JACOBS UNIVERSITY

Study Program Handbook

# Supply Chain Engineering & Management

Master of Science

**Subject-specific Examination Regulations for Supply Chain Engineering & Management (SCEM)**

The subject-specific examination regulations for SCEM are defined by this program handbook and are valid only in combination with the General Examination Regulations for Master degree programs ("General Master Policies").
This handbook also contains the program specific Mandatory study and Examination Plan (Appendix 1).

Upon graduation students in this program will receive a Master of Science (MSc) degree with a scope of 120 ECTS (for specifics see chapter 3 of this handbook).

Valid for all students starting their studies in fall 2018
Date: August 15, 2018
Study Program Chair: Prof. Dr. Yilmaz Uygun
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# 1. Program Overview

## 1.1. Concept

The worldwide exchange of goods, the mobility of people and the constant flow of information and ideas requires expertise about transport chains and how exchange processes work, what design options are available and the ability to develop new methods to meet future challenges. The primary goal of Supply Chain Management (SCM) is to achieve constant gains in competitive advantage and to organize the entire chain from strategy to implementation in the best possible way.

Within the last two decades, supply chain management has grown from an important instrument of operative optimization towards a strategic distinguishing feature in competition. Therefore, SCM is a key component in the performance of highly successful enterprises. It adds value for the company and its clients. Constant development, reconfiguration and optimization of companies' supply chains are necessary to adapt to changing supply chain environments. However, this requires the consideration and interpretation of a high number of technological, product, process, geographical and structural frame conditions and to derive situation-specific activities. Hence, well-trained leaders are needed who possess the ability to accurately position supply chain management as a strategic business function.

Developing and implementing such strategies calls for leaders who take on these challenges with a strong desire and ability to master them. Executives and project leaders require suitable methods to reduce and handle this complexity. Therefore, they need a concrete understanding of the interdependencies between the supply chain elements. This is a prerequisite to the application of methods and tools that help analyze and optimize cross-company coordination, processes and communication.

It is to be expected that the demand for leaders capable of dealing with this challenge will further increase in the future. Jacobs University's program *Supply Chain Engineering & Management* (SCEM) aims to satisfy this demand through a holistic educational approach focusing on interdisciplinary and practical knowledge that prepares its students for the complex challenges facing both industry and logistics research. It does so by encompassing the above mentioned core points in different ways and appropriately roots them into various modules of the curriculum.

The course of study integrates business and engineering approaches. It focuses on a company's internal organization and the alignment of SCM according to the company's operational strategy. It takes into account external company structures and explores supplier relationships as well as the management of relevant company networks.

Aside from professional qualifications, the development of social competences is necessary for a successful career in the field of SCM. Therefore, a core emphasis of the

program is placed upon leadership and supporting the participants' personal development. Students are introduced to models, instruments and methods which can be transferred to all fields related to logistics, supply chain management and production. Lecturers help students apply theoretical knowledge to practice through the use of exercises, case studies, simulations and business games.

The program's educational approach is characterized by its strong practical relevance and strong involvement of participants. Lecturers enthusiastically apply the latest instruction techniques and interactive teaching strategies. Elements of direct response and group work are accompanied by exercises and labs. Moreover, critical discussions are encouraged in order to inspire and improve the students' understanding of module content. Occasionally, online module components may be included, which adds flexibility to the participants' learning process.

The program's directors believe in the efficiency of 'experiential' learning. Hence, faculty, lecturers and tutors intensively use case studies, business games and simulations as active teaching methods. Furthermore, students learn and work successfully in interdisciplinary and intercultural teams.

Intensive communication and discussion between lecturers and participants are central elements of the program. The personal support of each student by an assigned Academic Advisor as well as regular meetings with the program coordinators foster the successful completion of the program despite different learning rates and entry knowledge levels.

The successful completion of the studies leads to the obtainment of an internationally acknowledged Master of Science (MSc) degree and enables a quick career entry in the area of Supply Chain Management, be it in a national or an international context.

## 1.2. Qualification Aims

### 1.2.1. Educational Aims

Skilled employees are necessary for companies to become trend- and agenda-setters in terms of the latest production and logistics technologies, control and optimization approaches and customer and employee-oriented management.

The Supply Chain Engineering & Management program aims to provide an in-depth understanding of the essential aspects in designing, maintaining and analyzing supply chains as well as teach the skills necessary to apply methods and tools to successfully and responsibly work on/in supply chain networks. The program seeks to expand the participants' competencies and capabilities to be prepared for all upcoming tasks and developments within the field of SCM. The curriculum aims to teach modern leadership and management competencies. This includes the analysis of business processes, the

ability and the readiness to recognize the potential for change, the initiation of change processes and the successful design of those change processes.

Students are introduced to working with and within companies and very quickly develop personality and professionalism through frequent, individual feedback sessions and personal attention. This facilitates and speeds up their career development and helps them to quickly become valuable assets in the workforce.

Studying at Jacobs University takes place in a highly intercultural environment. Students acquire intercultural competences as part of their education at Jacobs University through everyday group work, class participation, and extra-curricular activities. In this way, the students gain practical intercultural competences and build up their confidence in an English speaking work and study environment. One of the core abilities of internationally successful executives in any business area is a strong, confident appearance and communication ability in various cultural contexts.

