.Avila@kit.edu***

5.1.2 Multi-Project Management in an International Setting

Lecturer	Dr.-Ing. Robert Landwehr
Content	▪ Identification of the main characteristics and problems of international single and multi-project management ▪ Introduction of methods and tools for multi-project management ▪ Discussion of the organization and financing as well as the cultural aspects of international single and multi-project management ▪ Analysis of real world business cases
Course Objectives	Because of the growing importance of project work and the increasing internationalization of projects, this course focuses on complex multi-project management approaches in global environment. The content of the course “Project Management” is extended by introducing methods and tools for managing single and multiple projects. Another point of focus is the organization and the financing of international projects. The content of the course is complemented by industrial examples to provide a practical reference. The concerted aim is to impart the basic knowledge of project, development and innovation management.
Learning Targets/ Skills	The Participant

	▪ gains knowledge of various methods and procedures of project management and project controlling in a global context. ▪ is able to analyze problem areas of project management in international and intercultural coherences and to specifically contribute to the improvement of project management in an intercultural environment. ▪ is able to structure a project portfolio in critical and confusing situations and to make proposals to the top-management about the evaluation and selection or prioritization of projects. ▪ is capable to systematically establish and apply a multi-project management system including related tools and processes (including project portfolio analysis, program management, risk evaluation, interdependency analysis etc.) with the aid of the mediated knowledge in a business (respectively at a location).
Pre-Requisites	Professional basic knowledge in project management, such as project planning, risk assessment for projects and project controlling.
Teaching Method	The course consists of lectures, and industrial presentations as well as accompanying exercises and collective discussions.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-
Exam	100 %	-

Course Material	Lecture notes and presentations in digital form.
Literature	▪ B.P. Lientz, K.P. Rea: International Project Management, 2002 ▪ Owen J. Murphy: International Project Management; South-Western Pub 2005; ISBN: 0324203020
Contact Lecturer	Dr.-Ing. Robert Landwehr, E-Mail: ***Robert@Landw3hr.de***

5.1.3 Development Management

Lecturer	Prof. Dr.-Ing. Albert Albers
Content	Development management is an essential function in many industries and strongly related to project management. Well founded knowledge within this field is extremely advantageous. By taking part in this course, participants learn to define and characterize development of projects. The significance of the processes, that make a product and a company successful are also taught. Thus participants gain insight into the influences on targets, methods to control development processes, cost and time management, human resource management, quality management and information management. In addition, fundamental methods, such as the adaptation of phase models, the strategic planning of human resources and the integration of a development department into a company, will be taught. Real examples are presented in order to convey company structures, project management and the influence of company-specific factors, three key issues within development management.

Course Objectives	Great ideas do not suffice to turn R&D investments into profitable products. This course offers a groundbreaking innovative approach towards developing products that consumers will buy and therefore help to support a company's long-term success based on an effective project management.
Learning Targets/ Skills	The Participant ▪ gains competencies of the product development process and the existing dependencies on markets and businesses as well as important parameters of product development and development methods. ▪ is capable of analyzing the development process in terms of project management on the basis of a systematic development approach (including profile definition, idea generation, conceptual and integrated development). ▪ learns, based on practically oriented case studies, how to apply creativity techniques, like development rules and principles for quality management, to be able to find ideal solution processes in the project planning of a development process.
Pre-Requisites	No specific prerequisites are required.
Teaching Method	The course structure consists of lectures, and industrial presentations as well as accompanying exercises and group discussions.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-
Exam	100 %	-

Course Material	Lecture notes and presentations in digital form.
Literature	A comprehensive reader will be supplied.
Contact Lecturer	Prof. Dr.-Ing. Albert Albers, E-Mail: ***Albert.Albers@kit.edu***

5.1.4 Intercultural Management

Lecturer	Dr. Michael Buchmann
Content	Why and what is 'Intercultural Management'? ▪ 'Culture' in the sense of 'business culture', 'corporate' or 'leadership culture' and 'national management culture'; it's strong impact on business and management performance ▪ Triangle and interaction of 'culture', 'context' and 'individual' ▪ Cultural competence as a key factor for international success Systems and indicators to measure and describe different management cultures ▪ Survey of individual values of participants, comparisons with cultural values ▪ Dimensions of culture (Hofstede, Hall) ▪ Hofstede's 5 dimensions of culture; references to Hall, Trompenaars, Globe

<table>
<tr><td></td><td>

- 'Culture standards', factors of variations, changes over time
- Illustrations and examples from and reference to countries of participants

Applications

- Specific implications for international project management
  - Communication, risk and conflict management
  - Hierarchy and stake holder management, leadership
  - Team composition, development and cooperation
  - Planning, structuring and time management

  with further attention to virtual teams
- Leveraging intercultural polarities –process and tools for international project management
- Leveraging intercultural polarities –process and tools for international project management
- Case study
</td></tr>
<tr><td>Course Objectives</td><td>Cultural differences are mainly based on historical reasons and depend on the social perspective and judgment. The objective of this course is to understand this approach and accept the consequences for the individual behavior. Culture appropriate behavior greatly increases success in international management and cooperation's. Participants acquire a clear and manageable system to tell and successfully inter-act with cultural differences in project management.</td></tr>
<tr><td>Learning Targets/ Skills</td><td>The Participant

- is able to systematically analyze cultural differences.
- acquires a comprehension of intercultural differences and the effects on global project management teams in order to adjust the own behavior.
</td></tr>
<tr><td>Pre-Requisites</td><td>Open mindedness.</td></tr>
<tr><td>Teaching Method</td><td>PowerPoint presentations and lectures with frequent examples, discussions with and contributions by participants, individual survey, exercises and short cases</td></tr>
<tr><td>Performance Appraisal</td><td>

	Written	Oral
Participation during course	-	60%
Case Study	-	40%
Project Work	-	-
Exam	-	-

</td></tr>
<tr><td>Course Material</td><td>Lecture notes and presentations</td></tr>
<tr><td>Literature</td><td>

- Geert Hofstede: Cultural Dimensions for Project Management, in J. O. Riis, J. Lauridsen, M. Fangel, S. Hildenbrandt and F. Runge (eds): Project Management – Tools and Visions, Proceedings of the 7th Internet Worl Congress 1982, Volume G-K, Copenhagen, The Danish Technical Press, 1982, 683-700
- Nancy J. Adler with Allison Gundersen: International Dimensions of Organizational Behavior, Thomson Higher Education, Mason OH USA, 5th ed. (international student edition) 2007.
- Geert Hofstede, Gert Jan Hofstede, Michael Minkov: Cultures and Organizations: Software of the Mind – Intercultural Cooperation and its Importance for Survival, revised and expanded 3. ed., Mc Graw Hill 2010.
</td></tr>
<tr><td>Contact Lecturer</td><td>Dr. Michael Buchmann, E-Mail: buchmann@executivesynergy.net</td></tr>
</table>

5.2 Finance for Executives

The module “Finance for Executives” focuses on analyzing, interpreting and reporting business activities in companies. The module’s focus is on financial accounting and on corporate finance. In the financial accounting segment, participants gain an understanding of how financial accounting is used by prospective consumers of corporate financial information, such as managers, stockholders, financial analysts, and creditors. The course enables students to understand how economic events are recorded in the three main financial statements: income statement, balance sheet, and statement of cash flows. Participants will develop the skills needed to analyze corporate financial statements.

In the corporate finance segment, participants gain a profound economic and methodical knowledge of modern financial management. Participants develop an understanding of how capital is allocated within companies and are able to assess the profitability of investment projects and acquisitions. In addition, participants gain a thorough understanding how financial markets work and how companies are able to obtain capital from financial markets to support their business strategy.

Module Name: Finance for Executives

Module Supervisor: Prof. Dr. Martin E. Ruckes

Type of Module: Management Module 2 (MM2)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Introduction to Finance and Accounting	7,5	10,5
Financial Accounting	33,75	47,25
Fundamentals of Finance	33,75	47,25

Major Learning Results (LR):

LR-1: Evaluation of investment projects from a financial point of view and the development of an understanding of the main principles of business finance and the efficient acquisition of capital resources.

LR-2: Development of an understanding of how financial statements are generated and how users of financial information analyze financial statements.

LR-3: Application of concepts to real world problems by combination of concepts of financial accounting, financial management and business strategy.

Performance Appraisal for this Module:

Within the second Management Module the performance appraisal consists of three exams and a case study with a presentation.

Credit Points: 6

5.2.1 Introduction to Finance and Accounting

Lecturer	Prof. Dr. Martin E. Ruckes, Dr. Torsten Lüdecke
Content	The introductory lecture reviews some of the most challenging issues and questions raised by modern corporate finance and focuses on how this discipline views and uses financial statements. The balance sheet and the income statement are presented as the two most important financial statements. Both statements are analyzed with respect to the question how management decisions shape financial statements.
Course Objectives	The course shows how finance and accounting work together and build upon each other. To that end, key principles and concepts along with many important terms from both domains are introduced and defined.
Learning Targets/ Skills	The Participant gets a broad understanding of ▪ what executives want to accomplish in corporate finance ▪ guiding principles of finance and accounting, ▪ the content, structure, and use of major financial statements.
Pre-Requisites	None
Teaching Method	Lecture as well as accompanying exercises, homework, discussion sections and cases.
Performance Appraisal	

	Written	Oral
Presentation during course	-	
Reflection document	-	20%
Project Work	-	-
Exam	80%	-

Course Material	Lecture notes, homework, exercises and case studies.
Literature	Hawawini, G. and Viallet, C. (2011): Finance for Executives, 4th ed., South-Western Publishing. Penman, S.H. (2013): Financial Statement Analysis and Security Valuation, 5th ed., McGraw Hill.
Contact Lecturer	Prof. Dr. Martin Ruckes, E-Mail: ***Martin.Ruckes@kit.edu*** Dr. Torsten Lüdecke, E-Mail: ***Torsten.Luedecke@kit.edu***

5.2.3 Financial Accounting

Lecturer	Dr. Torsten Lüdecke
Content	This course provides participants with an understanding of the key financial statements and its underlying accounting principles. It is shown how investment and financing decisions affect the balance sheet and the income statement. Financial statement analysis is applied to measure a firm's liquidity, operational efficiency, and profitability.
Course Objectives	The course objective is to understand and critically assess financial statements. Participants know about the main principles and concepts of financial accounting used to prepare the balance sheet and income statement. Financial statements are analyzed to reveal profitability, identify cash flows and track the operating cycle.
Learning Targets/ Skills	The Participant is able to ▪ understand the balance sheet, income statement and statement of cash flow ▪ track corporate decision-making into financial statements, ▪ apply financial statement analysis.
Pre-Requisites	None
Teaching Method	The course structure consists of lectures as well as accompanying exercises, cases, homework and discussion sections.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-
Exam	100 %	-

Course Material	Lecture notes, homework, case studies and exercises.
Literature	Penman, S.H. (2013): Financial Statement Analysis and Security Valuation, 5th ed., McGraw Hill. Hawawini, G. and Viallet, C. (2011): Finance for Executives, 4th ed., South-Western Publishing.
Contact Lecturer	Dr. Torsten Lüdecke, Email: ***Torsten.Luedecke@kit.edu***

5.2.4 Fundamentals of Finance

Lecturer	Prof. Dr. Martin Ruckes
Content	This course begins with an overview of the environment in which financial decisions occur and of the financial information available. Investment rules, such as the net present value rule are applied to value securities and to capital budgeting. It follows the valuation of risky cash flow streams resulting from corporate projects or entire firms. After discussing the instruments of long-term financing, the problems of optimal capital structure and the dividend decision are addressed.
Course Objectives	The course objective is to understand the main principles of finance and thereby be able to analyze corporate investment and financing decisions, such as ▪ valuation of risky cash flows and its application to corporate investments, ▪ financing choices, ▪ firm valuation.
Learning Targets/ Skills	The Participant

<table>
<tr><td></td><td>

is placed in a position to judge corporate investment projects from a financial point of view,
gains a thorough comprehension of the main principles of business finance,
is able to assess the value of business enterprises

</td></tr>
<tr><td>Pre-Requisites</td><td>None</td></tr>
<tr><td>Teaching Method</td><td>The course structure consists of lectures as well as accompanying exercises, cases, homework, discussion sections and cases.</td></tr>
<tr><td>Performance Appraisal</td><td>
<table>
<tr><td></td><td>Written</td><td>Oral</td></tr>
<tr><td>Participation during course</td><td>-</td><td>-</td></tr>
<tr><td>Case Study</td><td>-</td><td>20%</td></tr>
<tr><td>Project Work</td><td>-</td><td>-</td></tr>
<tr><td>Exam</td><td>80%</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Course Material</td><td>Lecture notes, homework, exercises and case studies.</td></tr>
<tr><td>Literature</td><td>Hawawini, G. and Viallet, C. (2015): Finance for Executives, 5th ed., South-Western Publishing</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr. Martin E. Ruckes, E-Mail: Martin.Ruckes@kit.edu</td></tr>
</table>

5.3 Management Accounting, Marketing and Strategy

This module addresses three key core functions of any business: Management Accounting, Marketing and Strategy. Participants will be introduced to fundamental concepts in each of these three domains. After the module they will be able to apply methods and tools to face challenges in this context.

