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Contact & Imprint

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

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1 Foreword

Added value of a Master of Sciences in "Production and Operations Management" for prospective executives

In an increasingly competitive environment where the quality of a product is on an equally high level and innovations are disseminating ever faster, a key to success of business units in service and production is the efficiency of the value creating process. Globalization and the closer interaction of partners in the value creating chain are options for improvement of the currently established business processes. A big challenge is the strive for global optimum of the value creating chain while maintaining local responsibility for execution, reliability and quality.

The Executive Master Program of Production and Operations Management (POM) provides the necessary knowledge methods and tools to understand and improve the operation of production and service units by creating appropriate and best-in-class business processes. Since in production and logistics the flow of data, products and money are closely linked, causes on the modules of POM deal with all these three factors. Human resources management is vital to achieve the manageability of those processes, which are needed to set up and operate network and systems that combine data money and material into a product.

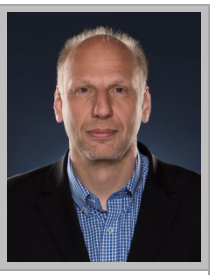
Project Management on a global scale in particular in multi project environment is a necessary tool to set up and improve operations and structures. The optimization and sizing of the necessary structures for production, warehousing, transportation and information processing is based on mathematical modeling and data exploration. Necessary fundamentals are subject of the courses in operations research. All the above topics are covered in the POM by linking concepts and models in case studies to the experience of participants. The interdependencies of the necessary functions in the supply chain will be constantly addressed throughout the program, bringing everything together in an interdisciplinary, final case study, which will top of the teaching program, preparing you for your Master thesis. People with experiences in production, services, especially logistics, will gain extensions of their professional skills enabling them to understand and manage value creating chains, connecting business units and companies on a higher level of profitability and long term customer satisfaction.

Prof. Dr.-Ing. Kai Furmans

Program Director for Production and Operations Management

2 Program Directors

Title/Name	Prof. Dr.-Ing. Kai Furmans 
Phone	+49 (0)721 608-48600
E-Mail	***Kai.Furmans@kit.edu***
Affiliation	Institute for Conveying Technologies and Logistics, Karlsruhe Institute of Technology (KIT) Fritz-Erler-Str. 1-3, 76133 Karlsruhe, Germany
Current Position	Director of the Institute for Conveying Technologies and Logistics Endowed Chair of Logistics H. Hübner Foundation
Vita	1992 PH. D. (Dr.-Ing.) Universität Karlsruhe (TH) 1996 - 2003 Robert Bosch GmbH, Director of Logistics 2000 Doctorate of Science (Habilitation) Universität Karlsruhe 2003 Appointed Full Professor Karlsruhe Institute of Technology (KIT)
Fields of Interest	▪ Finite Element Analysis of Material Handling Systems ▪ Enhancement of self-organization in Traffic using I+K support services ▪ Cause and Effect in decentralized supply chains ▪ Simulation and Modeling of Logistic Systems ▪ Distribution Networks ▪ IT-Systems for Logistics
Memberships & Awards	▪ GOR ▪ VDI: chair of work group “Methods of Modeling”

Title/Name	Prof. Dr. Stefan Nickel 
Phone	+49 (0)721 608-43381
E-Mail	***Stefan.Nickel@kit.edu***
Affiliation	Institute of Operations Research: Discrete Optimization and Logistics, Karlsruhe Institute of Technology (KIT) Englerstr. 11, 76131 Karlsruhe, Germany
Current Position	Head of the Chair: Discrete Optimization and Logistics at the IOR
Vita	1995-1999 Assistant Professor, University of Kaiserslautern Since 1999 Associate Professor, University of Kaiserslautern 2003-2009 Chair in Operations Research and Logistics, University of Saarbrücken Since 2009 Chair in Discrete Optimization and Logistics, KIT

Fields of Interest	▪ Modellinglocation decisions in Supply Chain Management ▪ Multiperiodic deisgn and optimization of distribution networks ▪ Optimization methods in in-house logistics ▪ Optimization methods in health care
Memberships & Awards	▪ INFORMS ▪ European Working Group on Locational Decisions (EWGLA) ▪ College on Locational Analysis (COLA) ▪ Gesellschaft für Operations Research e.V. (GOR) ▪ Mathematical Programming Society (MPS)

3 Organization

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 of the KIT. 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 and the curriculum of the program.

# of Module	Type of Module	Name of Module	Course
1	EM1	Introduction to Production and Operations Management	1. Introduction to Industrial Engineering
			2. Production and Logistics Controlling
			3. Information Systems I
			4. Operations Research I
2	EM2	IT Support of Production Systems	1. Industrial Services
			2. Information Systems II
			3. Simulation of Production Systems
			4. Operations Research II

# of Module	Type of Module	Name of Module	Course
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	Methods of Operations Management	1. Supply Network Management I
			2. Production Engineering
			3. Human Factors and Ergonomics
			4. Stochastic Models of Manufacturing Systems
6	MM3	Management Accounting, Marketing and Strategy	1. Business Strategy
			2. Management Accounting
			3. Marketing
7	EM4	Networks of Supply and Production Systems	1. Supply Network Management II
			2. Supply Network Management III
			3. Technologies of Distribution Networks
			4. Global Production
8	EM5	Production and Distribution Systems	1. Information Technology for Logistic Systems
			2. Quality Management
			3. Supplier Management
			4. Industrial Management Case Study
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 POM