### 1.2.2. Intended Learning Outcomes

By the end of this program, students will be able to:

- explain the strategic importance of Supply Chain Engineering & Management in a global context;
- critically evaluate and apply the most important theories of supply management, supplier relations and value creation to real life situations, organizations and industries;
- independently investigate complex problems and undertake scientific or applied research into a specialist area utilizing both qualitative and quantitative methods;
- evaluate and utilize interdisciplinary approaches to solve academic and professional problems;
- apply relevant methods to manage logistics processes and network relationships;
- assess opportunities and risks in global supply networks;
- communicate clearly and professionally with experts from different disciplines and to moderate in interdisciplinary interaction;
- use individual feedback on a continuous basis to develop and mature within their studies and beyond;
- manage multicultural and diverse environments and easily participate in and lead mixed teams;
- quickly become acquainted with their work and hence start their career more easily because of the integration of theory and practice during their education;
- experience how to develop their personal career objectives;
- discuss financial issues of a project with financial controllers;
- make operational and strategic decisions involving complex and conflicting objectives;

- develop professional communication and presentation skills as well as provide structured management reports.

### 1.3. Target Audience

The program is designed for students of different professional, geographical and cultural backgrounds. Candidates who are dedicated and interested in gaining theoretical and application-oriented knowledge are particularly addressed by the program.

Ideally, applicants have already completed their first degree or equivalent training in the disciplines of logistics, economics, engineering or information technology. Applicants with first degrees in other subject areas with a proven special affinity or strong interest for the topic and the desire for further Master-level practical education are also welcome to apply.

Also, the program addresses young professionals with a few years of work experience who would like to focus or deepen their knowledge in the field of SCEM and who are interested in an application-oriented course of study. The program prepares students for a career in industry - graduating students usually enter the job market after graduation. Non-Germans who are interested in starting a career in Germany or at a German enterprise will further gain the insights and preparation necessary to enter the German labor market.

The program especially aims to motivate students to add their own input into the design of the program. The educational approach supports exchange and discussion within the student community. Hence, the willingness to interact, to appreciate different teaching and learning formats, to accept challenges, and to develop professionally during the studies are important requirements for successful participation in the program.

Studying at Jacobs University takes place in a highly intercultural environment. Therefore, the willingness to join such a multicultural-international community and work together with students and faculty across various fields of interest is absolutely necessary.

## 1.4. Career Options

Supply Chain Management is a growing profession in high demand worldwide. Survey results of company representatives throughout various industries and company sizes, especially from logistics, show the high demand for flexible young executives with excellent interdisciplinary academic backgrounds.

The program prepares its participants to become decision makers in an increasingly interconnected world: true managers of globalization. SCEM opens the door to a wide range of careers in Germany, Europe and around the globe. The profiles of the MSc Supply Chain Engineering & Management graduates are of great interest to companies operating in national and international, medium and large-sized, trade and service as well as production industries. Graduates are particularly qualified for tasks in the fields of supply chain management, logistics, procurement, retail, process optimization and beyond.

The career paths that open up for the graduates of SCEM are manifold. They range from specialists in supply chain fields to project management careers in different fields, and from operational to strategic and corporate management positions. After graduation, the students excel at fulfilling various project responsibilities by applying their gained knowledge in the areas of supply chain management, logistics systems, project management, leadership and team management.

Previous graduates of this major have found employment at renowned international companies with ease. Those continuing to PhD studies have been accepted to top-ranking universities. Far more than 50% of the program's graduates start their careers in Germany, most of them in industry (according to an alumni survey conducted in November 2015). Others work in The Netherlands, Denmark, the United States, Switzerland, India, the United Kingdom, Singapore, Belgium, Thailand, China and elsewhere. Today, graduates work in diverse industries such as automotive, aerospace, consulting, manufacturing, transportation, railway, food & beverage, retail, purchasing, wholesale, information technology as well as in NGOs.

The Career Services Center of Jacobs University as well as its Alumni Association help students in their career development. The Career Services Center provides students with high-quality training and coaching in preparing applications and interviews, in effective presenting, business etiquette and employer research as well as in many other career-aspects. Thus, it helps students identify and achieve rewarding careers after their graduation from Jacobs University. In addition to that, the Alumni Association helps students to establish a long-lasting and worldwide network that is useful when exploring career opportunities in industry, academia and elsewhere.

## 1.5. Admission Requirements

The graduate program Supply Chain Engineering & Management is designed for students who at minimum hold a Bachelor's degree in the areas of business administration, logistics, economics, industrial engineering and management, or in information technology. Applicants need to prove a strong interest in the contents of the study program. The general "Admission and Enrollment Policies" of Jacobs University apply (https://www.jacobs-university.de/admission-und-enrollment-policies).

Some work experience (one to three years) is recommended, but is not a prerequisite. Additionally, participants should possess elevated analytical, problem solving and verbal communication skills.

Studying at Jacobs University takes place in a highly intercultural environment. It is therefore necessary to be willing to join such a multicultural-international community and work together with students and faculty across various fields of interest at Jacobs University.

Applicants need to submit the following documents in order to be considered for admission:

- Letter of Motivation
- Curriculum vitae (CV)
- University transcript in English or German
- Bachelor's degree certificate or equivalent (may be handed in later)
- Two letters of recommendation
- English language proficiency test with a minimum score of 90 (TOEFL), 6.5 (IELTS) or 60 (Duolingo). Native speakers and applicants who completed their undergraduate studies in English may be exempt from this requirement

Please visit http://jacobs-university.de/study/graduate/application-information for more details on the application process.

# 2. The Curriculum

## 2.1. The Curriculum at a Glance

The Supply Chain Engineering & Management curriculum is divided into four semesters and takes two years to complete. Each semester is composed of a mixture of foundational modules, specialized modules, industry seminars and applied project work, leading to a master's thesis that may be conducted in collaboration with an industry partner.