In the Management Accounting part of this module, participants will understand the key principles behind cost accounting, planning, and control. In the Marketing element, participants will be introduced to the marketing concept and the marketing mix. The implementation of the marketing concept will then be illustrated along the challenge of selling hybrid offerings made up of products and services ("solution selling"). Doing so, the module also introduces a number of important sales concepts. Finally, the Strategy element of the course will introduce participants to a strategic perspective on business portfolios, by using analysis and evaluation tools to, at the end, formulate strategies at a company level.

Module Name: Management Accounting, Marketing and Strategy

Module Supervisor: Prof. Dr. Martin Klarmann

Type of Module: Management Module 3 (MM3)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Business Strategy	15	21
Management Accounting	37,5	52,5
Marketing	22,5	31,5

Major Learning Results (LR):

LR-1: Description of central concepts of strategic management alongside the ideal-typical strategy process and the implementation of internal and external analyses.

LR-2: Evaluation of accounting systems, instruments of cost management and identification of interfaces with financial accounting, financial management and business strategy.

LR-3: Understanding of the marketing concepts. Ability to apply key methods to the analysis and handling of marketing and sales problems, especially in the context of selling solutions.

Performance appraisal for this Module:

Within the third Management Module the performance appraisal for *Management Accounting* and *Business Strategy* consists of a written exam and the assignment during the course. For the course *Marketing* the performance appraisal will be based on case study presentations and a simulation game.

Credit Points: 6

5.3.1 Business Strategy

Lecturer	Prof. Dr. Hagen Lindstädt Dr. Kerstin Fehre
Content	The course introduces the overall process of strategic management containing strategic analysis, strategy formulation, strategy evaluation based on competitive advantage, and portfolio strategy. The overall process is used as the structuring element, each step will be analyzed and explained in detail. In addition, students learn and experience the most important concepts of strategy formulation in oligopolies. A special emphasis is put on the integration, discussion and application of the frameworks. Several case studies will confirm the attained knowledge.
Course Objectives	Major course objectives are to explain the process of strategic management and to analyze business situations from the internal and external perspective. The formulation of strategies on the business unit and on the corporate level and the evaluation of strategic options based on competitive advantages are introduced and discussed. Furthermore, a major objective is to access existing business portfolios from a strategic perspective.
Learning Targets/ Skills	The Participant ▪ is able to describe central concepts of strategic management alongside the ideal-typical strategy process ▪ is able to undertake internal and external strategic analyses (e.g. SWOT Analysis) with the goal of strategy formulation ▪ understands the classical concepts and sources of competitive advantages as well as their meaning for the formulation of competitive and business strategies ▪ is able to formulate strategies at a company level and at a business unit level ▪ understands the central principles of strategy evaluation and strategy implementation as well as the classical concepts of change management.
Pre-Requisites	No specific prerequisites are required; however prior knowledge of accounting and financial management as well as principles of business administration is advantageous.
Teaching Method	The course structure consists of lectures and accompanying exercises, cases, and discussion sections. PowerPoint slides will be presented. Selected media will be used as necessary.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-

	Exam	100 %	-
Course Material	A comprehensive reader will be provided.		
Literature	▪ Robert M. Grant: Contemporary Strategy Analysis, Blackwell, 7th ed. 2010		
Contact Lecturer	Prof. Dr. Hagen Lindstädt, E-Mail: ***lindstaedt@ibu.uni-karlsruhe.de*** Dr. Kerstin Fehre, E-Mail: ***Kerstin.Fehre@kit.edu***		

5.3.2 Management Accounting

Lecturer	Prof. Dr. Anja Kern		
Content	Participants will learn about: ▪ Product costing concepts ▪ Cost allocation: between departments and from activities to products ▪ Job costing ▪ Process costing ▪ Short-term decision making, cost-volume-profit analysis ▪ Strategic investment decisions ▪ Budgeting and variance analysis ▪ Responsibility accounting ▪ Performance management		
Course Objectives	Participants get an overview of accounting and controlling topics. They understand specific accounting and controlling topics, they are able to apply these to assignments and they are able to position these in the context of their own work.		
Learning Targets/ Skills	The Participant gains an understanding of key concepts and techniques of management accounting, is able to use relevant costs for decision making, and is in the position to purposeful apply instruments for planning and control.		
Pre-Requisites	We build on some understanding from Management Module 1, in particular: ▪ Principles of financial accounting ▪ Discounting of future cash flows		
Teaching Method	The meetings will be partly lecture style and there will also be ample time for students to work on assignments and for plenary discussion of those assignments and related topics. These discussions should additionally stimulate students to exchange professional ideas and experience.		
Performance Appraisal		Written	Oral
	Participation during course	30%	10%
	Case Study	-	-
	Project Work	-	-
	Exam	60%	-
Course Material	Lecture slides and textbook (see below)		
Literature	Cost Management" by M. Wouters, F. Selto, R. Hilton, and M. Maher, 2012, McGraw-Hill Higher Education, ISBN-13 9780077132392		
Contact Lecturer	Prof. Dr. Anja Kern, E-Mail: ***dranjakern@gmail.com***		

5.3.3 Marketing

Lecturer	Prof. Dr. Martin Klarmann
Content	▪ Introduction to Marketing ▪ Essentials in Marketing Strategy ▪ Product Management ▪ Pricing ▪ Sales Management
Course Objectives	It is the overarching objective of this class to introduce participants to the marketing concept (i.e., seeing the firm from the customer's perspective). To do so, essential marketing decisions in the context of product management, pricing, and sales management are discussed and participants are introduced to key tools to approach these issues. Selling "solutions" is the key context in which most of these methods are introduced.
Learning Targets/ Skills	The Participant ▪ understands the idea of market segmentation and is capable of choosing appropriate segmentation criteria for his or her own firm. ▪ understands marketing's product concept and is able to apply conjoint analysis to distinguish important from less important parts of the offering. ▪ knows what a "solution" is and can avoid key mistakes in the implementation of solution selling. ▪ can estimate a price demand function and apply the three key approaches to determining prices for an offering. ▪ can make educated choices with regard to the channel structure of his or her firm. ▪ can design and implement different approaches to measuring customer feedback. ▪ knows the basic personal selling process and the challenges that go with it.
Pre-Requisites	none
Teaching Method	Lecture, case study and a simulation game.
Performance Appraisal	

	Written	Oral
Participation during course	-	
Case Study	-	80%
Simulation Game	-	20%
Exam	-	-

Course Material	All slides presented in class will be provided to students. Case Study reading material will be distributed upfront the module.
Literature	▪ Christian Homburg, Sabine Kuester, and Harley Krohmer (2009), Marketing Management: A Contemporary Perspective, New York (McGraw-Hill) ▪ Christian Homburg, Heiko Schäfer, and Janna Schneider (2012), Sales Excellence: Systematic Sales Management (Management for Professionals), Berlin (Springer)
Contact Lecturer	Prof. Dr. Martin Klarmann, E-Mail: ***Martin.Klarmann@kit.edu***

5.4 Human Resource Management

The module deals with the current challenges of human resource management in organizations and companies. The economic analysis of an individual's behavior and the individual performance in strategic situations are presented, as well as current empirical research on relevant issues of human research management. Interactive classroom-experiments add to the microeconomic approaches and demonstrate the limits of the traditional economic theory based on individual rationality. The participants monitor the theoretical approaches within the frame of case studies and thereby gain an understanding for the complex challenges and possibilities of the processes and practices in human resource management. The participants rate relevant human resource issues like for example the advantages and disadvantages of pay for performance systems or the special problems in talent management. The effects of business cultures and their role for successful international project management are also analyzed and critically monitored by the participants. Furthermore, the participants learn methods of conflict management and are able to train these in practical sequences. In conclusion, problem solving strategies are presented in the module and applied by the participants.

Module Name: Human Resource Management

Module Supervisor: Prof. Dr. Petra Nieken

Type of Module: Management Module 4 (MM4)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Human Resource Management	37,5	52,5
Leadership and Conflict Management	22,5	31,5
Management Training	15	21

Major Learning Results (LR):

LR-1: To understand problems of human resource management and their relation to the structuring of organizations as well as the relation to the business success and strategic situations in organizations.

LR-2: To know and be able to apply various leadership methods and to be able to apply an approach for avoiding and solving conflict situations.

LR-3: Application of the theoretic knowledge in a specific case studies and a comprehensive management training.

Performance appraisal for this Module:

Within the fourth Management Module the performance appraisal will be based on group project work for *Management Training*. The written exam for *Human Resource Management* counts 70% and class room participation and case study is a 30% component. The exam for *Leadership and Conflict Management* will be conducted as an oral exam.

Credit Points: 6

5.4.1 Human Resource Management

Lecturer	Prof. Dr. Petra Nieken
Content	The course covers relevant topics of human resource management. Microeconomic approaches will be complemented by classroom experiments and empirical research results based on field as well as laboratory data. Experimental research has become increasingly important in recent years. By introducing participants to this research method they are made familiar with some current attempts to integrate insights on human behavior into economic models, e.g., fairness considerations. These approaches are particularly interesting in the context of labor contracts and individual behavior in organizations. We will cover topics such as linking human resource management processes to the company's strategy, compensation and motivation, performance appraisal systems, talent management, recruiting and selecting employees as well as trust, control and the role of corporate culture for organizational performance. Participants will work in teams on case studies that are distributed before the course starts. These real-world examples illustrate a variety of challenges of HR management. Each team will present the results at the end of the course and discuss the analysis with other students in class.
Course Objectives	The course aims at a fundamental understanding of individual behavior and performance in organizations as well as the challenges of human resource management processes. An overview of current research topics in personnel economics is provided.
Learning Targets/ Skills	The Participant ▪ understands basic questions of human resources management and their connection to the design of organizations. ▪ has knowledge on applicability and difficulty of scientific research methods in human resources and organizational economic context. ▪ applies the acquired knowledge based on international renowned case studies.
Pre-Requisites	Basics in microeconomic theory and econometrics.
Teaching Method	The course structure consists of lectures, case studies, simulations and project work. It explores team and self-awareness.
Performance Appraisal	

	Written	Oral
Participation during course	-	10%
Case Study	-	20%
Project Work	-	-
Exam	70%	-

Course Material	PowerPoint slides, case studies, accompanying articles, instructions for classroom experiments.