3.2 Academic Calendar Intake 2015

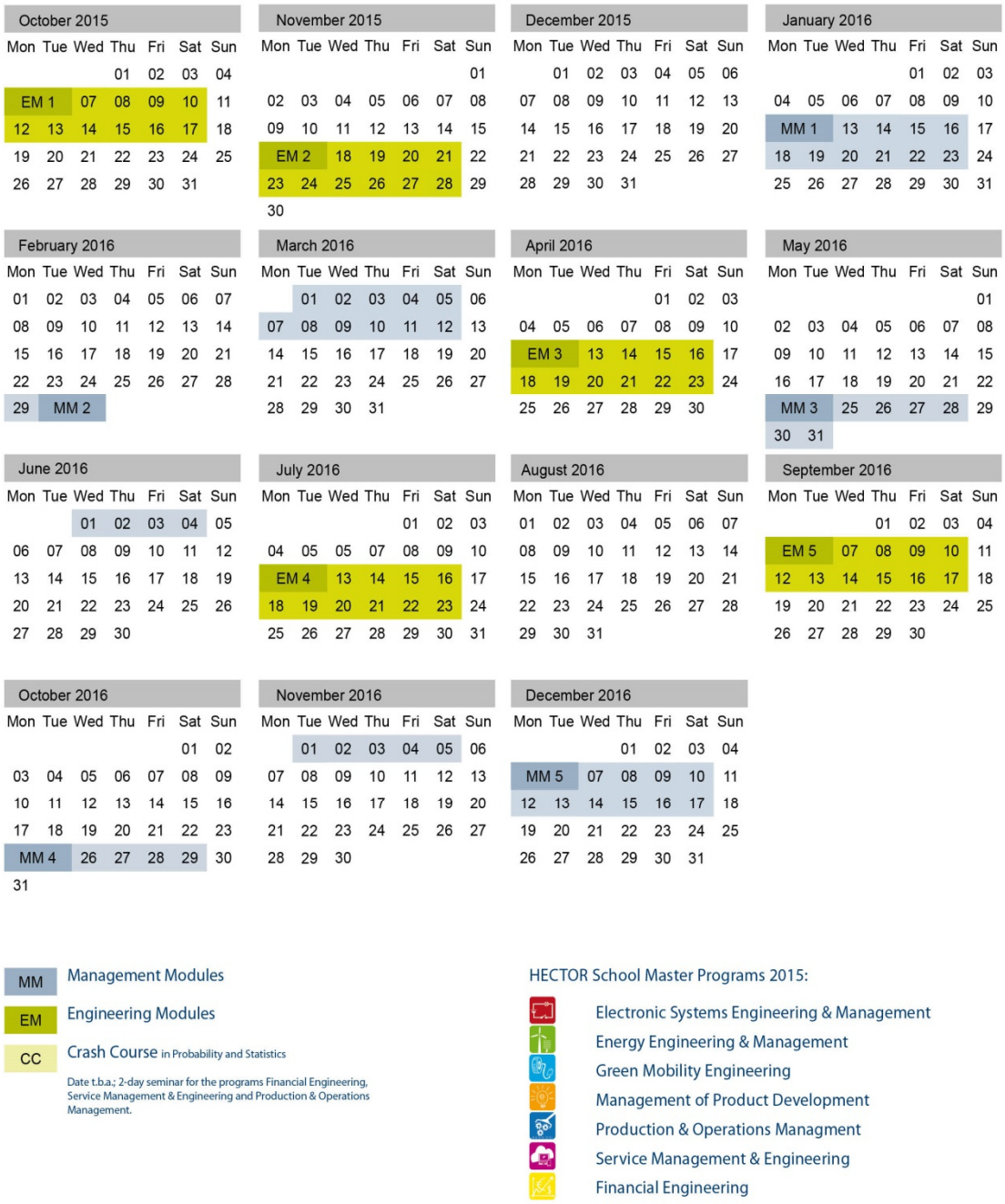


Figure 1: Academic Calendar Intake 2015

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 the 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	
		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	900/600	30	20
Total		90	90

3.5 Lecturers

3.5.1 Management Modules

Name	Institute
Program Director	
Prof. Dr. Stefan Nickel	Institute for Operations Research, 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 Economic Information and Marketing, KIT
Prof. Dr. Petra Nieken	Chair of Human Resource Management, KIT
Prof. Dr. Clemens Puppe	Institute of Economic Theory and Statistics
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, KIT
Dr. Michael A. Buchmann	IMTEAM Intercultural Management Team
Prof. Dr. Barbara Deml	Institute for Industrial Science and Business Organization (ifab), KIT
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, KIT
Prof. Dr. Berthold Wigger	Institute for Economic Policy Research, KIT

3.5.2 Engineering Modules

Name	Institute
Program Director	
Prof. Dr.-Ing. Kai Furmans	Institute for Conveying Technologies and Logistics, KIT
Module Supervisors	
Prof. Dr. Oliver Stein	Institute for Operations Research, KIT
Prof. Dr. Dr.-Ing. Dr. h. c. Jivka Ovtcharova	Institute for Information Management in Engineering, KIT
Prof. Dr.-Ing. Gisela Lanza	Institute of Production Science, KIT
Lecturers in Alphabetical Order	
Dr. Bernd Brinkmeier	Siemens AG
Prof. Dr. Hansjörg Fromm	KSRI – Karlsruhe Service Research Institute, KIT
Prof. Dr.-Ing. Kai Furmans	Institute for Conveying Technologies and Logistics, KIT
Dr.-Ing. Thilo Gamber	Continetal TEVES AG & Co. oHG
Dr.-Ing. Jan Hrdina	Continental AG
Prof. Dr. Stefan Nickel	Institute for Operations Research, KIT
Jun. Prof. Dr.-Ing. Verena Nitsch	Universität der Budneswehr München
Stefan Ruhrmann	Global Advanced Manufacturing Institute, China, KIT
Prof. Dr.-Ing. habil. Volker Schulze	Institute of Production Science, KIT
Dr.-Ing. Patricia Stock	REFA Institut e.V.
Mathias Thomas	Dr. Thomas +Partner GmbH & Co. KG
Dr. Helmut Wlcek	KSRI – Karlsruhe Service Research Institute, KIT

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 Production and Operations Management

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

1. Using the skills acquired in the Master Program in the area of production management with a special focus on production processes, information technology and logistics, as well as the necessary subject-specific methods and tools, the graduates are able to understand and analyze the processes in production and manufacturing, grasp the requirements and formally describe them, formulate constraints and objectives and implement targeted improvements. For this purpose, they also learn to use methods of simulation.
2. The graduates are able to independently analyze and optimize the efficiency of value-adding processes in connection with the operation of production and service systems.
3. They know current operations management concepts and methods, particularly in the context of decision support and -making, and can use and develop these in a way related to issues.
4. Graduates are able to recognize the possibilities and limits of formal methods and models, as well as the challenges related to the transfer from the model world to reality and are also capable of dealing with them in a solution-oriented way.
5. Since in production and logistics information, means of production and cost effectiveness are closely linked, the graduates can independently optimize problems, taking into account all three factors and using multidisciplinary approaches.
6. Graduates are able to analyze and evaluate technological problems in the context of logistics and production under economics aspects.
7. They are able to thoroughly understand the approach in the internal and external financial reporting and to apply it in the corporate context.
8. Furthermore, they are familiar with approaches to preparing and optimizing a company's strategic decisions.
9. 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.
10. The graduates are able to understand marketing, human resource management, and legal issues approaches in the technological context, to recognize and evaluate interconnections and, on this basis, to evaluate the effectiveness of strategies. On the basis of this analysis, recommendations for action can be derived.

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, Prof. Dr. Stefan Nickel, Dipl.-Inform. Abilio Avila
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	Participation during course: Written - / Oral - Case Study: Written - / Oral - Project Work: Written - / Oral - Exam: Written 100 % / Oral -
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	Participation during course: Written - / Oral - Case Study: Written - / Oral - Project Work: Written - / Oral - Exam: Written 100 % / Oral -
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 A. Buchmann
Content	Why and what is 'Intercultural Management'? ▪ 'Culture' in the sense of 'business culture', 'corporate' or 'leadership culture' and 'national management culture'; it has a 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 ▪ 'Culture standards', factors of variations, changes over time

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

- 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>Power point 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 in digital form.</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, Also in International Journal of Project Management, Vol. 1, no. 1, 1983, 4-48
- 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 A. 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 three exams, a case study with a presentation.

Credit Points: 6

5.2.1 Introduction to Finance and Financial 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
Participation during course	-	100%
Reflection document	-	-
Project Work	-	-
Exam	-	-

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***

5.2.2 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	-	20%
Project Work	-	-
Exam	80%	-

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***

5.2.3 Fundamentals of Finance

Lecturer	Prof. Dr. Martin E. 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

	▪ 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
Pre-Requisites	None
Teaching Method	The course structure consists of lectures as well as accompanying exercises, cases, homework, discussion sections and cases.
Performance Appraisal	

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

Course Material	Lecture notes, homework, exercises and case studies.
Literature	Hawawini, G. and Viallet, C. (2015): Finance for Executives, 5th ed., South-Western Publishing
Contact Lecturer	Prof. Dr. Martin E. Ruckes, E-Mail: ***Martin.Ruckes@kit.edu***

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: ***Hagen.Lindstaedt@kit.edu*** 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
	Assignment 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 measure 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 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. Dr. h.c. 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.