The first semester is an introductory semester in which students are acquainted with general methods and knowledge about scientific work, language skills and mathematical-technical knowledge. They gain fundamental, interdisciplinary, and state-of-the-art knowledge that is essential for the further development of their studies. In its second semester, the program's focus is on supply chains and industrial engineering. In the third semester, emphasis is put on introducing students to complex tasks in science and industry. Students are expected to demonstrate their capabilities to self-organize the preparation of solutions for current theoretical and practical scientific problems of an industrial partner. During the fourth (final) semester students write their master's thesis.

It is recommended to complete a three-month internship between semesters two and three. This gives students the opportunity to practice and increase their acquired knowledge and abilities.

The modules are grouped into five areas (see figure 1). Each area consists of mandatory modules as well as electives as outlined below. In the third semester, students have to choose 3 mandatory elective modules (out of 4 modules in the core area).

The areas are:

- Core Area: 45 ECTS credit points
- Research & Discovery Area: 15 ECTS credit points
- Math & Methods Area: 15 ECTS credit points
- Career Area: 15 ECTS credit points
- Master Thesis: 30 ECTS credit points

Detailed module descriptions in their latest version are available in the catalogue on CampusNet (https://campusnet.jacobs-university.de).

*Figure 1: Modules of the study program Supply Chain Engineering & Management*

<table>
<tr><td>4</td><td colspan="7">Master Thesis<br>(30 CP)</td></tr>
<tr><td></td><td colspan="4">CORE<br>(45 CP)</td><td>RESEARCH & DISCOVERY<br>(15 CP)</td><td>MATH & METHODS<br>(15 CP)</td><td colspan="2">CAREER<br>(15 CP)</td></tr>
<tr><td>3</td><td colspan="4">Mandatory Electives (choose 3)</td><td rowspan="2">Research Project<br>(5 CP)</td><td rowspan="2">Advanced Programming Approaches for Data Analytics<br>(5 CP)</td><td colspan="2" rowspan="2">Business in Practice and Theory<br>(5 CP)</td></tr>
<tr><td>Supply Chain Finance<br>(5 CP)</td><td>Data Analytics in Supply Chain Management<br>(5 CP)</td><td>Smart Cities and Transportation Concepts<br>(5 CP)</td><td>Principles of Consulting<br>(5 CP)</td></tr>
<tr><td>2</td><td colspan="2">Trends & Challenges in SCM<br>(5 CP)</td><td colspan="2">Advanced Supply Chain Management<br>(5 CP)</td><td>Purchasing & Distribution<br>(5 CP)</td><td>Supply Chain Engineering<br>(5 CP)</td><td>Research Methods<br>(5 CP)</td><td rowspan="2">Language Skills (5 CP)</td><td rowspan="2">Communicating & Presenting (5 CP)</td></tr>
<tr><td>1</td><td colspan="2">Advanced Project, Quality & Risk Management<br>(5 CP)</td><td colspan="2">Supply Chain Management, Logistics & Transportation<br>(5 CP)</td><td>Big Data Challenge<br>(5 CP)</td><td>Applied Modeling & Simulation<br>(5 CP)</td><td>Programming Approaches for Data Analytics<br>(5 CP)</td></tr>
</table>

* In the third semester, students choose 3 out of 4 core area modules

## 2.2. Modules

### 2.2.1. Core Area

#### 2.2.1.1. Advanced Project, Quality and Risk Management

| **MCO001 – ProjQualRisk** | **5 ECTS** |
|---|---|
| ▪ **MCO001-052101 Risk Management**<br>▪ **MCO001-051412 Project Management Concepts** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | annually |
| **Program Affiliation** | Master in Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Instructors of Record** | Prof. Dr. Werner Bergholz; Dr. Christopher Hausmann |
| **Content and Educational Aims** | Managing and engineering supply chains requires the handling of numerous projects, the assurance of quality in products and processes as well as proper identifying, assessing and mitigating the risks involved. Thus, this module encompasses three main topics: Project Management, Quality Management and Risk Management. All of these areas include the transfer of specialist knowledge as well as soft skills.<br>Project Management contains the application of appropriate knowledge, processes, skills, tools and techniques to contribute to the success of temporary endeavors undertaken to create a unique product, service, or result. Project Management is of overwhelming relevance for global supply chains, esp. those which develop rapidly by innovative processes. In research and practice, project management is of increasing importance and it is correspondingly accepted to balance the competing project constraints of scope, quality, schedule, budget, resources and risk. On the individual level, project management knowledge can be considered a basic skill today.<br>Quality Management is a generic engineering/management tool, which can be applied to any production or service industry. This part of the module is structured according to the ISO9001:2000 quality management standard and will focus on specific methods and techniques as well as application examples in industry. Topics include Quality Function Deployment (QFD), Statistical Process Control, 8 D Process, and lean management methods.<br>Risk Management comprises all coordinated activities that help organizations understand, evaluate and take action on their risks |