Literature	Cascio, W.F.: Managing Human Resources, McGraw-Hill, 2013 Lazear, E. P. and M. Gibbs: Personnel Economics in Practice. John Wiley & Sons, 2015. Huselid, M.A., Becker, B.E. and Beatty, R.W. (2005): The workforce scorecard: Managing human capital to execute strategy. Harvard Business School Press.
Contact Lecturer	Prof. Dr. Petra Nieken, E-Mail: ***Petra.Nieken@kit.edu***

5.4.2 Leadership and Conflict Management

Lecturer	Prof. Dr. Barbara Deml
Content	The aim of this course is to teach the fundamentals of professionals at work. In order to reach this target participants will become acquainted with the basic concepts of leadership methods and learn techniques of managing conflict situations among staff members. The course deals with agreements on objectives, management techniques in planning, communication and information, decision-making, leadership and teamwork, self-management, conflict resolution and conflict strategy. The use of several case studies reinforces all of these skills and introduces participants to the real-life application of leadership techniques in conflict management.
Course Objectives	Master difficult leadership situation, e.g., after assuming a new leadership position. Change often produces conflicts or resistance towards new management styles by the new team-members. Conflicts are therefore pre-destined and system based. The course will teach efficient leadership tools and methods in order to achieve a win-win situation for the entire group.
Learning Targets/ Skills	The Participant ▪ acquires knowledge of different leadership methods and approaches in order to avoid and solve conflict situations and can practice these in practical sequences, is able to identify and apply problem solving strategies. ▪ acquires knowledge of different management techniques (e.g. definition of goals, decision theories, planning techniques, communication, self-management) and is able to analyze and apply tools in their appropriate usage in example situations in this topic. ▪ learns how to apply various leadership methods and -tools (e.g. appraisal interviews, delegation, feedback, self-management and time management).
Pre-Requisites	Successful participation in the module Project Management. For recommended literature see below.
Teaching Method	The course structure consists of lectures, case studies, simulations and project work. It explores team and self-awareness.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-
Exam	-	100%

Course Material	Lecture notes, homework, case studies and exercises, in printed form
Literature	▪ Drucker, Peter: The Effective Executive, London: Butterworth Heinemann, Revised Edition 2007

	▪ Herzberg, F; Mausner, B.; Snyderman, B.: The motivation to work. New York: Transaction Publ. 1993
Contact Lecturer	Prof. Dr. Barbara Deml, E-Mail: ***Barbara.Deml@kit.edu***

5.4.3 Management Training

Lecturer	Prof. Dr.-Ing. Albert Albers
Content	By focusing upon various company objectives and strategies, participants will expand their management competencies in numerous aspects. Particular emphasis is placed on the interrelations between product life cycles - including product launch, entry into a new market, and relaunch - and organizational decisions affecting human resource management, research and development activities and marketing. The fundamental management techniques of competition analysis, portfolio analysis, marketing mix and pricing of special commercial operations are acquired in order to ensure product success. Participants will also become acquainted with and make use of break-even analysis and market research reports as a way of making marketing decisions. In addition, participants learn about supply and stock keeping, particularly covering optimal order quantities. With regard to the important theme of production, participants will be taught about investment, disinvestments, utilization planning, ecological production and rationalization and learning curves, as well as the important decision of whether in-house production or third party supply would be most beneficial. Organizational aspects of research and development is another key area in which participants will expand their knowledge. Finance and accounting also plays a vital role in the education of future managers, therefore a great deal of attention is paid to this subject. Participants are taught about income and financial statements, cash flow, share prices and shareholder value. Furthermore, they benefit from learning the important skills of cost element, cost center and product cost accounting, progressive break-even analysis and financial budgeting. Participants are also trained in the field of human resource management. The crucial topics of personnel planning, qualifications, productivity as well as employee turnover and absences are particularly dealt with, as knowledge of these aspects is key for future managers.
Course Objectives	Management Training provides the knowledge and methods in order to rigorously analyze business situations and then exercise judgment. The broader the range of responsibilities the more it becomes necessary to evaluate and appraise problems.
Learning Targets/ Skills	The Participant ▪ learns how to apply his acquired knowledge of management and business economics in a realistic business game. ▪ experiences the target conflicts that appear during the leadership of a business. ▪ learns how to make decisions under uncertainty and under time pressure and to present them to a management team. ▪ commutes his theoretical knowledge into competency, think and act economically cross-linked.
Pre-Requisites	Successful participation in the module “International Project Management”.
Teaching Method	The course structure consists of lectures, case studies, simulations and project work. It explores

	team and self-awareness.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	100%	-
Exam	-	-

Course Material	Lecture notes, homework, case studies and exercises, in printed form.
Literature	None.
Contact Lecturer	Prof. Dr.-Ing. Albert Albers, E-Mail: ***Albert.Albers@kit.edu***

5.5 Law and Contracts

This module consists of an economic and a juristic part. In the economic part the subject areas decision theory, expected use, risk and ambiguity, negotiation- and basis-incentive-theory create the starting basis. The main goal of this part of the module is to deepen the knowledge of the participants in problems and concepts of the macroeconomic and microeconomic theory. The participants cut through the concepts and quantitative methods of the macroeconomic and microeconomic theory and are enabled to independently give an opinion on macro- and microeconomic problems. Furthermore, current problems of the world economy are discussed, for example stagnation and economic growth, unemployment and international labor division and harmonization of the international currency system. In this way the participants are enabled to recognize relevant economic coherences and to create connections to their practical experiences.

The juristic module part is divided in lectures about business law and lectures about international patent, trademark and copyright law. The participants gain deepened knowledge of complex under company law constructions. In the process participants get to know various corporate structures and understand the implications of forms of company for the risk management and for the guidelines in financial reporting. Moreover, the participants are conveyed the knowledge on which juristic basis the terminology of “intellectual property” is based and which consequences this has on business decisions.

Module Name: Law and Contracts

Module Supervisor: Prof. Dr. Clemens Puppe

Type of Module: Management Module 5 (MM5)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Decisions, Contracts, Markets and Trade	37,5	52,5
International Law - The Law of Business Organizations	22,5	31,5
International Intellectual Property Law	15	21

Major Learning Results (LR):

LR-1: Dealing with advanced concepts of the microeconomic theory and basic concepts of the macroeconomic theory.

LR-2: Fundamental knowledge of the German and international business law.

LR-3: Detailed knowledge of the judicature of “intellectual property“.

Performance appraisal for this Module:

Within the fifth Management Module the performance appraisal will be based on three written exams with varying components of class room participation.

Credit Points: 6

5.5.1 Decisions, Contracts, Markets and Trade

Lecturer	Prof. Dr. Clemens Puppe Prof. Dr. Berthold Wigger
Content	The course treats the fundamental principles of economics both from a microeconomic and a macroeconomic perspective. In the microeconomic part, the focus is on the impact of individual decisions on market equilibrium and the optimal design of contracts. The basic modeling tools including expected utility theory, the derivation of individual demand with quasi-linear preferences, and the fundamental concepts of game theory and bargaining theory are introduced. The macroeconomic part covers the topics of trade cycles and economic growth, money and inflation, aggregate income and unemployment. Current issues such as the open economy and problems of European integration will also be discussed.
Course Objectives	The student will be trained in basic economic thinking both from a micro- and a macroeconomic perspective and in basic econometrics. The purpose of the course is to provide the necessary background for all other courses related to economics.
Learning Targets/ Skills	The participants ▪ know how to deal with advanced concepts of the microeconomic theory – for example the general theory of equilibrium or the pricing theory – and are able to apply these to real problems, e. g. the allocation of factor and goods markets. ▪ know the basic concepts of the macroeconomic theory, especially the dynamic theory of equilibrium, and are able to apply these to the latest political issues, for example questions of optimal taxation, arrangement of pension insurance systems as well as politico-economic and monetary policy arrangements to stabilize business cycles and economic growth. ▪ understand and can apply the substantial techniques to analyze inter temporal macroeconomic models with uncertainty. ▪ understand the dynamic theories of equilibrium that are necessary for the description of prices and allocations of goods and financial markets as well as their temporal development.
Pre-Requisites	Basic knowledge of linear algebra and analysis.
Teaching Method	The material presented in the course will be supplemented by problem sets and exercises. Part of the course will consist of case studies. Homework and discussion sections complete the lectures.
Performance Appraisal	

	Written	Oral
Participation during course	-	20%
Case Study	-	10%
Project Work	-	-

	Exam	70 %	-
Course Material	The course material will be presented using all types of electronic and other multi-media devices. Lecture notes will be available in printed form.		
Literature	▪ Varian (2010): Intermediate Microeconomics: A Modern Approach, 8th Edition, Norton. ▪ Mankiw (1999): Macroeconomics, Worth Publishers ▪ Burda/ Wyplosz (2001): Macroeconomics – A European Text, Oxford University Press		
Contact Lecturer	Prof. Dr. Clemens Puppe, E-Mail: ***Clemens.Puppe@kit.edu*** Prof. Dr. Berthold U. Wigger, E-Mail: ***Berthold.Wigger@kit.edu***		

5.5.2 International Law – The Law of Business Organizations

Lecturer	Prof. Dr. Martin Schulz		
Content	This course provides insight into important business law issues relevant to managerial practice including corporate governance and compliance issues. After outlining the German corporate legal framework, we will discuss some crucial issues of international and European business law, such as the law applicable to corporations engaged in cross-border activities. Special emphasis will be placed on recent developments in the EU including the new multinational corporate form of the European Company (SE). We will analyze some prominent forms of business organizations with a special focus on limited liability companies and stock corporations. Key practical issues such as the incorporation of business forms, important questions relating to composing corporate contracts, corporate governance and compliance issues as well as the liability of shareholders and managers will also be discussed and analyzed.		
Course Objectives	Participants ▪ understand how business law functions (also in cross border cases). ▪ gain insight into important forms of business organizations. ▪ learn central issues of business law including their international dimension. ▪ recognize the interdependence of business law within a globalized economy.		
Learning Targets/ Skills	Participants become familiar with important forms of business organizations and learn how to deal with business law issues including international aspects and cross border elements. Participants learn how to structure and communicate legal issues in international business law cases.		
Pre-Requisites	A basic knowledge of German as well as basic knowledge of legal concepts (such as contracts) is helpful.		
Teaching Method	The course structure consists of lectures including case studies and home reading.		
Performance Appraisal		Written	Oral
	Participation during course	-	-
	Case Study	-	-
	Project Work	-	50 %
	Exam	50 %	-

Course Material	PowerPoint Presentations, case studies based on actual law cases and a reader (to be prepared and distributed in advance).
Literature	▪ Kraakman, Reinier / Davies, Paul / Hansmann, Henry / Hertig, Gerard / Hopt, Klaus / Kanda, Hideki / Rock, Edward, The Anatomy of Corporate Law, A Comparative and Functional Approach, 2nd edition Oxford 2009. ▪ Schulz, Martin/ Wasmeier, Oliver. The Law of Business Organizations – A Concise Overview of German Corporate Law, Heidelberg 2012. ▪ Du Plessis, Jean J. / Großfeld, Bernhard / Luttermann, Claus / Saenger, Ingo / Sandrock, Otto, German Corporate Governance in International and European Context, Berlin 2007.
Contact Lecturer	Dr. Martin Schulz, E-Mail: ***martin.schulz@ggs.de***

5.5.3 International Intellectual Property Law

Lecturer	Sven Jacobs
Content	In international business relations, intellectual property plays an ever increasing role. In innovative industries and in the information society, patents, trademarks and copyrights often constitute the most valuable asset of a firm. Knowledge of how the international IP system works, how IP can be protected beyond national boundaries, is therefore an important part of managing problems of law and contracts. The course gives an overview of the fundamental principles of international Intellectual Property (IP) law as part of the global system of international trade law. The mechanisms of international protection by registration rights (patents, trademarks) and non-registration rights (copyright) are explained. The course focuses both on the legal rules and mechanisms in place and on the underlying philosophies of unification and harmonization of conflicting IP policy options and aims. The course also highlights institutional aspects of the WTO/TRIPS-system and of European harmonization in the area of IP.
Course Objectives	The Course aims at a general understanding of the mechanisms of international IP law, in particular, how the international system is built on the basis of the notion of territoriality and national law. The course interrelates with the other legal lecture (International Law –The Law of Business Organizations, taught by Schulz), and the specialized course on “Media Law” taught as a specialized course in the Master Program Service Management and Engineering by Prof. Kühling.
Learning Targets/ Skills	The participant ▪ holds detailed knowledge of the main rights of intellectual property, ▪ analyses and evaluates more complex issues and adds them to a legal solution, ▪ transforms the legal fundamentals in contracts about the usage of intellectual property and solves more complex violation cases, ▪ knows and understands the basics of legal application procedures and has a wide overview of the legal matters caused by the internet.
Pre-Requisites	Participants should have some basic knowledge and working experience in intellectual property (IP) law. Specialized knowledge in at least one of the major IP rights (patents; trademark; copyright) is advisable, but not a prerequisite.