<table>
<tr><td>Pre-Requisites</td><td>Successful participation in the module “International Project Management”.</td></tr>
<tr><td>Teaching Method</td><td>The course structure consists of lectures, case studies, simulations and project work. It explores team and self-awareness.</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>100%</td><td>-</td></tr>
<tr><td>Exam</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
<tr><td>Course Material</td><td>Lecture notes, homework, case studies and exercises, in printed form.</td></tr>
<tr><td>Literature</td><td>None.</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Albert Albers, E-Mail: Albert.Albers@kit.edu</td></tr>
</table>

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 participant 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 Participant ▪ knows how to deal with advanced concepts of the microeconomic theory – for example the general theory of equilibrium or the pricing theory – and is able to apply these to real problems, e. g. the allocation of factor and goods markets. ▪ knows 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. ▪ understands and can apply the substantial techniques to analyze inter temporal macroeconomic models with uncertainty. ▪ understands 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 digital 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	The Participant ▪ understands how business law functions (also in cross border cases). ▪ gains insight into important forms of business organizations. ▪ learns central issues of business law including their international dimension. ▪ recognizes the interdependence of business law within a globalized economy.		
Learning Targets/ Skills	The Participant becomes familiar with important forms of business organizations and learn how to deal with business law issues including international aspects and cross border elements. The Participant learns 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).
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	The Participant 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 Introduction to Production and Operations Management

Industrial management and engineering is of holistic character. So far, industrial engineering has aimed integrating man, material, equipment, and funds in production systems. Now, activities also focus on the IT and technology infrastructure to control complex systems. Hence, the industrial engineer concept was enlarged from an “efficiency expert” and “productivity expert” by the concept of a “knowledge worker”. Today, industrial engineering also deals with the development, optimization, installation, and management of holistic systems, consisting of man, materials, and infrastructure, for any type of production or service. The Introduction Production and Operations Management module enables participants to understand all necessary concepts and underlying methods of industrial management. This module focuses on deterministic and stochastic operations research which is of great help for the planning process of logistic systems (modeling, simulation, etc.) and IT concepts and tools which accompany the Product Life Cycle Management process at the interface of product development and production.

Module Name: Introduction to Production and Operations Management

Module Supervisor: Prof. Dr. Oliver Stein

Type of Module: Engineering Module 1 (EM1)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Introduction to Industrial Engineering	18	25,2
Production and Logistics Controlling	19,5	27,3
Information Systems I	18	25,2
Operations Research I	19,5	27,3

Major Learning Results (LR):

LR-1: Understanding of industrial engineering concepts and analysis of production systems with the help of stochastic models, evaluation based on the characteristics determined.

LR-2: Understanding of the relationships in product-related information management systems over the complete product lifecycle.

LR-3: Identification of optimization potentials in the production and logistics environment, solution with the help of mathematical formulas, and determination of the quality of the results.

Performance appraisal for this Module:

Within the first Master-specific Module in Production and Operations Management the performance appraisal is mostly based on oral exams containing varying components of classroom participation. The exams for the lectures *Production and Logistics Controlling* and *Operations Research I* will be combined.

Credit Points: 6

6.1.1 Introduction to Industrial Engineering

Lecturer	Dr.-Ing. Thilo Gamber Dr.-Ing. Jan Hrdina
Content	The course is a general introduction to the operations of an industrial company. It explains major processes of production enterprises. The content of "Introduction to Industrial Engineering" is: ▪ Objectives and Process Models; ▪ Market Analysis, Product Design and Production Program ▪ Production Control ▪ Planning of Resources ▪ Quality Management ▪ Product Utilization and Recycling ▪ Design of Manufacturing Systems ▪ Design of Assembly Systems ▪ Maintenance Strategies ▪ Management Systems ▪ Principles of Project Management ▪ Procedures in Factory Planning
Course Objectives	"Introduction to Industrial Engineering" is intended as an introductory course for understanding management processes in industry. Many of the topics mentioned in this course appear in the following courses during the major "Production and Operations Management".
Learning Targets/ Skills	The Participant ▪ gains competencies of basic concepts of Industrial Engineering ▪ will learn how to create effective and efficient processes in industry
Pre-Requisites	No specific prerequisites are required.
Teaching Method	The course structure consists of lectures and tutorials.
Performance Appraisal	Written: Participation during course: - / Oral: -

	Case Study	-	-
	Project Work	-	-
	Exam	-	100%
Course Material	Lecture notes in printed form.		
Literature	▪ Krajewski, Lee J.; Ritzman, Larry P.: Operations Management. Reading MA: Addison-Wesley Publishing, 2009. ▪ Nahmias, S.: Production and Operation Analysis. New York, NY et al.: McGraw-Hill/ Irvine, 2008. ▪ Hoop, W.J.; Spearman, M.L.: Factory Physics. New York, NY et al.: McGraw-Hill/ Irvine, 2011.		
Contact Lecturer	Dr.-Ing. Thilo Gamber, E-Mail: **Thilo@Gamber.de** Dr.-Ing. Jan Hrdina, E-Mail: **Jan_Hrdina@web.de**		

6.1.2 Production and Logistics Controlling

Lecturer	Dr. Helmut Wlcek		
Content	The course gives an overview about the following topics: ▪ Targets of production and logistics controlling ▪ Strategic and operational production and logistics controlling ▪ Methods of production and logistics controlling o Performance monitoring with Key performance indicators (KPI) and KPI systems o Cost accounting and activity based costing o Deviation Management o Investment calculation o Benchmarking		
Course Objectives	Understanding the targets and methods of production and logistics controlling		
Learning Targets/ Skills	The Participant ▪ acquires knowledge of the decentralized questions of global production and logistics controlling. ▪ understands concepts of planning and running of global supply chains and is able to plan such supply chains. ▪ understands the requirements and boundary conditions in planning global production networks. ▪ acquires knowledge of the basics of Performance Monitoring.		
Pre-Requisites	No specific prerequisites are required.		
Teaching Method	The course consists of lectures, exercises, discussions, cases, and homework.		
Performance Appraisal		Written	Oral
	Participation during course	-	-
	Case Study	-	20%
	Project Work	-	-

	Exam	-	80%
Course Material	Lecture Notes		
Literature	▪ Arnold, D. et al.: “Handbuch Logistik”. Berlin, Springer Verlag, 2008. ▪ Weber, J., Wallenberg, C.M.: “Logistik- und Supply Chain Controlling”. Stuttgart, Schäffer-Poeschel, 2010.		
Contact Lecturer	Dr. Helmut Wlcek; E-Mail: ***Helmut.Wlcek@kit.edu***		

6.1.3 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 (PLC) in terms of information types and different PDM, ERP, CRM, SCM systems within this approach. The functional overview of PLM (PLC Management) Systems as well as Model Driven Architectures are 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. Information Systems I is a basic course, required for the students planning to attend Information Systems II.
Learning Targets/ Skills	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.
Pre-Requisites	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.
Teaching Method	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 included during lecture.
Performance Appraisal	

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

	Exam	-	90%
Course Material	The course will be held in the form of multi-media presentation. The online version of the course will also be available in the Share Point. For exercises and project work, the participants will have access to computer labs.		
Literature	▪ Gray, Peter M. D.: The functional approach to data management : modeling, analyzing and integrating heterogeneous data / Peter M. D. Gray - Berlin ; Heidelberg : Springer, 2003		
Contact Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova, E-Mail: ***Jivka.Ovtcharova@kit.edu***		