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| | in order to minimize the effect of uncertainty on objectives. Multilayer supply chains face certain threats: natural disasters, terrorist attacks or the loss of important suppliers and service providers, all of which can disable an organization for days or weeks. Thus, effective risk management can make the difference between survival and collapse of an organization. This part of the module presents the foundations for the general field of risk management before continuing to supply chain risk management. Topics include Failure Mode and Effects Analysis (FMEA), supply chain risk classifications, as well as supply chain risk management strategies and case studies. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ assess the importance of project management, quality management, risk management and supply chain risk management;<br>▪ explain the relevance of international standardized project management and the different steps to implement, plan, steer and finish a project;<br>▪ explain the relevance and influence of stakeholders and environment and the importance of continuous tracking and learning;<br>▪ evaluate the success factors of horizontal cooperation in teams;<br>▪ apply and integrate quality tools in order to identify and evaluate causes for quality problems and suggest appropriate actions;<br>▪ evaluate quality problems based on data analysis (Pareto analysis, histograms, scatter diagrams, stratification);<br>▪ relate customer requirements to technical specifications for products, thus ensuring high customer satisfaction;<br>▪ assess risks based on their severity, likelihood of occurrence and likelihood of detection;<br>▪ categorize diverse types of supply chain risks;<br>▪ design an appropriate supply chain risk management approach based on proactive and reactive strategies;<br>▪ develop an overall philosophy for continuous improvement and total quality management. | |
| **Assessment** | Separate module component assessments of which all have to be passed:<br>Written examination (50%)<br>Oral examination (50%) | |
| | The educational aims and intended learning outcomes of this module require two assessment types to evaluate both specialist knowledge and soft skills. | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |

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| **Recommendations for Preparation** | Reading the syllabus is recommended. |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Seminars (17.5 hours)<br>▪ Private study (90 hours) |
| **Relationship to other Modules** | -- |

| **Module Components** | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| MCO001-052101 | Risk Management | Lecture | 2.5 | yes |
| MCO001-051412 | Project Management Concepts | Lecture | 2.5 | yes |

### 2.2.1.2. Supply Chain Management, Logistics & Transportation

| **MCO002 – SCMLogTra** | **5 ECTS** |
|---|---|
| ▪ **MCO002-051002 Supply Chain Management, Logistics & Transportation** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | annually |
| **Program Affiliation** | Master in Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students<br>Optional for students of other programs |
| **Module Coordinator** | Dr. Stanislav Chankov |
| **Content and Educational Aims** | Logistics and transportation are core elements of supply chain management. Thus, it is crucial for students pursuing a master degree in Supply Chain Management and Engineering to deeply understand the main functions and processes of logistics and transportation and how they impact supply chain performance. The focus is on providing a holistic perspective on logistics and supply chain management in terms of processes and conflicting targets, different terms and definitions, processes, functions and targets of logistics and supply chain management and how they impact the overall company success.<br>The module is structured in three main parts:<br>▪ Logistics Processes – covers the procurement, production, distribution and transportation processes.<br>▪ Logistics Management - covers inventory management, logistics service providers and lean management. |

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| | ▪ Supply Chain Management – covers cross-company management aspects and supply chain strategies such as postponement and mass customization.<br>In between the lectures, there will be also guest lectures with speakers from the industry giving insights on how logistics and supply chain management works in practice and what the main challenges are. Part of the module work load is also a project where students will have to work in small teams to investigate a specific logistics/supply chain management issue and suggest solution approaches. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ explain different definitions and terms commonly used in the logistics and supply chain management realm;<br>▪ explain the linkages and differences between logistics, transportation and supply chain management;<br>▪ describe processes, strategies and tools of procurement, production and distribution logistics;<br>▪ explain the main challenges and conflicting targets in logistics and supply chain management and their trade-offs;<br>▪ apply different methods and tools to improve and optimize logistics/supply chain processes (e.g. ABC/XYZ analysis, Kraljic Matrix, Throughput Diagram, Logistics Operating Curves, Logistics Potential Analysis, Storage Model, Safety Stock Calculation);<br>▪ evaluate different models of transportation and be able to select the most appropriate mode for different cases;<br>▪ evaluate in what way logistics and supply chain operations impact the economic success of a company;<br>▪ evaluate how the economic and industry trends impact the logistics and supply chain performance of production and service provider companies;<br>▪ compare and contrast different supply chain strategies and their applicability to different settings;<br>▪ integrate the knowledge gained in class to solve different case studies and real world problems. | |
| **Assessment** | Written Examination | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (35 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.1.3. Big Data Challenge

| **MCO003 – BigData** | **5 ECTS** |
|---|---|
| ▪ **MCO003-051003 Big Data Challenge** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | ▪ MSc Data Engineering<br>▪ MSc Supply Chain Engineering & Management<br>▪ MSc Psychologie<br>▪ BSc Industrial Engineering & Management<br>▪ BSc Computer Science<br>▪ BSc Electrical and Computer Engineering |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Adalbert F.X. Wilhelm |
| **Content and Educational Aims** | Big data is one of the buzz words of this decade and refers to the collection and exploration of complex data sets. This complexity of big data is typically described by the four V's: Volume, Velocity, Variety, and Veracity. From a business perspective, big data is often portrayed as a sea of big opportunities. The public debate is torn between the two poles portrayed by the writers George Orwell and Aldous Huxley: complete surveillance resulting in oppression on the one end, and irrelevance and narcism on the other. The technological research quite naturally is mostly concerned with the technical feasibility of the approaches, the continuously increasing challenges with respect to the four V's, and the creative solutions needed to tackle them. In this module you will get an overview on big data by looking at it from various aspects, primarily the business and societal point of view. The focus is not on the technical methods and skills, but on case studies that show big data and data engineering in a cross-section. |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ contribute knowledgeably to the current debate about big data, digitalization and industry 4.0;<br>▪ explain and discuss pros and cons of digitalization from a business perspective as well as a societal perspective;<br>▪ perform a SWOT analysis on current big data initiatives;<br>▪ evaluate technological possibilities and innovations driven by big data; |