Teaching Method	The course consists of lectures, as well as accompanying exercises and discussion sections.
Performance Appraisal	

	Written	Oral
Participation during course	-	20%
Case Study	-	-
Project Work	-	-
Exam	80 %	-

Course Material	▪ Course book (see literature); handouts ▪ Legal Sources (Online) ▪ PowerPoint Presentations ▪ Optional: discussion forum
Literature	▪ Goldstein, International Intellectual Property Law, Foundation Press, New York, 2001 (or later edition, if available at the time of the course) ▪ WIPO Intellectual Property Handbook – Policy, Law and Use, 2nd edition, Geneva, 2004. Wipo Publication No. 489(E).
Contact Lecturer	Sven Jacobs, E-Mail: ***Sven.Jacobs@nortonrosefulbright.com***

6 Description of the Engineering Modules

6.1 Design and Validation Process and Information Systems for Product Development

The module gives an in-depth introduction in the product development processes and its challenges. Individual process steps and the organization are defined. Moreover, the product lifecycle is implemented in the form of the Product-Lifecycle Management (PLM) system. When using virtual reality systems, it is important to identify both opportunities and limits of this new technology. The participants identify workflows relevant to data modeling. The module also covers methods of validation in Product Design Project (PDP) and specific environment simulations. The typical approach to planning and executing a simulation study is applied.

Module Name: Design and Validation Process and Information Systems for Product Development

Module Supervisor: Prof. Dr.-Ing. Jivka Ovtcharova

Type of Module: Engineering Module 1 (EM1)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Mission and Vision in Product Development	7,5	10,5
Information Systems I	18	25,2
Test Based Development	19,5	27,3
Methods of Simulation	30	42

Major Learning Results (LR):

LR-1: Knowledge of the product development process.

LR-2: Qualification to generate and evaluate models of technical systems.

LR-3: Knowledge of major activities in the product development process.

LR-4: Planning and performance of validation activities based on new scientific approaches (e.g. augmented reality; XML).

Performance appraisal for this Module:

Within the first Master-specific Module in MPD the performance appraisal consists of oral exams containing varying components of project work. The exam for the lectures *Methods of Simulation* and *Test Based Development* will be a combined one.

Credit Points: 6

6.1.1 Mission and Vision in Product Development

Lecturer	Prof. Dr.-Ing. Albert Albers
Content	The lecture gives an overview about the whole module targeting the three aspects of Product Development – systems, methods and processes.
Course Objectives	Getting acquaintance with challenges of current and tomorrows product development.
Learning Targets/ Skills	Motivation to be involved in Product Development and to investigate it as a technical and economic discipline.
Pre-Requisites	none
Teaching Method	Lecture with case studies
Performance Appraisal	<table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>-</td></tr><tr><td>Case Study</td><td>-</td><td>-</td></tr><tr><td>Project Work</td><td>-</td><td>-</td></tr><tr><td>Exam</td><td>-</td><td>-</td></tr></table>
Course Material	Power point presentation and lecture notes
Literature	none
Contact Lecturer	Prof. Dr.-Ing. Albert Albers, E-Mail: ***Albert.Albers@kit.edu***

6.1.2 Information Systems I

Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova
Content	This course is divided into three main parts. The first part is devoted to the fundamentals of Information and Data Modeling. The second part describes the Product Life Cycle in terms of information types and different PDM, ERP, CRM, SCM systems within this approach. The Functional Overview of PLM Systems as well as Model Driven Architectures is the main aspects in this part. The third part focuses on detailed description of IT Architecture, Communication Mechanisms and Commercial PLM Solutions.
Course Objectives	▪ Product-related information management in and between enterprises. ▪ View of the entire planning, control and organization as well as other necessary processes. ▪ Creation and holistic administration of all data, documents and resources within the entire Product Life Cycle.

<table>
<tr><td></td><td>Information Systems I is a basic course, required for the students planning to at-tend Information Systems II. Within this module, there is a correlation with the course Basics in Product Development Processes, especially in topics devoted to PDM, PLM and ERP Systems.</td></tr>
<tr><td>Learning Targets/ Skills</td><td>The Participant
gains insight into the planning, controlling and organization of information flows.
gains knowledge of the maintenance of all data, documents and processes within the product life cycle.
is capable of understanding the implementation of the product life cycle.
gains knowledge of data modeling, product data management, ERP Systems.</td></tr>
<tr><td>Pre-Requisites</td><td>The prerequisites for this course are the basics of computer science and general understanding of Information Technologies. Skills and knowledge in Business Processes and Product Life Cycle are also beneficial for students. There are no mandatory conditions (courses) to attend this course.</td></tr>
<tr><td>Teaching Method</td><td>This course will be offered in the form of lectures (theoretical part with examples) as well as exercises (to gain practical skills). Project work to round out the gained knowledge is also foreseen.</td></tr>
<tr><td>Performance Appraisal</td><td><table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>-</td></tr><tr><td>Case Study</td><td>-</td><td>-</td></tr><tr><td>Project Work</td><td>-</td><td>10%</td></tr><tr><td>Exam</td><td>-</td><td>90%</td></tr></table></td></tr>
<tr><td>Course Material</td><td>The course will be held in the form of multi-media presentation. For exercises and project work, the students will have access to computer labs.</td></tr>
<tr><td>Literature</td><td>Gray, Peter M. D.: The functional approach to data management : modeling, analyzing and integrating heterogeneous data / Peter M. D. Gray - Berlin ; Heidelberg, 2003
Molina, Arturo: Handbook of life cycle engineering : concepts, models and technologies - Dordrecht : Kluwer Academic Publ., 1999</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Jivka Ovtcharova, E-Mail: Jivka.Ovtcharova@kit.edu</td></tr>
</table>

6.1.3 Test Based Development

Lecturer	Dipl.-Ing. Sascha Ott
Content	This course is divided into three main parts. The first one describes the significance of validation in the PDP as well as the Integration and Management of Validation Processes. The second one is devoted to Statistical Basics for Design of Experiments (DoE) and basics of Modeling. The third part focuses on Chain of Testing and Rapid Prototyping as well as on Augmented Reality Systems used as Validation Tools.
Course Objectives	The course objectives consist of introducing simulation models for technical systems, to discuss and learn experimental and virtual validation methods.

Learning Targets/ Skills	The Participant ▪ understands the concept of stochastic correlations. ▪ acquires in-depth knowledge of modeling, analyzing and optimizing stochastic systems in economics and engineering ▪ is able to discuss, present and defend subject-specific arguments within a given task ▪ gains knowledge of standard procedures for planning and executing a simulation study.
Pre-Requisites	Mathematical skills e.g. differential equations
Teaching Method	The course structure consists of lectures, as well as accompanying exercises, cases and homework. Multimedia Based lectures.
Performance Appraisal	<table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>20%</td></tr><tr><td>Case Study</td><td>-</td><td>-</td></tr><tr><td>Project Work</td><td>-</td><td>-</td></tr><tr><td>Exam</td><td>-</td><td>80%</td></tr></table>
Course Material	▪ PowerPoint slides with printed handouts ▪ Software files for accompanying exercises, cases and homework for download from Intranet-platform
Literature	▪ Bamberg, G., Baur, F. (2002): Statistik (12. Aufl.); R. Oldenbourg, München ▪ Montgomery, D.C. (2005a): Introduction to Statistical Quality Control, 5th ed.; Wiley, New York
Contact Lecturer	Dipl.-Ing. Sascha Ott, E-Mail: ***Sascha.Ott@kit.edu***

6.1.4 Methods of Simulation

Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova Dr.-Ing. Nikola Bursac
Content	This course is divided into four main parts. The first one describes different methods of simulation, like Finite Difference/ Volume Methods, Finite Element Method (FEM), Boundary Element Method (BEM), Multi Body Simulation, etc. The second one is devoted to Optimization and Interlinking of Methods. The third part focuses on Information Integration and Visualization and Evaluation. The fourth one gives an Overall View of the Simulation in the PDP (Product Development Process).
Course Objectives	▪ Well-founded knowledge about potentials and limits of the simulation methods used. ▪ Well-founded knowledge about the necessary information integration and the IT-infrastructure. ▪ Outline of the relevant software systems available on the market. Within this module there is a correlation with a course in Product Development and Basics of Validation. This course correlates also with the complete track of Information Systems within MPD master program, especially in topics devoted to CAx systems and VR.

<table>
<tr><td>Learning Targets/ Skills</td><td>The Participant
understands the fundamentals of selected/specific numerical methods in the area of mechanics.
is aware of the main concepts, methods and procedures for applying simulation to a product creation process and is able to solve simple product development problems by means of the presented methods.
can evaluate both the application and the complexity of different processes, taking into consideration the engineer’s question/matter.
understands the complexity of heterogeneous systems and acquires basic knowledge in the digital factory
understands the need for information integration within processes and is capable of estimating the potential of visualization in order to improve the product development process</td></tr>
<tr><td>Pre-Requisites</td><td>The prerequisites for this course are the Basics of Engineering Mechanics, Numerical Analysis. Skills and knowledge in static and strength of materials, kinematics, motion of rigid bodies.</td></tr>
<tr><td>Teaching Method</td><td>This course will be offered in form of lectures (theoretical part with examples) as well as exercises (to get practical skills).</td></tr>
<tr><td>Performance Appraisal</td><td><table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>-</td></tr><tr><td>Case Study</td><td>-</td><td>-</td></tr><tr><td>Project Work</td><td>-</td><td>-</td></tr><tr><td>Exam</td><td>-</td><td>100%</td></tr></table></td></tr>
<tr><td>Course Material</td><td>The course will be held in form of multimedia presentation. The online version of the course will be also available in the local network of the KIT. For exercises the students will get the possibility to use the computer labs.</td></tr>
<tr><td>Literature</td><td>The Finite Element Method, Vol. 1, Butterworth Heinemann, Dover Pubn Inc., 2000
Topology Optimization Theory, Methods and Applications, Springer, 2003</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Jivka Ovtcharova, E-Mail: Jivka.Ovtcharova@kit.edu
Dr.-Ing. Nikola Bursac, E-Mail: Nikola.Bursac@kit.edu</td></tr>
</table>

6.2 Integrated Product Development

One of the most important factors of success of product development is the systematic planning and use of adequate tools and methods. Application of the portfolio analysis, of mind mapping or Data Stream Management (DSM) is essential. Apart from these tools, it is important to understand the structures, standards, and modifications in CAx and VR systems. Knowledge of the background of information technology is an absolute necessity. Participants realize the effects and impacts of design modifications as well as the influence of prototypes or simulations on the innovation process.

Module Name: Integrated Product Development

Module Supervisor: Prof. Dr.-Ing. Albert Albers

Type of Module: Engineering Module 2 (EM2)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Integrated Product Development	37,5	52,5
Information Systems II	19,5	27,3
Industrial Design Engineering	18	25,2

Major Learning Results (LR):

LR-1: Definition and control of team-based development processes.