6.1.4 Operations Research I

Lecturer	Prof. Dr. Oliver Stein		
Content	The course covers the following topics: Introduction: Basic concepts of decision making, optimization models, algorithms, and applications, time complexity of algorithms. Linear Programming (LP): Modeling linear programs, simplex method, duality, transportation, transshipment, and assignment problems, elements of game theory. Network optimization: Graphs and networks, shortest paths in networks, maximal and minimum cost flows in networks, minimal spanning trees.		
Course Objectives	Understanding of decision making and optimization models and algorithms, in particular, in linear and network optimization.		
Learning Targets/ Skills	The Participant ▪ names and describes the basic terms of crucial subareas in the subject Operations Research (Linear Optimization, graphs and networks) ▪ knows the vital methods and the related mathematical models for a quantitative analysis ▪ gains knowledge of modeling and classification of optimization problems such as the selection of suitable solution procedures in order to solve optimization problems independently ▪ validates, illustrates and interprets received solutions.		
Pre-Requisites	Calculus and linear algebra, use of basic software (e.g., Excel).		
Teaching Method	The course consists of lectures, accompanying exercises, cases, homework, and discussions. Media: PC (PowerPoint), blackboard, overhead projector.		
Performance Appraisal		Written	Oral
	Participation during course	-	25%
	Case Study	-	-
	Project Work	-	-
	Exam	-	75%
Course Material	PowerPoint slides		
Literature	▪ F.S. Hillier, G.J. Lieberman: Introduction to Operations Research, McGraw-Hill, 2005		

	▪ K. Neumann, M. Morlock: Operatiosn Research, Hanser, 2002. ▪ H. Büning, P. Naeve, G. Trenkler, K.H. Waldmann: Mathematik für Ökonomen im Hauptstudium, Oldenburg, 2000
Contact Lecturer	Prof. Dr. Oliver Stein; E-Mail: ***Stein@kit.edu***

6.2 IT Support of Production Systems

IT support of production systems is an essential part in state of the art production systems. E.g., virtual engineering is the early, continuous, integrated support of the development process as regards to the adjustment, evaluation, and concreteness of the development results from all partners with the help of virtual prototypes. Modern production systems strongly depend on an appropriate IT support during the complete lifecycle. For this reason, this module focuses on understanding, generating, and analyzing models from various domains. On this basis, evaluation and optimization methods are applied to new problems and extended. Methodological competences are combined with scientific work in the areas of product lifecycle management, simulation, and optimization.

Module Name: IT Support of Production Systems

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

Type of Module: Engineering Module 2 (EM2)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Industrial Services	18	25,2
Information Systems II	19,5	27,3
Simulation of Production Systems	18	25,2
Operations Research II	19,5	27,3

Major Learning Results (LR):

LR-1: Description of application scenarios for modern CAD systems and modeling methods, other CAx systems, and of virtual development systems for optimization and decision-making, identification of their limits, and extension of their potentials.

LR-2: Analysis of service processes in industrial production by description and modeling with formal methods. On this basis, design of new service processes.

LR-3: Integration of the aspects of man, machine, and material in simulation models, understanding of the limits of various types of modeling, and generation and adaptation of appropriate models in the domains.

LR-4: Use of modern and heuristic algorithms for practical problem solution in the field of integer, nonlinear, and dynamic programming.

Performance appraisal for this Module:

Within the second Master-specific Module the performance appraisal will be based on written exams containing varying degrees of classroom participation. The exams for the lectures in *Simulation of Production Systems* and *Operations Research II* will be combined.

Credit Points: 6

6.2.1 Industrial Services

Lecturer	Prof. Dr. Hansjörg Fromm
Content	The course addresses the following topics: ▪ What are Industrial Services? - Introduction and Overview ▪ From "Classical Maintenance" to "Servitization" ▪ Spare Parts Planning – Location and Inventory Planning ▪ Service Technician Planning ▪ Call Center Services ▪ Condition-Based Monitoring, Predictive Maintenance ▪ Service Business Models – Full Service Contracts ▪ IT-Enabled Value-Add Services
Course Objectives	The course gives the students an understanding of the transformation that the industry is currently undergoing in becoming more service-oriented ("servitization"). The main trends and their economic implications will be highlighted. The importance of mathematical methods and IT will be demonstrated for "classical" service areas like spare parts planning and call center operations, but also for evolving areas like predictive maintenance and full-service contracts
Learning Targets/ Skills	The Participant ▪ gets an deep insight into the trends in industrial services. ▪ gains competencies in the most important operational issues in industrial services and the mathematical methods used for decision support.
Pre-Requisites	Basics in calculus, statistics, and probability theory
Teaching Method	The course consists mainly of lectures (theoretical part), demos, and exercises (practical application)
Performance Appraisal	

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

Course Material	PowerPoint slides
Literature	For an introduction: ▪ Oliva, Kallenberg: Managing the transition from products to services (2003) ▪ Cohen, Agrawal, Agrawal: Winning in the Aftermarket (2006)

	▪ Neely, The Shift to Services: Trends, Challenges and Opportunities (2012)
Contact Lecturer	Prof. Dr. Hansjörg Fromm, E-Mail: ***Hansjoerg.Fromm@kit.edu***

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 Systems and Modeling Methods. The second part describes the CAx Systems including the CAD, CAPP, CAE, 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
Course Objectives	▪ Rapid development cycle as an active process element. ▪ 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.
Learning Targets/ Skills	The Participant ▪ gains knowledge of CAx and VR Systems ▪ acquires fundamentals of data interfaces
Pre-Requisites	The prerequisites for this course are Basics of 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.
Teaching Method	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.
Performance Appraisal	Written / Oral Participation during course: - / - Case Study: - / - Project Work: - / 10% Exam: - / 90%
Course Material	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 the Karlsruher Institute of Technology (KIT). For exercises and project work, students will have access to computer labs.
Literature	▪ Roller, Dieter: CAD systems development : tools and methods - Berlin ; Heidelberg : Springer, 1997 ▪ Kalawsky, Roy S.: The science of virtual reality and virtual environments : a technical, scientific and engineering reference on virtual environments - Wokingham, England : Addison-Wesley, 1993
Contact Lecturer	Prof. Dr.-Ing. Jivka Ovtcharova; E-Mail: ***Jivka.Ovtcharova@kit.edu***

6.2.3 Simulation of Production Systems

Lecturer	Prof. Dr.-Ing. Kai Furmans Prof. Dr. Volker Schulze Dr.-Ing. Patricia Stock
Content	This course gives the students an insight into the analysis of production and supply networks by simulation. The topics covered in this course include: Random Numbers; Discrete Simulation; Waiting Queue Models and Statistical Analysis; Simulation Packages; Material Flow-oriented Simulation; Simulation of Warehouses and Distribution Systems; Machine Simulation; Robotics Simulation; Shop Floor Simulation; Simulation of Semi-Automated Assembly Systems; Personnel-oriented Simulation; Enterprise Simulation.
Course Objectives	▪ Learning concepts of simulation and understanding different approaches used in modeling tools. ▪ Understanding the benefits of dynamical analyses of processes. Knowledge of simulation as a planning and control tool provided in this course is needed for the "Industrial Management Case Study". There are also interrelations with Supply Network Management I-III, Distribution Networks.
Learning Targets/ Skills	The Participant ▪ gains competencies of the general simulation comprehension. ▪ learns to analyze practical problems and to develop approaches to solving a problem with simulation models. ▪ synthesizes the gained knowledge with the goal to be able to pick appropriate simulation instruments, to use these in product systems and to apply and implement the results respectively. ▪ compares the gained knowledge with the respective personal working experiences of the participants of discussion groups.
Pre-Requisites	▪ Basic knowledge of production systems ▪ Basic knowledge of production management ▪ Basic knowledge of manufacturing processes
Teaching Method	Slides, PowerPoint Presentation and blackboard for the lecture; demonstration of different simulation tools. Simulation tool eM-Plant for laboratory sessions.
Performance Appraisal	
Course Material	Lecture notes and exercises in digital form. Free download of em-Plant students' li-cense:

	Written	Oral
Participation during course	-	25%
Case Study	-	-
Project Work	-	-
Exam	-	75%

	http://www.emplant.de/student/order.htm
Literature	▪ Averill Law; David Kelton: Simulation Modelling and Analysis, New York: McGraw-Hill, 2000.
Contact Lecturer	Prof. Dr.-Ing. Kai Furmans; E-Mail: ***Kai.Furmans@kit.edu*** Prof. Dr. Volker Schulze; E-Mail: ***Volker.Schulze@wbk.kit.edu*** Dr.-Ing. Patricia Stock; E-Mail: ***Patricia.Stock@refa-institut.de***

6.2.4 Operations Research II

Lecturer	Prof. Dr. Oliver Stein
Content	This course covers the following topics: ▪ Integer programming: Integer programs and LP relaxations, branch-and-bound and branch-and-cut methods, heuristic algorithms, important combinatorial optimization problems from practice. ▪ Nonlinear programming (NLP): Differences between LP and NLP models, optimality conditions in NLP, most useful NLP algorithms. ▪ Dynamic programming (DP): Sequential decision processes, Bellman's optimality principle and functional equation, solution of DP problems. ▪ Inventory control and lot sizing: Components of inventory or lot sizing models, deterministic models with continuous and periodic review, stochastic models.
Course Objectives	Understanding of integer and nonlinear optimization in contrast to pure linear programs for modeling of practical problems and corresponding solution techniques.
Learning Targets/ Skills	The Participant ▪ learns and applies the basic terms of the key sections of the subject Operations Research (integral and combinatorial optimization, non-linear optimization, dynamic optimization and stochastic models), ▪ molds and classifies optimization problems and choses suitable solution processes in order to solve optimization problems independently, ▪ is able to apply known optimization processes and possibilities to develop new procedures.
Pre-Requisites	Calculus and linear algebra, use of basic software (e.g. Excel), Operations Research I.
Teaching Method	The course consists of lectures, accompanying exercises, cases, homework, and discussions. Media: PC (PowerPoint), blackboard.
Performance Appraisal	
Course Material	PowerPoint slides.
Literature	▪ Hillier & Lieberman, Introduction to Operations Research, Holden-Day, 2009

	Written	Oral
Participation during course	-	25%
Case Study	-	-
Project Work	-	-
Exam	-	75%

	▪ Murty, Operations Research, Prentice Hall, 2005. ▪ Winston, Operations Research - Applications and Algorithms, PWS-Kent, 2003
Contact Lecturer	Prof. Dr. Oliver Stein, E-Mail: ***Stein@kit.edu***

6.3 Methods of Operations Management

The ever-growing integration and globalization of production structures lead to an increasing importance of operations management for cost and performance development in operations networks. Consequently, the module “Methods of Operations Management” focuses on the further development of the corresponding skills and competences in this field. Participants are to enhance their knowledge in order to be able to understand production and supply chain management taking into account human resources. At the same time, mapping of the physical world onto the world of planning and controlling has to be understood. On this basis, this module concentrates on applying the lessons learned as well as on the further development of the methodology and its integration in the teamwork at the production company.

Module Name: Methods of Operations Management

Module Supervisor: Prof. Dr.-Ing. Gisela Lanza

Type of Module: Engineering Module 3 (EM3)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Supply Network Management I	19,5	27,3
Production Engineering	19,5	27,3
Human Factors and Ergonomics	18	25,2
Stochastic Models of Manufacturing Systems	18	25,2

Major Learning Results (LR):

LR-1: Development of a holistic understanding of supply network management for decision-making and planning of the individual processes in the short, medium, and long terms.

LR-2: Modeling of production systems in a supply chain, identification of appropriate optimization methods, and problem solution with the help of appropriate tools.

LR-3: Understanding of the significance of the human factor in production management and learning of approaches and methods for ergonomic workplace design and work organization, evaluation and improvement of existing workplaces.

LR-4: Knowledge of physical material flow and monetary controlling, derivation of efficient characteristics (KPI and KPR).

Performance appraisal for this Module:

Within the third Master-specific Module the performance appraisal consists of oral exams containing varying degrees of classroom participation. The exams in *Supply Network Management I* and *Stochastic Models of Manufacturing* are combined.

Credit Points: 6

6.3.1 Supply Network Management I

Lecturer	Prof. Dr. Stefan Nickel
Content	This course covers topics in supply network management including supply network attributes, examples of supply networks (consumer goods manufacturing and computer assembly), strategic decision making in supply networks, supply network planning and tasks and requirements, hierarchical planning, architecture of an Advanced Planning System for supply network management.
Course Objectives	Understanding of the basic decision-making processes that arise in supply network management and are derived from managerial and economic considerations.
Learning Targets/ Skills	The Participant ▪ understands the structure and interaction of the elements of a Supply Chain. ▪ gains knowledge of Supply Network Processes including purchase, production, distribution and sale within long-, medium- and short-term planning. ▪ is able to analyze the connections of impact and to rate the optimization processes.
Pre-Requisites	Operations Research I, II, Project Management and Scheduling, Stochastic Models of Manufacturing Systems.
Teaching Method	The course consists of lectures, accompanying exercises, cases, homework, and discussions. Media: PC (PowerPoint), blackboard, overhead projector.
Performance Appraisal	Written: Participation during course: -; Case Study: -; Project Work: -; Exam: - Oral: Participation during course: 20%; Case Study: -; Project Work: -; Exam: 80%
Course Material	Power Point Slides
Literature	▪ De Kok & Graves, Supply Chain Management: Design, Coordination and Operation, Elsevier, 2003 ▪ Nahmias: Production and Operations Analysis, McGraw-Hill, 2008. ▪ Stadtler & Kilger, Supply Chain Management and Advanced Planning, Springer, 2005.
Contact Lecturer	Prof. Dr. Stefan Nickel; E-Mail: ***Nickel@kit.edu***

6.3.2 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. Moreover, selected methods are being discussed and applied to real assembly lines. The course shows interconnections between the planning activities and the operating conditions and offers support for decision marking at all planning stages.
Course Objectives	▪ Overview of planning and designing production systems within the current climate of changing markets. ▪ Learn the different principles of lean production planning. ▪ Being able to understand and implement essential methods of production planning.
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 essential methods of production planning.
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	The course structure consists of a preceding e-learning module, lectures, accompanying group work, practical applications and discussions.
Performance Appraisal	Written: Participation during course: -; Case Study: -; Project Work: -; Exam: - Oral: Participation during course: 10%; Case Study: 20%; Project Work: -; Exam: 70%
Course Material	Lecture notes, slides, e-learning module.
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***