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| | ▪ assess the business opportunities of current big data developments. | |
| **Assessment** | Term paper (project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | Researching information, assessing sources and report writing |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lecture (17.5 hours)<br>▪ Project work (90 hours)<br>▪ Private study (17.5 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.1.4. Trends & Challenges in Supply Chain Management

| **MCO004 – TrendChalSCM** | **5 ECTS** |
|---|---|
| ▪ **MCO004-051004 Trends & Challenges in Supply Chain Management** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | Master in Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Content and Educational Aims** | Manufacturing and logistics systems are subject to permanent technological advancements. Progress in manufacturing and logistics technologies for processing, handling, transport and warehousing reshape processes and structures.<br>This module deals with current and near-future technologies to be used in manufacturing and logistics systems. These are cross-cutting technologies that touch upon different skills, departments, and disciplines that show a high degree of complexity to be managed.<br>This module will look at select technologies under development and in early stage of application in laboratories and in industrial innovation centers by analyzing their potentials and limitations and effects on current supply chain and manufacturing systems. |

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| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ assess the effects of complex technologies in manufacturing and logistics systems;<br>▪ derive costs and benefits of these technologies;<br>▪ analyze the potentials of new cross-cutting technologies;<br>▪ manage the change requirements posed by new technologies;<br>▪ apply project management tools to effectively work in teams in order to perform the group project task. | |
| **Assessment** | Term paper (group project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Seminars (35 hours)<br>▪ Group work (45 hours)<br>▪ Private study (45 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.1.5. Advanced Supply Chain Management

| **MCO005 – AdvSCM** | **5 ECTS** |
|---|---|
| ▪ **MCO005-051005 Advanced Supply Chain Management** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Michael Rüdiger |
| **Content and Educational Aims** | Today's competitive global environment places ever-increasing demands on corporations concerning quality, cost and operational flexibility. Many organizations try to address these heightened demands by predominantly focusing on their core competencies and by having suppliers responsible for most or all non-core activities. The real net output ratio – the depth of a company's internal value creation – for many organizations has fallen below 50% and in some industries, like the automotive |

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| | industry, has dropped to below 25%. Consequently, the management of supply chains has become the key factor for corporate success in the short- mid- and long term. In this module, participants will explore the true scope, application and definition of supply chain management with thorough lectures and real-world applications. The module will also provide students with a set of tools to master integrated supply chain management design challenges and to determine the best supply chain design for companies in different operating environments. From the big picture down to the details, students will learn to identify the characteristics and objectives of inventory, transportation, warehousing and material handling as they interact in a company and country spanning supply chain. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ deal with methods to manage supply chain management operations;<br>▪ develop strategies for Customer Service and satisfaction;<br>▪ develop strategies to put in place based on the relationship between flexibility & demands of the firm;<br>▪ develop procurement strategies;<br>▪ make decisions for different stages of supply chain globalization. | |
| **Assessment** | Term paper (project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (35 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.1.6. Purchasing and Distribution

| **MCO006 – PurchDist** | **5 ECTS** |
|---|---|
| ▪ **MCO006-051432 International Purchasing**<br>▪ **MCO006-051501 Management of Logistics Service Providers** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Günter Prockl |
| **Content and Educational Aims** | This module covers two main aspects of supply chain management: purchasing and distribution.<br>The first part of the module deals with purchasing as a part of the entire business as well as with prerequisites for profitable business overall. The purchasing chapter of the module consists of two main sub-parts, purchasing itself and business simulation. The purchasing part of the module is based on group work and discussions with a focus on collaborative approaches and on understanding and developing these approaches in future doings of students. The aim here is to gain a deep understanding of possibilities and challenges procurement offers and faces in an organization. Another aim is to improve economical thinking skills and understanding how the key elements influence a business and its financial standing.<br><br>A major objective of the second part of the module is to equip students with a sound knowledge and understanding of processes and key business challenges within the field of distribution, transportation and logistics services. Students learn to understand distribution logistics. This mainly refers to service supply chains of logistics service providers in the context of their specific business models, where aspects such as specific value propositions, different revenue models, and different architectures of the resource basis are integrated. This second part outlines the evolution of distribution logistics from direct to store deliveries in the early 1970s up to the optimized supply chains of today (same day deliveries, omni-channel supply chains). |
| **Intended Learning Outcomes** | After successful completion of the module, students should be able to<br>▪ compare appropriate business models for logistics services in their context;<br>▪ develop purchasing strategies, plans and related processes in a global environment; |

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| | ▪ design logistics services by considering and combining different modes of transportation;<br>▪ integrate concepts and theories to answer specific questions referring to different modes of logistics services;<br>▪ evaluate the role of different actors within the service supply chain for different modes;<br>▪ assess key business challenges for different modes and players in the logistics service supply chain and so provide reasons for specific developments of different segments in the logistics service industry;<br>▪ think economically and understand how the key elements influence a business and its financial standing;<br>▪ develop team working skills and ability to cooperate with different people. | |
| **Assessment** | Two separate module component assessments of which both have to be passed:<br>Purchasing: term paper (group project report; 50%)<br>Distribution: written examination (50%) | |
| | The educational aims and intended learning outcomes of this module require two assessments to evaluate negotiation skills (Purchasing) and specialist knowledge (Distribution). | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Seminars (17.5 hours)<br>▪ Group work (45 hours)<br>▪ Private study (45 hours) | |
| **Relationship to other Modules** | -- | |

| **Module Components** | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| MCO006-051432 | International Purchasing | Seminar | 2.5 | yes |
| MCO006-051501 | Management of Logistics Service Providers | Lecture | 2.5 | yes |