LR-2: Overcoming of constructional and organizational obstacles.

LR-3: Application of creativity techniques.

LR-4: Design of ergonomic products.

LR-5: Definition of product profiles as a basis of an initial target system of new products.

LR-6: Assessment and selection of CR methods in the design process.

Performance appraisal for this Module:

Within the second Master-specific module in MPD the performance appraisal consists of oral exams containing varying components of class room participation. The performance appraisal exam for the lecture *Industrial Design Engineering* will be conducted as written exam.

Credit Points: 6

6.2.1 Integrated Product Development

Lecturer	Dipl.-Ing. Nobert Burkardt
Content	Participants learn the systematic planning of processes with different tools and methods to support the finding of product profiles, product ideas and product concepts, such as: portfolio analysis, value analysis, analogy, design guidelines. For management of the product development process, the design structure matrix method (DSM) is presented.
Course Objectives	Professional execution of design work takes into consideration client's needs as well as the company's best interest. This course teaches how to use information from customers in order to support and optimize the design process.
Learning Targets/ Skills	The Participant ▪ is able to class the product development process with the total of the entrepreneurial processes. ▪ gets to know the systematic planning of a process with the help of various tools and methods; including Poka Yoke, Kano-Model, Mind Map or Meta-Plan. ▪ knows how to use and apply portfolio analysis, value analysis and design guidelines in this context.
Pre-Requisites	Basic knowledge in product development (EM1)
Teaching Method	The course structure consists of lectures as well as case studies, demonstrations and discussion sections.
Performance Appraisal	
Course Material	PowerPoint presentation, case study, examples of measuring and test equipment, web-based application, course notes.
Literature	▪ Hans-Jörg Bullinger: Concurrent Simultaneous Engineering Systems , 1998, Springer Verlag
Contact Lecturer	Dipl.-Ing. Norbert Burkardt, E-Mail: ***Norbert.Burkardt@kit.edu***

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-
Exam	-	100%

6.2.2 Information Systems II

Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova
Content	This course is divided into three main parts. The first part is an Introduction to modern CAD (Computer Aided Design) systems and Modeling Methods. The second part describes the Cax (Computer Aided (X) Systems) systems including the CAD, CAPP (Computer Aided Process Planning), CAE (Computer Aided Engineering), etc. The third one is devoted to Virtual Engineering, based on the definition of a process, methodology and technology such as VR, AR and MR (Mixed Reality).
Course Objectives	▪ Rapid development cycle as an active process element.

<table>
<tr><td></td><td>

- Emphasis on early development phases.
- Formulation of alternative concepts for the product.
- Decision and specification of product

Information Systems II is an intermediate course following and completing the course Information Systems I. It is obligatory for the students planning to attend Information Systems III.
</td></tr>
<tr><td>Learning Targets/ Skills</td><td>

The Participant

- gains knowledge of CAx and VR Systems
- acquires fundamentals of data interfaces
</td></tr>
<tr><td>Pre-Requisites</td><td>The prerequisites for this course are basics in computer science and general understanding of information technologies. Skills and knowledge in CAx systems and virtual engineering are helpful. Participants are required to attend the course “Information Systems I” and to pass successfully the oral exam after its completion.</td></tr>
<tr><td>Teaching Method</td><td>This course will be offered in the form of lectures (theoretical part with examples) as well as exercises (to get practical skills). Project work to round out the gained knowledge is also foreseen.</td></tr>
<tr><td>Performance Appraisal</td><td>

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	10%
Exam	-	90%

</td></tr>
<tr><td>Course Material</td><td>The course will be held in the form of multimedia presentations. The online version of the course will also be available in the local network of KIT. For exercises and project work, students will have access to computer labs.</td></tr>
<tr><td>Literature</td><td>

- Roller, Dieter: CAD systems development : tools and methods - Berlin ; Heidelberg : Springer, 1997
</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Jivka Ovtcharova, E-Mail: Jivka.Ovtcharova@kit.edu</td></tr>
</table>

6.2.3 Industrial Design Engineering

<table>
<tr><td>Lecturer</td><td>Prof. Dr.-Ing. Thomas Maier

Dr.-Ing. Markus Schmid</td></tr>
<tr><td>Content</td><td>Industrial Design Engineering is a systematic way of thinking and a methodology to demanding problems, solving the creating process in designing new single products, product programs and product systems. The participants learn professional and social skills for a broader understanding of problem-solving methodologies and design methods especially in the context of complex human machine interfaces in the area of industrial design engineering and management, and an ability to define product structures by working with new creating methods integrating in the product development process. In order to support the integration to practical work the students will get a clear understanding of how to structure a successful design problem solving process in the area of design engineering and management by using the design methods based on</td></tr>
</table>

<table>
<tr><td></td><td>functionality and usability.</td></tr>
<tr><td>Course Objectives</td><td>Today's competitive business world requires a faster and smarter product development potential. The course will demonstrate how to translate customer needs into successful products with appropriate technical specifications. The product development process should be harmonized with international supply chain management to enrich the entire value chain. Design products need to adapt to a broad range of operating conditions. Ideally strategic business decisions should reflect product planning with regard to platforms and architectures. This course explores best practices in product design, development and management.</td></tr>
<tr><td>Learning Targets/ Skills</td><td>The Participant
understands the importance of a successful Industrial Design Engineering and get to know the effects and consequences of Design Modification.
gains an overview of prototypes, models and simulations and know how to classify and use these in relation to the innovation concept.</td></tr>
<tr><td>Pre-Requisites</td><td>Basic knowledge in product development</td></tr>
<tr><td>Teaching Method</td><td>The course structure consists of advanced theoretical knowledge as well as creative case studies, demonstrations and discussion sections.</td></tr>
<tr><td>Performance Appraisal</td><td><table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>-</td></tr><tr><td>Case Study</td><td>-</td><td>-</td></tr><tr><td>Project Work</td><td>-</td><td>-</td></tr><tr><td>Exam</td><td>100%</td><td>-</td></tr></table></td></tr>
<tr><td>Course Material</td><td>PowerPoint Presentation, Case Study, Examples of measuring and test equipment, Web-based application, Course Notes</td></tr>
<tr><td>Literature</td><td>A comprehensive reader will be supplied prior to the beginning of lecture.</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Thomas Maier; E-Mail: Thomas.Maier@iktd.uni-stuttgart.de
Dr.-Ing. Markus Schmid; E-Mail: Markus.Schmid@ikdt.uni-stuttgart.de</td></tr>
</table>

6.3 Success Factors in Product Development

While EM1 and EM2 systematically explain and deepen into the principles of the product development process, this module focuses on further aspects for a successful product development. Crucial factors of success in product development, such as Total Quality Management (TQM) and Total Cost of Ownership (TCO), are explained and illustrated by examples. Methods presented, such as FMEA (Failure Mode and Effects Analysis) and FTA (Failure Tree Analysis) as well as target costing, are efficient tools to support the product development process. Using examples, the participants learn to structure and systematically manage the design process in teams. The participants are aware of the significance and limits of modern interface technologies. They can assess and classify business strategies in terms of international competitiveness.

Module Name: Success Factors in Product Development

Module Supervisor: Prof. Dr.-Ing. Albert Albers

Type of Module: Engineering Module 3 (EM3)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Strategic Product Portfolio Generation	7,5	10,5
Target Costing	4,5	6,3
Variables for Efficiency Improvement in Product Development	7,5	10,5
Information Systems III	18	25,2
Product Engineering	19,5	27,3
Lightweight Design	18	25,2

Major Learning Results (LR):

LR-1: Understanding and application of methods to optimize the performance of companies considering the criteria of product development, market development, and internationalization.

LR-2: Methodological competence for holistic quality assurance of products.

LR-3: Learning and use of methods for the economic design of products.

LR-4: Knowledge of the planning and design of production systems.

Performance appraisal for this Module:

Within the third Master-specific Module in MPD the performance appraisal consists of oral exams containing varying components of project work.

Credit Points: 6

6.3.1 Strategic Product Portfolio Generation

Lecturer	Prof. Dr.-Ing. Albert Albers
Content	The advantages of Product Generation Engineering regarding innovation possibility and risk management.
Course Objectives	▪ Product Generation Engineering; ▪ Shares of new Product Generations ▪ Reference Products
Learning Targets/ Skills	The participant ▪ Understands the theory of Product Generation Engineering; ▪ Is able to analyze Products regarding the shares of Product Generation Engineering ▪ Can use reference products to develop new product generations
Pre-Requisites	none
Teaching Method	The course structure consists of lectures as well as some practical examples and discussion sections.
Performance Appraisal	

	Written	Oral
Participation during course	-	20%
Case Study	-	-
Project Work	-	-
Exam	-	80%

Course Material	PowerPoint Presentation, Case Study, Course Notes
Literature	none
Contact Lecturer	Prof. Dr.-Ing. Albert Albers, E-Mail: ***Albert.Albers@kit.edu***

6.3.2 Target Costing

Lecturer	Dipl.-Ing. Sascha Ott
Content	Participants learn the basics, the principle approach and the systematic application of the method target costing. The meaning of target costing for the product lifecycle costs, the influences on innovation processes are discussed during this lecture.

Course Objectives	This course teaches how in target costing is done in an effective way for supporting industrial engineering processes. Participants of this course are able to adapt the method target costing on different technology development processes.
Learning Targets/ Skills	The participant ▪ is able to use target costing ▪ knows who to identify the most important cost drivers during product development ▪ can decide how target costing can be used avoiding negative interactions with creative invention processes ▪ gets to know the systematic planning of a process with the help of various tools and methods; including Poka Yoke, Kano-Model, Mind Map or Meta-Plan. knows how to use and apply portfolio analysis, value analysis and design guidelines in this context.
Pre-Requisites	Basic knowledge in product development (EM1)
Teaching Method	The course structure consists of lectures as well as some practical examples and discussion sections.
Performance Appraisal	

	Written	Oral
Participation during course	-	20%
Case Study	-	-
Project Work	-	-
Exam	-	80%

Course Material	Power-Point Presentation
Literature	Hiroshi Okano: Target cost management and product development at Toyota, 1997, MIT Japan Program
Contact Lecturer	Dipl.-Ing. Sascha Ott; E-Mail: ***Sascha.Ott@kit.edu***

6.3.3 Variables for Efficiency Improvement in Product Development

Lecturer	Dipl.-Ing. Norbert Burkardt
Content	The lecture focusses on economic aspects of product development Different disciplines pertinent for the product development process will be discussed.
Course Objectives	Strategic Cost Management, Quality Management, Efficiency Improvement
Learning Targets/ Skills	• Methods of Strategic Cost Management • Tools for Cost Reduction • Quality Management Tools in Product Development • Process Organisation to improve Efficiency
Pre-Requisites	Courses ´"Integrated Product Development" and "Development Management".
Teaching Method	Lectures, case studies and discussions
Performance Appraisal	

	Written	Oral
Participation during course	-	20%

	Case Study	-	-
	Project Work	-	-
	Exam	-	80%
Course Material	PowerPoint presentation		
Literature	none		
Contact Lecturer	Dipl.-Ing. Norbert Burkardt; E-Mail: ***Norbert.Burkardt@kit.edu***		