6.3.3 Human Factors and Ergonomics

Lecturer	Jun. Prof. Dr.-Ing. Verena Nitsch
Content	The course gives an introductory overview of the following topics: ▪ An Introduction to Human Sensory Perception and Information Processing ▪ Equipment, Workplace and Environmental Design ▪ Stress and Strain ▪ Anthropometry and Basic Biomechanics

	▪ Human Error and Error Prevention ▪ Usability Engineering and User-centered Product Design ▪ Occupational Health and Safety ▪ Human Factors in Organizational Design and Management ▪ Human Factors and Ergonomic Methods and Standards
Course Objectives	This course is designed to provide students an understanding of human aspects in Production Management. It is itself a prerequisite for the "Industrial Management Case Study".
Learning Targets/ Skills	The Participant ▪ has a basic understanding of human perception and cognition processes. ▪ is aware of the effects of the workplace on the individual and common sources of human error. ▪ is equipped with the knowledge to apply human factors and ergonomics methods to design user-friendly products and ergonomic workplaces. ▪ is aware of current HFE standards.
Pre-Requisites	No specific pre-requisites are required.
Teaching Method	The course content is taught in lectures and illustrated with case studies, videos and interactive demonstrations.
Performance Appraisal	Written: Participation during course -; Case Study -; Project Work -; Exam - Oral: Participation during course -; Case Study -; Project Work -; Exam 100%
Course Material	Lecture notes and reading recommendations.
Literature	▪ Salvendy, G. (Ed.) (2006), Handbook of Human Factors and Ergonomics (3rd ed.), New Jersey: Wiley & Sons. ▪ Wickens, C.D., Lee, J.D., Liu, Y., Gordon Becker, S. E. (2004) An Introduction to Human Factors Engineering (2nd ed.) London: Pearson Prentice Hall.
Contact Lecturer	Jun. Prof. Dr.-Ing. Verena Nitsch; E-Mail: ***Verena.Nitsch@unibw.de***

6.3.4 Stochastic Models of Manufacturing Systems

Lecturer	Prof. Dr.-Ing. Kai Furmans
Content	This course introduces the basics of stochastic models of manufacturing systems with an emphasis on queuing theory. After presenting examples for different kinds of single-stage systems and the approach for describing them analytically, the students are familiarized with effects occurring in queuing networks. Finally the skills acquired in this course are applied to several of the methods of lean manufacturing to understand the mechanisms and provide the participants an insight into their specific industry environment.
Course Objectives	▪ Understanding the importance of stochastic processes in Production and Operations Management. ▪ Learning methods that enable the participant to manage stochastic behavior of networked

<table>
<tr><td></td><td>systems.

The course provides an insight into factory physics, which is helpful for understanding Supply Network Management I-III, Production Engineering, Simulation of Production Systems and Quality Management.</td></tr>
<tr><td>Learning Targets/ Skills</td><td>The Participant

▪ gains competencies of the calculation of operating figures of stochastic networks
▪ analyzes the interdependency in product life cycles with methodic models
▪ is able to apply methodic models to questions of Lean Management</td></tr>
<tr><td>Pre-Requisites</td><td>Basics in Stochastics, Linear Algebra</td></tr>
<tr><td>Teaching Method</td><td>The course structure consists of lectures as well as accompanying exercises, laboratory work 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>25%</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>75%</td></tr>
</table>
</td></tr>
<tr><td>Course Material</td><td>Lecture notes and exercises in printed form.</td></tr>
<tr><td>Literature</td><td>▪ S.C. Graves, A.H.G. Rinnooy Kan, P.H. Zipkin: Logistics of Production and Inventory, North Holland, 1993.

▪ Kai Furmans: Bedientheoretische Methoden als Hilfsmittel der Materialflußplanung, Wissenschaftliche Berichte des Instituts für Fördertechnik und Logistiksysteme der Universität Karlsruhe (TH); Bd. 52, 2001.</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Kai Furmans, E-Mail: Kai.Furmans@kit.edu</td></tr>
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6.4 Networks of Supply and Production Systems

Today's competitive environment regarding Supply Chains has dramatically changed. Emerging economies such as China have become key players and have changed the view on modern network systems. Supply Chain Management plays a key role in Production and Operations Management. Having understood the individual objects in the added value chain, these have to be combined in the supply chain. This includes the internationalization of processes of values added, their distribution to physical and dispositive processes as well as methods for their planning and control.

For this purpose, new models have to be generated and existing models have to be further developed and adapted. Multidisciplinary analysis of the production logistics point of view and its mathematical modeling are of particular significance. In this way, the participants can derive profound statements relating to the performance of novel network structures.

Module Name: Networks of Supply and Production Systems

Module Supervisor: Prof. Dr.-Ing. Kai Furmans

Type of Module: Engineering Module 4 (EM4)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Supply Network Management II	18	25,2
Supply Network Management III	19,5	27,3
Technologies of Distribution Networks	19,5	27,3
Global Production	18	25,2

Major Learning Results (LR):

LR-1: Familiarization with technical interactions and challenges of modern logistics systems, use, solution, and implementation of models covering major issues.

LR-2: Independent mathematical modeling of decision/optimization problems and formulation and compilation of solutions for various modules of the APS (advanced planning system).

LR-3: Knowledge of methods to model stochastic impacts on supply networks and, on this basis, development of solutions and demonstration of their effectiveness.

LR-4: Understanding of the relevance, opportunities, and motivation of the internationalization of producing companies and of the solutions to cope with the resulting challenges and risks.

Performance appraisal for this Module:

Within the fourth Master-specific Module the performance appraisal will be based on oral exams containing varying degrees of classroom participation. The exams for the lectures in *Supply Network Management II* and *Supply Network Management III* will be combined.

Credit Points: 6

6.4.1 Supply Network Management II

Lecturer	Prof. Dr. Stefan Nickel
Content	The course covers the following topics: ▪ Decision/optimization problems and solution approaches for the following modules of an Advanced Planning System (APS): Demand planning, supply network design, master planning, BOM explosion and lot sizing, detailed production planning, procurement planning, distribution planning, short-term transportation planning, ATP. ▪ Specification of the APS modules for the examples "consumer goods manufacturing" and "computer assembly" discussed in course Supply Network Management I.
Course Objectives	Understanding of the individual modules of an APS for supply network management and of the material and information flows between the modules.
Learning Targets/ Skills	The Participant ▪ gains knowledge of the basic decision and optimization problems in the Supply Chain. ▪ understands modules and optimization methods in the planning of a deterministic Supply Chain. ▪ is able to create modules independently and to apply them on questions in the branch of production and branch of logistics.
Pre-Requisites	Supply Network Management I, Operations Research I, II, Project Management and Scheduling, Stochastic Models of Manufacturing Systems.
Teaching Method	The course consists of lectures, accompanying exercises, cases, homework, and discussions. Media: PC (PowerPoint), blackboard.
Performance Appraisal	

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

Course Material	PowerPoint slides.
Literature	▪ De Kok & Graves, Supply Chain Management: Design, Coordination and Operation, Elsevier, 2003. ▪ Nahmias: Production and Operations Analysis, McGraw-Hill, 2008. ▪ Stadtler & Kilger, Supply Chain Management and Advanced Planning, Springer, 2005.