### 2.2.1.7. Supply Chain Finance

| **MCO007 – SCFinance** | | **5 ECTS** |
|---|---|---|
| ▪ **MCO007-051007 Supply Chain Finance** | | |
| **Workload** | 125 hours | |
| **Duration** | 1 semester | |
| **Frequency of Module Offer** | Annually | |
| **Program Affiliation** | MSc Supply Chain Engineering and Management | |
| **Mandatory Status** | Mandatory for SCEM students | |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun | |
| **Content and Educational Aims** | Supply chains do not only involve material and information flows between companies but also money flows to finance such core activities. This module explains the relations between supply chain management and corporate finance by emphasizing how a supply chain and the materials/products delivered can be financed and how this creates value for both the shareholders of the company and for the stakeholders.<br>This module will use case studies from manufacturers, distributors and retailers to understand the financial needs and means. The module will give students a comprehensive and thorough overview and understanding of different strategies and applications of supply chain finance.<br>Main topics include shareholder value creation, cash-flow maximization, financial risk mitigation, supply chain finance decision-making, accounting methods, financial analysis, working capital management, capital budgeting, and sustainability. | |
| **Intended Learning Outcomes** | After successful completion of the module, students will be able to<br>▪ measure the impact of supply chain activities on the financial performance of the company;<br>▪ apply the proper financing and accounting methods for specific cases by considering the complex relations between value creation methods and supply chain value drivers;<br>▪ develop strategies to finance supply chain activities in global markets;<br>▪ develop strategies to satisfy stakeholders' and shareholders' expectations in the best way. | |
| **Assessment** | Written Examination | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |

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|---|---|---|
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Seminars (17.5 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.1.8. Data Analytics in Supply Chain Management

| **MCO008 – DataAnaSCM** | **5 ECTS** |
|---|---|
| ▪ **MCO008-051008 Data Analytics in Supply Chain Management** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management<br>MSc Data Engineering |
| **Mandatory Status** | Mandatory |
| **Module Representative** | Prof. Dr.-Ing. Hendro Wicaksono |
| **Content and Educational Aims** | In recent years, big data has become a significant topic in supply chain management as the amount of generated data in supply chain management practices has grown exponentially. Data analytics refer to techniques that apply data mining, statistical analysis, predictive analytics, machine learning, etc. to uncover hidden patterns, correlations, trends, and other business valuable information and knowledge from data.<br>The module focuses on the supply chain management scenarios that generate and consume data intensively and require data analytics to improve the decision making process through descriptive, predictive, and prescriptive analytics. These include, for example:<br>▪ Descriptive statistics and historical insight of companies' production, financial, operations, sales, customers, etc.<br>▪ Forecasting customer behavior, purchasing patterns, production performance, energy consumption, etc.<br>▪ Prescriptive analytics to assess the offer that should be made to a certain customer, to decide on the shipment strategy for each location, to determine the most efficient material flow in a factory, etc. |

<table>
<tr><td>Intended Learning Outcomes</td><td colspan="2">By the end of this module, students will be able to<br>▪ identify scenarios in supply chain management and evaluate the opportunities and challenges of data analytics applications;<br>▪ determine the objective of data analytics in different scenarios and the data sources required to achieve the objectives;<br>▪ apply methods and tools to collect and to integrate data from different sources in the context of supply chain management;<br>▪ apply machine learning and statistical analytics methods and tools to uncover hidden patterns, correlations, trends, and knowledge that are useful to improve supply chain management processes;<br>▪ evaluate data analytics results in different scenarios and solve the problems that might occur during the whole data analytics processes from data collection to analytics;<br>▪ develop deployment architecture concepts by integrating existing tools/software;<br>▪ develop business model and ecosystem concepts.</td></tr>
<tr><td>Assessment</td><td colspan="2">Term paper (project report)</td></tr>
<tr><td rowspan="3">Entry Requirements</td><td>Pre-requisites</td><td>--</td></tr>
<tr><td>Co-requisites</td><td>--</td></tr>
<tr><td>Knowledge, Skills And Competencies</td><td>Basics of statistical analytics and machine learning<br>Basics of database and SQL<br>Basics of programming skills such as R, Python, or Java</td></tr>
<tr><td>Recommendations for Preparation</td><td colspan="2">Reading the syllabus is recommended.</td></tr>
<tr><td>Forms of Learning and Teaching</td><td colspan="2">▪ Lectures and feedback sessions (35 hours)<br>▪ Group project (45 hours)<br>▪ Private study (45 hours)</td></tr>
<tr><td>Relationship to other Modules</td><td colspan="2">--</td></tr>
</table>