6.3.4 Information Systems III

Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova
Content	This course is divided into four main parts. The first one describes the data interfaces as well as the methods for the exchange of product data, etc. The second one is devoted to standards for graphical programming and ergonomic aspects of interfaces. The third part focuses on knowledge-based engineering (process and technology). The fourth one covers the topics of parametric and feature-based design.
Course Objectives	▪ The scope of the methods for a product data exchange. ▪ Characteristics of protocols and programming interfaces. ▪ Basics of parametric and future-based design. Information Systems III is a concluding course. It completes the Information Systems I-II Itrack. Within this module there is a correlation with a course “Methods of Simulation”, as well as with “Quality Management”. Special stress is put on the topics devoted to specifications of data interfaces and design approaches.
Learning Targets/ Skills	The participant ▪ is informed about interface technology. ▪ comprehends the requirements for design. ▪ is able to solve subtasks of the overall project and to integrate them again later on
Pre-Requisites	The prerequisites for this course are the basics of computer science and general understanding of information technologies. Skills and knowledge in data and programming interfaces and knowledge-based engineering are also an advantage for students. It is obligatory to attend the courses “Information Systems I”, “Information Systems II” and to pass successfully the oral exams after it.
Teaching Method	This course will be offered in form of lectures (theoretical part with examples) as well as exercises (to get practical skills). It is also foreseen a project work to round the gained knowledge.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work		10%

	Exam	-	90%
Course Material	The course will be held in form of multimedia presentation. The online version of the course will be also available in the local network of the KIT. For exercises and project work the students will have the possibility to use the computer labs.		
Literature	▪ Ovtcharova, Jivka: A framework for feature-based product design : fundamental principles, system concepts, applications- Düsseldorf : VDI-Verl., ISBN 3-18-324120-X ▪ Helpenstein, Helmut J.: CAD geometry data exchange using STEP : realization of interface processors - Berlin ; Heidelberg : Springer, ISBN 3-540-56902-2, 0-387-56902-2		
Contact Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova, E-Mail: ***Jivka.Ovtcharova@kit.edu***		

6.3.5 Production Engineering

Lecturer	Prof. Dr.-Ing. Gisela Lanza		
Content	This course focuses on both planning and operation of production systems considering business objectives as well as the value added chain. It introduces various planning methods and tools and discusses the planning of manufacturing and assembly. It shows interconnections between the planning activities with the operating conditions and offers support for decision making at all planning stages.		
Course Objectives	▪ Overview of planning and designing production systems within the current climate of changing markets. ▪ Learn how to use different planning methods and tools. ▪ Gain experience with the effects of organizational changes on production targets by setting up different scenarios, an appropriate design, and dimensioning.		
Learning Targets/ Skills	The Participant ▪ gains competencies for the planning of production systems. ▪ is able to analyze the performance requirements when planning production systems. ▪ is able to evaluate various solution methods for the design of production systems. ▪ is able to apply knowledge in certain case studies.		
Pre-Requisites	Special skills: knowledge and experience with production systems are beneficial but not required. Knowledge about manufacturing and assembly processes is desirable but not necessary.		
Teaching Method	This course structure consists of lectures as well as accompanying interactive exercises, case studies, discussions, and an excursion.		
Performance Appraisal		Written	Oral
	Participation during course	-	10%
	Case Study	-	20%
	Project Work	-	-
	Exam	-	70%
Course Material	Lecture Notes, case studies, hand-out		

Literature	▪ Hopp, W. J.; Spearman, M. L.: “Factory Physics”, Waveland Pr Inc, 2011. ▪ Nahmias, S.: “Production and Operations Analysis”, McGraw-Hill/Irwin, 2008.
Contact Lecturer	Prof. Dr.-Ing. Gisela Lanza, E-Mail: ***Gisela.Lanza@kit.edu***

6.3.6 Lightweight Design

Lecturer	Dipl.-Ing. Norbert Burkardt
Content	The course addresses general aspects of system oriented lightweight design. Holistic views on design methods and tools are presented and worked out to increase weight oriented functional efficiency in technical systems.
Course Objectives	▪ Lightweight strategies, Target weighing ▪ Methods of embodiment design ▪ Stiffening techniques ▪ Lightweight materials ▪ Joining techniques ▪ Validation ▪ Recycling
Learning Targets/ Skills	Participants are able to • evaluate the potential of central lightweight strategies and their application • apply different stiffening methods qualitatively and to evaluate their effectiveness. • evaluate the potential of computer-aided engineering as well as the related limits . • reflect the basics of lightweight construction from a system view.
Pre-Requisites	Basic knowledge in Mechanical Design and Engineering Mechanics.
Teaching Method	This course will be offered in form of lectures supported by concrete examples as well as exercises.
Performance Appraisal	<table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>10%</td></tr><tr><td>Case Study</td><td>-</td><td>-</td></tr><tr><td>Project Work</td><td>-</td><td>-</td></tr><tr><td>Exam</td><td>-</td><td>90%</td></tr></table>
Course Material	Lecture Notes
Literature	none
Contact Lecturer	Dipl.-Ing. Norbert Burkardt, E-Mail: ***norbert.burkardt@kit.edu***

6.4 Systems and Cases

Systems engineering is an interdisciplinary approach to the early definition of customers' needs and functionalities, the documentation of requirements on the system to be developed, and the continuous synthesis and validation of the system along the development process. A wide range of methodological aids is available to support the developer in systems synthesis and analysis. Eco-design methods are adequate tools to use ecological aspects as chances for product innovations. A final case study serves to acquire competence in the use of development methods. For this purpose, a development task is to be defined based on a concrete market situation and using the scenario technique. Then, this definition is to be implemented in a product concept. Intuitive and discursive creativity techniques based on TRIZ-box or methods of cost control are used under close-to-reality conditions. Based on a case study, all skills and theories learned are implemented in a practice-oriented environment. Product planning, product specification, and concept development processes are applied.

Module Name: Systems and Cases

Module Supervisor: Prof. Dr.-Ing. Albert Albers

Type of Module: Engineering Module 4 (EM4)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Systems Engineering	19,5	27,3
Eco-Design	18	25,2
Case Study in Product Development	37,5	52,5

Major Learning Results (LR):

LR-1: Understanding of systems engineering as an interdisciplinary approach to the efficient execution of complex and interdisciplinary product development processes.

LR-2: Knowledge of and first experience in the application of eco-design approaches and their integration in existing plans.

LR-3: In-depth knowledge of the use of methods to support activities in the product development process.

Performance appraisal for this Module:

Within the fourth Master-specific Module in MPD the performance appraisal consists of oral exams containing varying components of class room participation. The exam for the lectures *Systems Engineering* and *Eco-Design* will be combined. The performance appraisal for the case study in Product Development will be based on a performance evaluation for the assigned group project.

Credit Points: 6

6.4.1 Systems Engineering

Lecturer	Dr.-Ing. Rainer Züst
Content	The course is divided into three parts. The introduction will provide an overview and motivation of Systems Engineering (SE) methodology as well as the underlying assumptions for its application. The main part of the lecture will demonstrate the institutional embedding of systems thinking and systems dynamics. The application of heuristic principles will be used to explain examples of individual and social behavior. Using the introduction of a new product line, the life-cycle model will be explained and used to distinguish between preliminary study, main study and detailed study for systems design. A new airport as business facility will help to visualize the concept of complex problem-solving strategies. Situation analyses and goal definition methods will present concepts of analysis and synthesis to achieve full customer satisfaction. The final part of the lecture will show the interrelations between process management and innovation processes.
Course Objectives	Systems Engineering (SE) is a systematic way of thinking and a methodology to guide demanding problem-solving processes in the field of management and engineering.
Learning Targets/ Skills	The Participant ▪ learns to use and apply methods of system technology. ▪ understands the interaction of each and every system function in a project. ▪ is able to define successful procedures and to contemporary involve the needed experts
Pre-Requisites	General understanding of engineering-related planning and decision-making methodologies and processes.
Teaching Method	Short presentations combined with case studies; the participants should apply the theory (oral presentation and individual study especially of the SE-case-book) on easy and understandable examples.
Performance Appraisal	
Course Material	PowerPoint Presentation, Case Study, Examples of measuring and test equipment, Web-based application, Course Notes
Literature	A comprehensive reader will be supplied prior to the beginning of lecture. Additional References:

	Written	Oral
Participation during course	-	30%
Case Study	-	-
Project Work	-	30%
Exam	-	40%

	▪ Daenzer, W. F. et al. (Hrsg.), Systems Engineering. 11. Auflage, Verlag Industrielle Organisation, Zürich, 2002. ▪ Züst, R., Troxler, P., Systems Engineering Case-Book, Verlag Industrielle Organisation, Zürich, 2002.
Contact Lecturer	Dr.-Ing. Rainer Züst, E-Mail: ***Rainer.Zuest@swissinstitute.ch***

6.4.2 Eco-Design

Lecturer	Dr.-Ing. Rainer Züst
Content	The course introduces students to a design process that takes environmental factors into account. It consists of the following parts: ▪ introduction: motivation and overview of the eco-design process ▪ environmental aspects: life-cycle modeling and life-cycle assessment; example/ case study: aluminum chair ▪ stakeholder requirements: laws and standards; example/ case study: RoHS and WEEE ▪ eco-design tasks: environmental benchmarking and environmental quality function deployment, interpretation of LCA results, and defining successful eco-design strategies and measures by using the ECODESIGN PILOT; example/ case study: water kettle ▪ product improvement: product specification, functional structure, creativity session, product concept, and embodiment design ▪ environmental communication: labeling; example/ case study: EPD ▪ outlook: integration into the management process (continual improvement process)
Course Objectives	The course objective is to generate a deep understanding for the planning and decision making processes in the area of product design.
Learning Targets/ Skills	The Participant ▪ is able to recognize changes of the environment and to use these as a chance for production innovations. ▪ uses adequate tools and methods in order to analyse the environment and the requirements of the stakeholders. ▪ recognizes products with a higher benefit for the environment. ▪ understands the responsibility for economic aspects in engineering and in management. ▪ is able to integrate eco-design approaches in already existing plans and are able to convince their team as well as clients and suppliers of the advantages of eco-design.
Pre-Requisites	Product design (methodology) and Systems Engineering
Teaching Method	Short presentations combined with case studies; the participants should apply the theory (oral presentation and individual study especially of the SE-case-book) on easy and understandable examples.
Performance Appraisal	<table><tr><th></th><th>Written</th><th>Oral</th></tr><tr><td>Participation during course</td><td>-</td><td>30%</td></tr></table>

	Case Study	-	-
	Project Work	-	30%
	Exam	-	40%
Course Material	PowerPoint Presentation, Case Study, Examples of measuring and test equipment, Web-based application, Course Notes		
Literature	A comprehensive reader will be supplied prior to the beginning of lecture Additional References: ▪ Wimmer, W., Züst, R. ECODESIGN-Pilot – Product-Investigation- Learning and Optimization-Tool with CD-ROM, Kluwer Academic Publisher, Amsterdam, 2002. ▪ www.ecodesign.at		
Contact Lecturer	Dr.-Ing. Rainer Züst, E-Mail: ***Rainer.Zuest@swissinstitute.ch***		

6.4.3 Case Study in Product Development

Lecturer	Prof. Dr.-Ing. Albert Albers Dipl.-Ing. Norbert Burkardt		
Content	The target of the case study is for students to experience Product Development. Participants will get familiar with the methods they learned by actually doing product development in a team. The task is to find the correct product profile and turn it into the right product. By forming their own market, the teams will compete against each other and learn from each other. An additional goal for participants is to appreciate their role in the team effort. In addition participants are given the opportunity to analyze a complete project while implementing their own contributions and evaluate its success on a meta-level.		
Course Objectives	Students are to apply the methods learned in previous courses by doing an actual development project in a team. Project tasks include finding the right product profile, developing a product idea, investigation, benchmarking, developing a concept, and finally designing the product.		
Learning Targets/ Skills	The Participant ▪ is informed about product planning, product specification and concept development. ▪ masters the modeling of products, processes and models, such as the Stage Gate Process. ▪ knows how to plan the course of a project.		
Pre-Requisites	All courses related to product development, teamwork and creativity generation.		
Teaching Method	The course consists of lectures as well as accompanying exercises and project work.		
Performance Appraisal		Written	Oral
	Participation during course	-	-
	Case Study	-	100%
	Project Work	-	-
	Exam	-	-
Course Material	PowerPoint Presentation, Case Study, Examples of measuring and test equipment, Web-based		

	application, Course Notes
Literature	A comprehensive reader will be supplied prior to the beginning of lecture.
Contact Lecturer	Prof. Dr.-Ing. Albert Albers, E-Mail: ***Albert.Albers@kit.edu*** Dipl.-Ing. Norbert Burkardt, E-Mail: ***Norbert.Burkardt@kit.edu***

6.5 Multi-Technological Systems and Workshops

Successful work on complex multi-technological systems requires work in interdisciplinary teams. Apart from the use of appropriate support methods, such as the V-model, understanding of the varying perspectives of the team members is required. This results in high requirements on the quality assurance of interdisciplinary product development processes. Basic principles are presented and made available in the form of a practical guide. Finally, key methods of product development are trained in workshops and first application competence is acquired. Among others, analysis methods, universal problem solution methods, and verification and validation methods (DoE, XiL – X-in-the-Loop) are applied.