Contact Lecturer	Prof. Dr. Stefan Nickel; E-Mail: ***Nickel@kit.edu***

6.4.2 Supply Network Management III

Lecturer	Prof. Dr.-Ing. Kai Furmans
Content	In Supply Network Management III, the fundamentals of material flow systems and logistic processes are introduced to the students. Starting with basic elements of material flow systems and their transformation into models, the students learn how to plan material flow systems. Further contents are stock management and order picking, different approaches for modeling logistic processes, the bullwhip-effect, stochastic effects in logistics systems and line balancing in the automotive industry.
Course Objectives	The course teaches students the following: ▪ Knowledge on the basics of material flow systems. ▪ Understanding and modeling of logistic processes This course is strongly related to the courses named in „Pre-requisites“. Moreover there are connections to “Distributions Networks” and “Production Systems”.
Learning Targets/ Skills	The Participant ▪ gains the competency to model logistic processes. ▪ understands the effects of stochastic processes on the Supply Chain. ▪ is able to analyze the causes of unwanted behavior in the Supply Chain. ▪ is able to apply appropriate counteractions in a case study.
Pre-Requisites	Operations Research I + II, Supply Network Management I + II, Stochastic Models of Manufacturing Systems
Teaching Method	The course structure consists of lectures as well as accompanying exercises, laboratory work and discussion sections.
Performance Appraisal	

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

Course Material	Lecture notes and exercises in digital form.
Literature	▪ H. Stadtler, C. Kilger (editors): Supply Chain Management and Advanced Planning, Springer 2004.
Contact Lecturer	Prof. Dr.-Ing. Kai Furmans, E-Mail: ***Kai.Furmans@kit.edu***

6.4.3 Technologies of Distribution Networks

Lecturer	Prof. Dr.-Ing. Kai Furmans
Content	This course provides the students with fundamental knowledge in warehousing and distribution networks. Starting with an overview of the functional areas of distribution centers, the course will cover warehouse technology and dimensioning, cycle times, order picking and the control of a distribution center in more detail. Subsequently the students are introduced to the strategic perspective of distribution – from applicable distribution strategies, such as direct delivery or cross docking, to planning distribution networks.
Course Objectives	▪ Understanding the fundamentals of warehousing ▪ Understanding the fundamentals of distribution networks. This course is related to Stochastic Models of Manufacturing Systems and Supply Network Management III
Learning Targets/ Skills	The Participant ▪ has basic knowledge of the structure and the design of distribution networks and their components. ▪ understands the relevant processes of material flow planning and is able to apply these. ▪ independently evaluates various logistics processes. ▪ is able to reasonably apply planning processes.
Pre-Requisites	No specific prerequisites are required.
Teaching Method	The course structure consists of lectures as well as accompanying exercises, laboratory work and discussion sections.
Performance Appraisal	Written: Participation during course: -; Case Study: -; Project Work: -; Exam: - Oral: Participation during course: 20%; Case Study: -; Project Work: -; Exam: 80%
Course Material	Lecture notes and exercises in printed form.
Literature	▪ John J. Bartholdi III, Steven T. Hackman: Warehouse Science, 2005 (www.warehouse-science.com) ▪ Edward Frazelle: World-class warehousing and material handling, MacGraw-Hill 2002.
Contact Lecturer	Prof. Dr.-Ing. Kai Furmans, E-Mail: ***Kai.Furmans@kit.edu***

6.4.4 Global Production

Lecturer	Prof. Dr.-Ing. Gisela Lanza
Content	This course gives an overview of the approaches and principles in international production. It starts by introducing the principles of international production and types of international activities. The course continues with sales-motivated internationalization and cost-oriented

<table>
<tr><td></td><td>internationalization. It concludes with latest developments in challenges and risks of international activities and international project management.</td></tr>
<tr><td>Course Objectives</td><td>The course provides a comprehensive coverage of modern management knowledge concerning international production. The objective is to give young professionals a sound understanding of the types and motivations for international production. Focus is the aim to show challenges and risks of international production and to support young professionals working in an international environment.</td></tr>
<tr><td>Learning Targets/ Skills</td><td>The Participant
gains knowledge of various management approaches in international production
is able to recognize requirements and risks in international production based on this knowledge and can design risk strategies for the internationalization of production</td></tr>
<tr><td>Pre-Requisites</td><td>Basic knowledge in production systems is required.</td></tr>
<tr><td>Teaching Method</td><td>The course structure consists of lectures as well as case studies, demonstration 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>-</td><td>100%</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>John, R. et al: Global Business Strategy: An Introduction International Thomson Business Press, 1996, ISBN 1861523521</td></tr>
<tr><td>Contact Lecturer</td><td>Prof. Dr.-Ing. Gisela Lanza; E-Mail: Gisela.Lanza@kit.edu</td></tr>
</table>

6.5 Production and Distribution Systems

In the final engineering module of POM participants will be introduced to comprehensive topics in production and distribution systems, such as the important role of information technology for logistic systems and quality management within operations management. The lecture Supplier Management teaches the strategic process to ensure external success factors in the context of the procurement process by managing the supplier- buyer-relationship. This approach seeks to establish a reliable supplier base for ensuring access to qualified suppliers acting according to a company's requirements. Supplier management consists of planning, managing and controlling of individual supplier-buyer relationships as well as the whole supplier base. The methodologies of the supplier relationship management process will be introduced and applied by means of various case studies.

Finally the participants will be able to apply their knowledge of the whole Master Program in an industrial management case study, which deals with managing and restructuring a company in an international setting, using simulation tools and applying methods and strategies in production planning and control, monitoring logistic characteristics, analyzing and optimizing production costs, defining improvement approaches, establishing project management and re-engineering by work structuring.

Module Name: Production and Distribution Systems

Module Supervisor: Prof. Dr.-Ing. Gisela Lanza

Type of Module: Engineering Module 5 (EM5)

Lectures in Module	**Workload Distribution [hrs]**	
	Presence	**Self studies**
Information Technology for Logistic Systems	15	21
Quality Management	18	25,2
Supplier Management	19,5	27,3
Industrial Management Case Study	22,5	31,5

Major Learning Results (LR):

LR-1: Knowledge of methods to control logistics systems with the help of IT systems, organization of such systems, and adaptation to the tasks to be solved.

LR-2: Combination of practical and theoretical quality management knowledge along the chain of values added in industry.

LR-3: Synthesis of the knowledge acquired in all modules and establishment of a virtual bicycle factory in a business management and restructuration case study.

LR-4: Participants will be able to recognize, understand and apply methodologies to manage suppliers globally.

Performance appraisal for this Module:

Within the fifth Master-specific Module the performance appraisal will be based on oral exams containing varying degrees of classroom participation. The *Industrial Management Case Study* will summarize all previously obtained methods and qualifications for Production and Operations Management.

Credit Points: 6

6.5.1 Information Technology for Logistic Systems

Lecturer	Mathias Thomas
Content	This course covers the following topics: ▪ Communication systems ▪ Material flow / warehouse management ▪ Master control station ▪ Expert knowledge / practical field reports ▪ New Software: Endurance test for your business?
Course Objectives	See content
Learning Targets/ Skills	The Participant ▪ gains knowledge of information systems in order to support logistic processes and is able to choose and utilize them according to the requirements of the Supply Chain.
Pre-Requisites	No specific prerequisites are required.
Teaching Method	The course structure consists of lectures as well as accompanying exercises, laboratory work and discussion sections.
Performance Appraisal	

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

Course Material	Lecture notes and exercises in digital form.
Literature	none

Contact Lecturer	Mathias Thomas; E-Mail: ***M.Thomas@tup.com***

6.5.2 Quality Management

Lecturer	Prof. Dr.-Ing. Gisela Lanza
Content	This practice-oriented course gives an overview of the approaches and methods in quality management (QM) starting from QM philosophies and preventive methods to operational quality assurance including industrial measurement technology and statistical process control.
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 understanding 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 the 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. No special skills are required.
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***

6.5.3 Supplier Management

Lecturer	Prof. Dr.-Ing. Gisela Lanza, Stefan Ruhrmann
Content	This practice-oriented course gives an overview of the approaches and methods in Supplier Relationship Management starting from prerequisite of Supplier Relationship Management in China to strategical and operational Supplier Relationship Management methodologies.