### 2.2.1.9. Smart Cities and Transportation Concepts

| **MCO009 – SmartCit** | | **5 ECTS** |
|---|---|---|
| ▪ **MCO009-051009 Smart Cities and Transportation Concepts** | | |
| **Workload** | 125 hours | |
| **Duration** | 1 semester | |
| **Frequency of Module Offer** | Annually | |
| **Program Affiliation** | MSc Supply Chain Engineering & Management | |
| **Mandatory Status** | Mandatory in SCEM | |
| **Module Representative** | Prof. Dr.-Ing. Hendro Wicaksono | |
| **Content and Educational Aims** | In recent years, cities around the world have been initiating and developing ideas and projects that use the word "smart". The projects and ideas are characterized by technologies, such as green energy, artificial intelligence, internet-of-things or self-driving vehicles, which require large amounts of data. This module focuses on the main considerations of smart city projects which include intelligent transportation (public transportation, urban logistics, smart vehicle) and environmental infrastructure (energy, water, and waste), as well as the technological backbone such as internet of things, cloud computing and data analytics. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to<br>▪ identify typical scenarios of smart city projects and evaluate the opportunities and challenges.<br>▪ discover backbone technologies required for intelligent transportation and environmental infrastructure and analyze the economics, ecological and social impacts.<br>▪ develop technological architecture concepts for typical smart city scenarios.<br>▪ work with smart city data set and analyze the data to improve decision making in smart city context. | |
| **Assessment** | Term paper (project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills And Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures and feedback sessions (35 hours)<br>▪ Group project (45 hours)<br>▪ Private study (45 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.1.10. Principles of Consulting

| **MCO010 – PrincCons** | | **5 ECTS** |
|---|---|---|
| ▪ **MCO010-051010 Principles of Consulting** | | |
| **Workload** | 125 hours | |
| **Duration** | 1 semester | |
| **Frequency of Module Offer** | Annually | |
| **Program Affiliation** | MSc Supply Chain Engineering & Management | |
| **Mandatory Status** | Mandatory for SCEM students | |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun | |
| **Content and Educational Aims** | Managing supply chains involves many activities and projects that require expert skills, which may not be available in the company. Thus, support by experienced consultants from outside the company is crucial. Graduates of SCEM may not only end up in supply chain related departments in companies but also may work with consultancies focusing on supply chain issues. This module gives a deep understanding in how consulting companies are run and how cross-cutting skills of consultants look like. Here, consulting processes are analyzed in detail. Additionally, the complex and intertwined roles and responsibilities of consultants and their interactions with clients are addressed. Furthermore, the different goals of internal and external consultancies are covered. Students are introduced to typical approaches and analytical tools for consultants. Case studies help students understand the phases of consultancy projects, organizational set-ups and interface to client, as well as assessment of project results. | |
| **Intended Learning Outcomes** | After successful completion of the module, students will be able to<br>▪ apply the different concepts and methods of supply chain consulting;<br>▪ use the advanced analytical tools;<br>▪ decide which tools and methods are optimal for respective situations;<br>▪ gain a deep understanding of quantitative decisions-making tools for the improvement of supply chain processes;<br>▪ critically analyze the applicability of theoretical methods in practice. | |
| **Assessment** | Term paper (project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |

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| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Seminars (17.5 hours)<br>▪ Group project (45 hours)<br>▪ Private study (45 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.2. Research & Discovery Area

#### 2.2.2.1. Applied Modeling & Simulation

| **MRD001 – ModSim** | **5 ECTS** |
|---|---|
| ▪ **MRD001-051011 Applied Modeling & Simulation** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Content and Educational Aims** | Decisions on the design and operation of logistics systems require a thorough understanding of the system's behavior. In many cases logistics systems are too complex to develop analytical methods that can be used to predict the system's behavior and any implementation of changes bears a great risk on the overall performance of the system. Simulations can be used to derive insight about the behavior of complex systems before changes are implemented. In this module, students will learn how to develop and conduct simulation experiments to analyze the behavior of complex logistics and supply chain systems.<br>Throughout the module, different aspects of manufacturing systems and supply chains will be modeled and simulated.<br>The module is structured in three main parts:<br>▪ Discrete-event simulation: to design and analyze logistical parameters, such as inventory levels, capacity utilizations, lead times, etc.<br>▪ Agent-based simulation: to model individual agents and their behavior to understand their effect and impact on the overall system.<br>▪ System Dynamics: to model whole system on a highly aggregate level to understand its dynamics.<br>Students will prepare assignments based on the created models and they will work on a final group project by dealing with a complex problem to be solved by using different combined simulation methods. |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ model highly dynamic logistics systems;<br>▪ apply different simulation methods (discrete-event, agent-based, System Dynamics) to design and analyze processes; |

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| | ▪ detect bottlenecks and inefficiencies in such complex systems;<br>▪ analyze results of simulation runs;<br>▪ solve bottlenecks and optimize complex logistics systems by changing parameters and the overall system design;<br>▪ Apply project management tools to effectively work in teams in order to solve complex problems in a group. | |
| **Assessment** | Term paper (project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Lab (17.5 hours)<br>▪ Group work (45 hours)<br>▪ Private study (45 hours) | |
| **Relationship to other Modules** | -- | |

#### 2.2.2.2. Supply Chain Engineering

| **MRD002 – SCEng** | **5 ECTS** |
|---|---|
| ▪ **MRD002-051012 Supply Chain Engineering** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Dr. Stanislav Chankov |
| **Content and Educational Aims** | Supply Chain Engineering is concerned with the design of the supply chain network and the use of mathematical models and methods to determine the optimal strategies for managing the supply chain. Accordingly, this module has two components:<br>▪ application of mathematical models from operations research<br>▪ integrated decision making in supply chain management.<br>In the first part of the module, students will learn how to find optimal or near-optimal solutions to complex decision-making |