Module Name: Multi-Technological Systems and Workshops

Module Supervisor: Prof. Dr.-Ing. Albert Albers

Type of Module: Engineering Module 5 (EM5)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Introduction and Application to SysML	12	16,8
Patent Strategy in Industry	7,5	10,5
Quality Management	18	25,2
Workshop in Product Development	37,5	52,5

Major Learning Results (LR):

LR-1: Use and benefits of Model Based Systems Engineering (MBSE).

LR-2: Development of an understanding of quality management.

LR-3: Training of efficient product development methods.

Performance appraisal for this Module:

Within the fifth Master-specific Module in MPD the performance appraisal is based on oral exams containing varying components of class room participation. The performance appraisal for the Workshop in Product Development will be based on a performance evaluation for the assigned group project.

Credit Points: 6

6.5.1 Introduction and Application to SysML

Lecturer	Dr.-Ing. Nikola Bursac
Content	This course gives an overview of the use and benefits of Model Based Systems Engineering (MBSE) in Product Development. Starting from the analysis of a current Product Generation new development shares are identified. Based on this new subsystems are developed and modeled in SysML.
Course Objectives	▪ Overview of the SysML language; ▪ Product analysis using MBSE; ▪ Use of creativity methods for SysML ▪ Modelling with SysML
Learning Targets/ Skills	The participant ▪ Understands SysML Models; ▪ Is able to analyze Systems using MBSE ▪ Has basic skills to model Systems with SysML
Pre-Requisites	none
Teaching Method	The course structure is based on interactive learning in teams by the application of taught knowledge to a small project.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	100%
Exam	-	-

Course Material	Handouts
Literature	▪ Weilkiens, Tim. Systems engineering with SysML. Morgan Kaufmann, 2008. ▪ Albers, Albert, et al. "Abstraktionsgrade der Systemmodellierung–von der Sprache zur Anwendung." Tag des Systems Engineering (2014): 183. ▪ Albers, Albert, et al. "Produktgenerationsentwicklung – Bedeutung und Herausforderungen aus einer entwicklungsmethodischen Perspektive." Konferenzband Stuttgarter Symposium für Produktentwicklung. Stuttgart. 2015.
Contact Lecturer	Dr.-Ing. Nikola Bursac, E-Mail: ***Nikola.Bursac@kit.edu***

6.5.2 Patent Strategy in Industry

Lecturer	Dipl.-Ing. Frank Zacharias
Content	Fields of activity; ▪ Procedures and strategic targets of patent management
Course Objectives	▪ Overview re IP rights; ▪ Protection of innovations and designs in innovative companies and international; ▪ Licensing of technologies and adaption of patent strategies
Learning Targets/ Skills	Basic knowledge about patent and design law;

	▪ Introduction in internal proceedings and decision processes re IP matters; ▪ Entering in claim and risk management re IP conflicts; ▪ Knowledge base re negotiating and dispute resolution skills
Pre-Requisites	None
Teaching Method	Presentation of speech (via ppt.) and comprehensive discussions with students
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	-
Project Work	-	-
Exam	-	-

Course Material	Print out of ppt. speech
Literature	None
Contact Lecturer	Dipl.-Ing. Frank Zacharias; E-Mail: ***Frank.Zacharias@porsche.de***

6.5.3 Quality Management

Lecturer	Prof. Dr.-Ing. Gisela Lanza
Content	This course gives an overview of the approaches and methods in quality management (QM). Starting from QM philosophies and legal aspects of QM, the relation and importance of quality along the value-added chain in industry will be the main focus of this lecture. This includes quality assurance in the special context of statistical process control and experimental design. The practice oriented course concludes with the latest developments in Information Technology for QM and with the evaluation of quality in Supply Chains.
Course Objectives	The course provides a comprehensive coverage of modern quality management practice starting from basic principles and ending with state-of-the-art concepts and applications. The objective is to give young professionals a sound under-standing of methods and tools and their practical application in a wide variety of both product and process situations.
Learning Targets/ Skills	The Participant ▪ understands the different quality principles. ▪ is able to apply the identified tools and methods of quality management on new problems. ▪ is capable of analyzing and evaluating the applicability of the learned methods, processes and techniques for a certain problem.
Pre-Requisites	Necessary knowledge for the course includes a basic understanding of manufacturing systems as well as statistics and probability theory.
Teaching Method	The course structure consists of lectures as well as case studies, demonstrations and discussion sections.
Performance Appraisal	

	Written	Oral
Participation during course	-	-
Case Study	-	30%

	Project Work	-	-
	Exam	-	70%
Course Material	PowerPoint Presentation, Case Study, Examples of measuring and test equipment, Web-based application, Course Notes		
Literature	▪ Juran, J. M. / Defeo, J.: Juran's Quality Handbook, 6th edition, McGraw-Hill Professional, New York, 2010, ISBN 978-0-07-162973-7		
Contact Lecturer	Prof. Dr.-Ing. Gisela Lanza, E-Mail: ***Gisela.Lanza@kit.edu***		

6.5.4 Workshop in Product Development

Lecturer	Dipl.-Ing. Norbert Burkardt		
Content	▪ Performing an FMEA (Fault mode and effect analysis) on a complex mechatronic system. ▪ Application of Finite-Element-Method and Multi-Body-System-Simulation in Product Development Process (PDP) ▪ SPALTEN, as taught in the courses is a methodology that helps to solve problems systematically. The student will apply the methodology on a specific problem. ▪ Synectics as one of the more complex creativity methods will also be trained during this Workshop. The students will learn about the effectiveness and the power of this method.		
Course Objectives	Getting familiar with modern methods of fault-analysis, quality-management and robust design. The workshops will give the students an overview about the possibilities of modern simulation methods, a deep insight to the SPALTEN methodology and a feeling for the strength of synectics, a creativity method on a very high level of abstraction. The students will be able to moderate a synectics workshop on them.		
Learning Targets/ Skills	The Participant ▪ implements the methods of product development during the workshop. ▪ is able to solve unknown problems in the context of product development and the respective environment through the synthesis of the gained knowledge of the previous modules.		
Pre-Requisites	Attendance of previous courses of the Master of Management of Product Development.		
Teaching Method	Interactive learning in teams by the application of taught knowledge to a "real-world" problem.		
Performance Appraisal		Written	Oral
	Participation during course	-	-
	Case Study	-	-
	Project Work	-	100%
	Exam	-	-
Course Material	Handouts		
Literature	A comprehensive reader will provide before the beginning of the workshop.		
Contact Lecturer	Dipl.-Ing. Norbert Burkardt, E-Mail: ***Norbert.Burkardt@kit.edu***		

7 Master Thesis Management of Product Development

The Master Thesis can be performed either as a research project in one of the institutes at the KIT or in cooperation with the participant's company. In the latter case it should be performed under the supervision of a faculty member from the HECTOR School.

The following table (Tab. 7-1) summarizes the Master Thesis scope and process:

Content	The Master Thesis should contain the following aspects: ▪ description of the problem ▪ review of the relevant literature (state of the art) ▪ definition, selection and description of suitable approaches ▪ execution of the necessary work schedule (experiments, statistical analyses) ▪ derivation of a conclusion ▪ discussion of validity, scope and verification
Learning Targets/ Skills	Participants demonstrate the skills to independently solve a scientific problem adapting methods and models acquired during participation in the modules 1-10.
Pre-Requisites	Successful completion of 80% of the modules and exams.
Workload	The Master Thesis is to be completed within a period of 9 months. Start of the Master Thesis is the 1st day of the following month after the 8th HECTOR School module.
Master Thesis Operations	1. Orientation Phase: Until module 6 the participants are asked to search for a project within their professional environment. Along with this, they are also asked to search for a first supervisor within the lecturers of the HECTOR School. 2. Registration Phase: The participants are asked to hand in the official Master Thesis application form with an outline of the Master Thesis topic and signed by the chosen first supervisor to the student office of the HECTOR School until the end of module 8. The participant then receives the approval by the study regulations committee. 3. Project Phase: The project phase starts with the 1st of the following month after the 8th HECTOR School module. During the project phase the participants are asked to follow a milestone plan, which is agreed on with their supervisor. The participants regularly report about their progress to the HECTOR School. Before the final submission, the students will hold official colloquia, where they are asked to present the contents of their Master Thesis in a 20 minutes colloquium using modern media. The colloquia dates are usually set around 4 weeks before the official submission date. 4. Submission Phase: The participant is asked to hand in two paper copies and a digital version on CD or data stick to the student office by the announced completion date. Templates and style formats will be communicated by the HECTOR School.

Tab. 7-1 Master Thesis scope and process

Further information on the Master Thesis regulations can be seen in the General Study and Examination Regulations, § 11 (see also Chap. 9.4)

8 Karlsruhe Institute of Technology (KIT)

On October 01, 2009, the Karlsruhe Institute of Technology (KIT) was founded by a merger of Forschungszentrum Karlsruhe and Universität Karlsruhe. The basis was the KIT Merger Act that was adopted unanimously by the Baden-Württemberg state parliament in July 2009. KIT bundles the missions of both precursory institutions: A university of the state of Baden-Wuerttemberg with teaching and research tasks and a large-scale research institution of the Helmholtz Association conducting program-oriented provident research on behalf of the Federal Republic of Germany. Within these missions, KIT is operating along the three strategic fields of action of research, teaching, and innovation.

With roundabout 9450 employees and an annual budget of about EUR 850 million, one of the largest research and teaching institutions nationwide is established in Karlsruhe. It has the potential to assume a top position worldwide in selected fields of research. The objective: KIT will become an institution of top research and excellent scientific education as well as a prominent location of academic life, life-long learning, comprehensive advanced training, unrestricted exchange of know-how, and sustainable innovation culture.

8.1 Department of Mechanical Engineering

Production Technology: Taking an integrated approach

The holistic treatment of products and production in an international environment is central to industrial engineering research projects at Karlsruhe; included in this is not only manufacturing itself, but also operation, maintenance and recycling. The opening of national borders for industries results in the necessity to reduce development times and in turn increase the application of technical models and computational simulations.

Research at Karlsruhe in production focuses on taking an integrated approach to the product and the production within an international context. It is not restricted to the process of production alone, but also includes aspects such as plant operation, maintenance and recycling. Another aspect is the increasing pressure to intensify automation. Research and teaching at the Department's production-technology oriented institutes cover almost every phase of the product life cycle. Research includes issues such as product planning, design, production planning, manufacturing and assembly, quality management, material flow technology and logistics as well as industrial management and ergonomics.

Product Development and Design: The creative element

Product Development and Design have the goal of examining and developing a theoretical basis for methodical development processes including the respective computing systems (CAD/CAM). Taking traditional design methods as a starting point, researchers use an integrated approach to accompany and systematically manage the entire product development and production process. Complex product

development and production tasks are solved in close cooperation with industry. In doing so the focus is on the entire development chain – from environmentally compatible and strategic product planning brainstorming all the way to creating complete three dimensional CAD designs is focused on. Simulations and prototype construction are also part of the process. Other research areas include:

- Energy and environment – developing sustainable technology
- Material Technology – enabling innovative engineering
- Microsystem technology- large impact from small devices
- Mechatronics – a symbiosis of two technological worlds
- Vehicle and powertrain technology – the motors of a mobile society
- Theoretical basics – the foundations of engineering

8.2 Department of Economics and Management

Research and teaching at the Department of Economics and Management in Karlsruhe is distinguished by interdisciplinary networked tasks and a focus on current developments. The faculty is the largest training center for graduate industrial engineers in Germany.