Course Objectives	The course provides a comprehensive overview of the strategic sourcing process and the corresponsive Supplier Relationship Management. The course is aiming to give young professionals detailed insights to strategical and operational Supplier Relationship Management tools and methodologies as well as their practical application.
Learning Targets/ Skills	The Participant ▪ understands the different Supplier Relationship Management tools. ▪ is able to apply the identified tools and methods of Supplier Relationship Management. ▪ is capable of analyzing and evaluating the applicability of the learned methods for a certain situation.
Pre-Requisites	Necessary knowledge for the course includes a basic understanding of manufacturing systems as well as Supply Chain Management. No special skills are required.
Teaching Method	The course structure consists of lectures as well as case studies, demonstrations and discussion sections.
Performance Appraisal	

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

Course Material	PowerPoint Presentations, Case Studies
Literature	Chopra, S.; Sodhi, M. S.: Managing Risk to avoid Supply-Chain Breakdown, MIT Sloan Management Review 2004 Lambert, D. M., & Schwieterman, M.A.: Supplier relationship management as a macro business process. Supply Chain Management: An International Journal, 17(3), 337–352., 2012 Lanza, G.; Ruhrmann, S.: Leitfaden zur Planung und Durchführung von Sourcingprojekten. in: FQS-DGQ-Schriftenreihe, Frankfurt am Main, Auflage 1, 2013 Large, R.: Strategisches Beschaffungsmanagement: Eine praxisorientierte Einführung mit Fallstudien. 3. vollständig überarbeitete und erweitere Auflage, Gabler, Wiesbaden, 2006. Ruamsook, K.; Ruusel, D.; Thomchick, D.: U.S. Sourcing from Low-Cost Countries - A Comparative Analysis of Supplier Performance. In: The Journal of Supply Chain Management, 2007
Contact Lecturer	Prof. Dr.-Ing. Gisela Lanza, E-Mail: ***Gisela.Lanza@kit.edu*** Stefan Ruhrmann, E-Mail: ***Ruhrmann.Stefan@silu.asia***

6.5.4 Industrial Management Case Study

Lecturer	Dr.-Ing. Bernd Brinkmeier
Content	This case study deals with managing and re-structuring of a virtual bicycle factory. The factory is modeled in a simulation tool called INSIGHTS which was developed and run in a series of EU projects. The course consists of lectures, group work and a role game where each group has to present their results in front of the virtual company's board. The topics are: Production Planning and Control, Monitoring Logistic Characteristics, Cost Planning and Optimization, Defining Improvement Approaches, Establishing Project Management and Re-engineering by Work

<table>
<tr><td></td><td>Structuring.</td></tr>
<tr><td>Course Objectives</td><td>Application of theoretical knowledge to a real business case.</td></tr>
<tr><td>Learning Targets/ Skills</td><td>The Participant
is able to solve unknown tasks in the context of production and logistics environment with the synthesis of the acquired knowledge from the previous modules.</td></tr>
<tr><td>Pre-Requisites</td><td>Courses on "Introduction to Industrial Engineering"(EM 1), "Human Factors and Ergonomics"(EM 3), "Simulation of Production Systems"(EM 2), "Accounting & Controlling"(MM 1) and "Production and Logistics Controlling"(EM 3)</td></tr>
<tr><td>Teaching Method</td><td>Lecture, management game, group work, group presentation</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>
After the 5 day seminar there will be a group presentation of each student group. The oral exam afterwards focuses on the gained background knowledge, but not on the results that have been achieved in group work.
</td></tr>
<tr><td>Course Material</td><td>Lecture notes and homework in digital form.</td></tr>
<tr><td>Literature</td><td>Zülch, Gert; Cano, Juan Luis; Muller(-Malek), Henri (Edts.): Production Management Simulation Games. Aachen: Shaker Verlag, 2001. (esim – European Series in Industrial Management, Volume 4)</td></tr>
<tr><td>Contact Lecturer</td><td>Dr.-Ing. Bernd Brinkmeier; E-Mail: Bernd.Brinkmeier@siemens.com</td></tr>
</table>

7 Master Thesis Production and Operations Management

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 worldwide 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 in 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 in production in Karlsruhe 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 HECTOR School of Engineering and Management guarantees for the quality and continoues 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 lecture a written questionnaire is distributed among the participants by which they can evaluate the quality of the lectures. The main aspects are:

- lecture content
- 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 by the KIT and published on the Share Point 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 Service Management and Engineering 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 die weiterbildenden Masterstudiengänge Production and Operations Management" 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 Fee 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
14.09.2011	SF	10	5.1.2.	Update literature
14.09.2011	SF	12	5.2.1.	Update literature
14.09.2011	SF	13	5.2.2.	Update literature
14.09.2011	SF	14	5.2.3.	Update literature
14.09.2011	SF	22	5.4.2.	Update literature
14.09.2011	SF	23	5.4.3.	Update literature
14.09.2011	SF	25	5.5.1.	Update literature
14.09.2011	SF	29	6.1.1.	Update literature
14.09.2011	SF	32	6.1.4.	Update literature
21.02.2012	SF	26	4.3.3.	New lecturer for “Marketing”: Prof. Dr. Martin Klarmann
01.05.2012	SF	47	5.2.3.	New, third lecturer for “Simulation of Production Systems”: Dr.-Ing. Patricia Stock
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
18.10.2012	SF	39	5.1.1.	New lecturer for “Introduction to Industrial Engineering” added: Prof. Dr. Barbara Deml
23.11.2012	SF	45	5.2.1.	New lecturers for “Service Engineering” added: Prof. Dr. Hansjörg Fromm, Dr. Peter Korevaar
09.01.2013	SF	54	5.3.4.	New lecturer for “Production and Logistics Controlling” added: Helmut Wlcek
14.01.2013	SF	All	All	Review of entire program structure, learning results, workload and literature
03.07.2014	SF	11-35	4.0ff	Review of entire Management Modules
25.01.2016	SF	5	2.	Adding second program director
25.01.2016	SF	9	3.4.1.	Change of Module Supervisor
25.01.2016	SF	24	4.3.2.	Revision of content in “Management Accounting” and change of lecturer
25.01.2016	SF	26	4.4.	Change of Module Supervisor
25.01.2016	SF	27	4.4.1.	Revision of content “HRM” and change of lecturer

25.01.2016	SF	36	5.1.	Change of Module Supervisor
25.01.2016	SF	48	5.3.3.	Revision of content
25.01.2016	SF	60	5.5.3.	Integration of new lecture and lecturers
28.04.2016	SF	12	4., 4.1. and 4.2.	Qualification Objectives added Qualification Objectives for Study Course Level Qualification Objectives for Production and Operations Management
28.04.2016	SF	11	3.4.1.	Update of Chart: New program director for Management Modules and adjustment of several lecturers.
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