The interdisciplinary course in industrial engineering with business studies has characteristics that are typical for Karlsruhe Institute of Technology (KIT): it is geared towards quantitative problems and is therefore strongly method-orientated; it also includes applied computer science. Working in an interdisciplinary network, perhaps taking both economic and technical aspects into account at the same time, is essential for the design, manufacture and marketing of products.

Interdisciplinary research

Despite the large number of resources devoted to teaching at the institutes, research is still very much a priority. The interdisciplinary Research Training Group “Market Engineering” recently founded bridges the gap between education and research. The program is devoted to designing institutions, services, systems and social models for electronic markets while taking into account all of the economic, technology-based and legal aspects.

The main fields of research include:

- Finance and capital market research
- Marketing and market research
- Mapping work processes using computer science
- Information management
- Production and materials flow management
- Ergonomics

- Sustainable construction
- Traffic prediction and transport network planning
- System dynamics and innovation
- Optimization, resource management and risk management
- Actuarial science and applied risk science
- Welfare economics
- Experimental economic research

8.3 Department of Informatics

Without the use of computers hardly anything in our society would function. Whether in transportation, production, administration, health care or leisure, computers unobtrusively complete increasingly important tasks. As a result, information technology has become an extremely significant sector. The Universität Karlsruhe (TH) was the first German university to offer a full Diploma degree in informatics in 1972. Ever since then, the Department of Informatics is considered a leader in the field and internationally ranked number one in all the major rankings and evaluations.

Research and education in informatics at the Karlsruhe Institute of Technology (KIT) is characterized by its breadth coupled with a strong focus on theoretical and practical aspects. The value that the faculty places on multi-disciplinary education is shown by the offer of business informatics degree program. Other fields of research include:

- The applications of computer science: computer-aided surgery
- Semi-humanoid robot systems
- Computers for everyday use

8.4 Department of Electrical Engineering and Information Technology

Its 15 institutes – including two interdepartmental research centers – and approximately 1500 students put the department in the very heart of engineering at the Karlsruhe Institute of Technology (KIT). By focusing on automation, energy, information and communication technology and electronic components and circuits, the faculty puts students in touch with all of the cutting-edge areas of electrical engineering and information technology.

The demand for components and systems for the fast transfer, storage, visualization and processing of information is steadily increasing. Hybrid and quantum components and molecular electronics result in completely new possibilities for future information processing and storage.

Microelectronic and nanoelectronic components also enable the so-called System on Chip (SoC): the integration of complete microelectronic systems onto a single silicon chip has become feasible through the rapid development of CMOS VLSI technology. This demands cost-effective technology, application specific hardware/software architectures and highly efficient design methods. Other research areas include:

- Mechatronics – new functions through interdisciplinary research
- Energy at the cross roads of ecology and economics
- Fuel cells: a technology for the future
- Wireless communication: effective planning of transmitter networks
- Systems engineering: personal health monitoring
- Aviation and aeronautics
- Microelectronics, nanoelectronics and optoelectronics

8.5 Department of Chemical Engineering

The Department of Chemical Engineering and Process Engineering at the KIT with 12 chairs at 6 institutes and about 1000 students is one of the world's largest in their field of study. Chemical Engineers have been educated successfully in Karlsruhe since 1928. The traditional courses chemical engineering and process engineering were complemented by the bioengineering program in 2001. All three courses have steadily increasing intake and graduate numbers.

Chemical engineering, process engineering and biological engineering are interdisciplinary engineering sciences connecting the fields of engineering, technical physics, mathematics, and chemistry. The focus of research and teaching at the faculty is in the three general themes material process technology, biotechnology and food technology, energy and environmental technology.

8.6 Department of Civil Engineering, Geo and Environmental Sciences

At the beginning of the foundation of the University of Karlsruhe stood the engineer Johann Gottfried Tulla. In 1807 he founded an Engineering School in order to educate employees for the administration of Highway Building and Hydraulic Engineering, which was organized by him. An architect joined this project: Friedrich Weinbrenner, his Building School arose from the Architectural Drawing School, which existed since 1787. The union of Tulla's Engineering School and Weinbrenner's Building School with the Academy of Machine Construction of Freiburg and a School of Forestry gave rise to the foundation of a Polytechnic School in 1807. It achieved academic quality and was called "technical academy". Tulla, the principal of the highway building and hydraulic administration of Baden County had already intensely prepared the project. In Paris short after Napoleon's coup d'état he had got to

know the Polytechnic University of Ecole – the University, which at first gave its students a basic scientific education, before it specialized the prospective engineers in their future profession.

Today both the traditional acquiring of basic scientific knowledge and accomplishing of applied scientific work are regarded as equally important at the University Fridericiana, how the university is called since 1902. And Tulla's special field of activity - the regulation of the Rhein is still researched today. Since 2002 Geo- and Environmental Sciences and the Civil Engineering work together within this department. Thus the dovetail connection and interaction of building structures and their environment and the study of intervention/interference in the city and cultivated landscape are accommodated during the education and research.

9 Appendix

9.1 European Credit Transfer and Accumulation System

9.1.1 What is the ECTS (European Credit Transfer System)?

The European System for calculating, assessing and accumulating student performance is a system specifically designed for students. It is based on the workload that the student must complete in order to achieve the objectives of the program of study. These objectives are primarily defined in the form of learning outcomes and the competencies that are to be acquired in the course of study.

9.1.2 What are the primary aspects of ECTS?

The ECTS is based on the general understanding that the workload for a full-time student during an academic year corresponds to a total of 60 ECTS-credits. That means that the workload for a full-time student studying in Europe comprises 1500-1800 working hours per year in most cases. For our part-time program the workload consists of 90 ECTS for the whole program which is effectuated in approximately 1,5-2 academic years.

- The workload in ECTS consists of the time that a student requires to complete a variety of learning activities, such as attending lectures and seminars (contact hours), self-study, project work, exam preparation, etc.
- Credits are assigned to all components of a program of study (e.g. modules, courses, laboratories, final project, etc.) and indicate the workload of each component in relation to the total workload that would be required in one full year of study in the appropriate program of study.
- The learning results are a set of competencies, which indicate what the students should know, understand, and be able to do at the end of a short or long learning process. Credits in ECTS are awarded to students only after the course has been completed and a corresponding evaluation of the desired learning results has been made.
- The assessment of student performance is documented via the commonly-used grading system for each local/national region. It is good practice, especially in the case of credit transfers, to include an ECTS grade. The ECTS grading scale ranks students based on a statistical distribution. Thus, statistical data on student performance is a necessary prerequisite for applying the ECTS grading scheme. Successful students can obtain the following grades: A for the best 10%, B for the next 25%, C for the next 30%, D for the next 25%, E for the next 10%. Unsuccessful course performance receives a grade F. The transcript of records need not specify the number of failed attempts.

9.2 Quality Management

The faculty of the Hector School of Engineering and Management guarantee for the quality and continual improvement of the curriculum. A number of tools are used in order to ensure the high academic and pedagogic standards defined by their members.

9.2.1 Course evaluation

After each module a written questionnaire is distributed to the participants on which they can evaluate the quality of the lectures. The main topics are:

- lecture content
- mathematical demands
- practical applicability
- interference/overlap with other lectures
- relationship/link to preceding lectures
- speed of material presentation
- extension of the lecture material
- usefulness/relevance of lecture notes
- audibility of lecturer
- blackboard, transparency structure
- preparation of lecturer
- presentation style and motivation
- willingness to answer questions

After each module the returned questionnaires are analyzed and published on the sharepoint of the HECTOR School and are discussed with lecturers and students.

9.3 Admissions Regulations

The official “Satzung für den Zugang zu dem weiterbildenden Masterstudiengang Management of Product Development am Karlsruher Institut für Technologie” has been published here: http://www.sle.kit.edu/amtlicheBekanntmachungen2013.php

A translated version of the “Admission Regulations” can be found on the sharepoint of HECTOR School.

9.4 General Study and Examination Regulations

The official “Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den weiterbildenden Masterstudiengang Management of Product Development” has been published here:

http://www.sle.kit.edu/amtlicheBekanntmachungen2013.php

A translated version of the “General Study and Examination Regulations” can be found on the sharepoint of HECTOR School.

9.5 Fees Regulations

The official “Satzung des Karlsruher Instituts für Technologie (KIT) über die Studiengebühren für die weiterbildenden Masterstudiengänge Electronic Systems Engineering & Management, Energy Engineering & Management, Financial Engineering, Green Mobility Engineering, Management of Product Development, Production and Operations Management, Service Management & Engineering” has been published here: http://www.sle.kit.edu/amtlicheBekanntmachungen2013.php

A translated version of the “Fees Regulations” can be found on the sharepoint of HECTOR School.

9.6 Change Management

Corrections regarding content and structure are listed below:

Date	Author	Page	Chapter	Change/Corrections
01.09.2011	EH	All	All	Relaunch Course Guide Book in Layout and Structure
01.09.2011	EH	26	5.5.3	Change of Performance Appraisal from “Exam Written 100%” to “Exam Written 50% and Project Oral 50%”
06.09.2011	EH	6	4.4.1	Annexation of Dr. Emmerich Schiller as a lecturer in the Management Modules.
06.09.2011	EH	6	4.4.1	Extinction of Mr. Leif Marxen as a lecturer in the Management Modules. Prof. Albers will take over the subject.
14.09.2011	EH	31	6.1.3	Änderung Performance Appraisal lt. Angaben von Sascha Ott
15.09.2011	MW	11	5.1.2	Update literature
15.09.2011	MW	12 + 13	5.2.1	Update literature
15.09.2011	MW	14	5.2.2	Update literature
15.09.2011	MW	15	5.2.3	Update literature
15.09.2011	MW	24	5.4.2	Update literature
15.09.2011	MW	25	5.4.3	Update literature
15.09.2011	MW	27	5.5.1	Update literature
15.09.2011	MW	33	6.1.3	Update literature
15.09.2011	MW	35	6.2.1	Update literature
15.09.2011	MW	48 + 49	6.5.2	Update literature
21.02.2012	SF	26	4.3.3.	New lecturer for “Marketing”: Prof. Dr. Martin Klarmann
01.05.2012	SF	13	4.1.1.	New lecture “Introduction to Accounting and Controlling” added. Lecturer: Prof. Dr. Ir. Marc Wouters
16.10.2012	SF	17	4.2.1.	New lecturers for “Project Management and Scheduling” added. Lecturers: Dr. Silke Heine and Prof. Dr. Stefan Nickel
14.01.2013	SF	All	All	Review of entire program structure, learning results, workload and literature
28.04.2014	SF	13ff	5. and following chapters	New numeration of chapters 5 (former chapter 4) and all following chapters. Due to the nex chapter “Qualification Objectives”.
28.04.2016	SF	9	3.2.	New chapter “Sequence of Modules” – will be adapted for each Intake
		13ff	5.1. and 5.2.	Change of sequence of Management Module 1 and 2. New MM1 is now “Project Management”; new MM2 is now “Finance

			for Executives".
	25	5.3.2.	New lecturer for Management Accounting Adjustment of content
	27	5.4.	New Module Supervisor for Management Module 4
	28	5.4.1.	New lecturer for "Human Resource Management": Prof. Dr. Petra Nieken
	38	5.5.3.	New lecturer for International Intellectual Property Law
	73	9.3., 9.4., 9.5.	Adjustment of links