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| | problems by employing techniques such as mathematical modeling, statistical analysis, and mathematical optimization from the field of operations research. Operations Research is concerned with determining the maximum (of profit, performance, or yield) or the minimum (of loss, risk, or cost) of some real-world objective. This part of the module introduces students to modeling of decision problems and the use of quantitative methods and techniques for effective decision-making in supply chain management on topics such as: supplier selection, demand forecasting, production planning, transportation problems and vehicle routing.<br>In the second part of the module students play the Fresh Connection game. The Fresh Connection is an innovative web-based business simulation that delivers the ultimate supply chain learning experience. It engages participants in making strategic decisions in the management of a manufacturing company of fruit juices. Working in teams of four, participants represent the functional roles of sales, purchasing, supply chain and operations. They are confronted with various real-life, real-time dilemmas and render typical supply chain management decisions (e.g. supplier selection, production capacity planning, inventory management, etc.). Thereby, students learn how to use information in decision-making and how to handle risk and uncertainty. Thus, they experience the power of true alignment and a well-articulated supply chain strategy, supported by tactical skills and knowledge. |
| **Intended Learning Outcomes** | After successful completion of the module, students should be able to:<br>▪ calculate optimal or near-optimal solutions to complex decision-making problems using operations research methods;<br>▪ design mathematical models for business problems in supply chain management;<br>▪ apply techniques such as linear programming, dynamic programming or stochastic programming to solve business problems;<br>▪ resolve common network optimization problems such as transportation, shortest path, minimum spanning tree, and maximum flow problems;<br>▪ formulate and explain supply chain strategy;<br>▪ make decisions in a high-pressure environment as part of a team;<br>▪ evaluate different suppliers and defend appropriate contract terms in a global supply chain environment;<br>▪ design appropriate techniques for capacity planning in warehouses and production, inventory management and demand forecasting;<br>▪ develop project management tools to effectively work in teams in order to perform a task. |

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| **Assessment** | Two assessment components:<br>Term paper (group project report) (50%)<br>Written examination (50%) | |
| | The educational aims and intended learning outcomes of this module require two assessment types to evaluate both specialist knowledge (e.g. pure mathematical skills) as well as the application thereof in the business simulation. | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Seminars (17.5 hours)<br>▪ Group sessions (45 hours)<br>▪ Private study (45 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.2.3. Research Project

| **MRD003 - ResProj** | **5 ECTS** |
|---|---|
| ▪ **MRD003-051013 Research Project** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Instructors of Record** | Prof. Dr. Geert Brunekreeft, Dr. Eugenia Rosca |
| **Content and Educational Aims** | Supply Chain Engineering and Management graduates need to develop research skills as well, not only to prepare for their master thesis but also due to the fact that many graduates pursue an academic career. Thus, profound research skills as of utmost importance.<br>Content-wise, many industries are characterized by complex and highly interdependent supply stages. This raises issues of vertical and horizontal coordination, competition and market design as well as regulation. Picking up a specific example of |

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| | such a complex industry, this module aims to step into the specific issues of value chain management, analyzing theoretical and practical issues from the viewpoint of economics and business administration.<br>Typical research questions refer to the general market structure of the industry. What are the issues of competition and regulation of the industry? How critical is vertical and/or horizontal coordination, and how are information flows and coordination handled along the supply chain? What are possible problems of vertical integration or fragmentation in the sector? Are there problems of risks and cost structures, ownership, or investments or innovation?<br><br>This seminar requires the students to prepare in small groups a research paper on value chain management, and analyze specific economic issues of the selected industry based on applied scientific literature and methods. The main aim is to learn to think independently and critically. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ write and review a research paper with an applied scientific background;<br>▪ select and evaluate relevant literature;<br>▪ assess the key arguments in the debate critically and independently;<br>▪ develop an ability for a reasonable, reflecting, and stringent argumentation;<br>▪ precisely communicate their ideas and views in a concise and clear manner on academic level;<br>▪ precisely communicate of ideas in discussions and presentation in class. | |
| **Assessment** | Term paper (report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Seminars (35 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.3. Math & Methods Area

#### 2.2.3.1. Programming Approaches for Data Analytics

| **MMM001 – ProgrAppr** | | **5 ECTS** |
|---|---|---|
| ▪ **JTME-990203 Statistical Modeling with R**<br>▪ **JTSK-350111 Programming in Python** | | |
| **Workload** | 125 hours | |
| **Duration** | 1 semester | |
| **Frequency of Module Offer** | Annually | |
| **Program Affiliation** | MSc Supply Chain Engineering & Management (SCEM) | |
| **Mandatory Status** | ▪ Mandatory for SCEM students<br>▪ Optional for students of other programs | |
| **Module Coordinator** | Prof. Dr. Adalbert F.X. Wilhelm | |
| **Instructors of Record** | Prof. Dr. Adalbert F.X. Wilhelm, Dr. Kinga Lipskoch | |
| **Content and Educational Aims** | Data analysis has become a central part of jobs in the supply chain industry. While routine tasks are often accomplished with standard spreadsheet software, more advanced analytical procedures require the use of programming languages. R and Python are the two most popular programming languages used by data analysts and data scientists. While both share a broad spectrum of applicability, Python has been designed as a general-purpose programming language, and R had been designed primarily for statistical analysis. As open-source projects both software built on a huge worldwide user and developer community, which has extended the capabilities of both programs to a largely overlapping scope. In this module, students will get a first introduction into both languages. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ perform data handling and data manipulation tasks in R and Python;<br>▪ apply their knowledge to implement code in R and Python;<br>▪ effectively use core packages and libraries of R and Python for data analytic purposes;<br>▪ know about typical applications of R and Python in data science. | |
| **Assessment** | Written examination | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |

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|---|---|---|
| | Knowledge, Skills and Competencies | Logical thinking, analytical skills |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (35 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | Prerequisite for Advanced Programming Approaches for Data Analytics | |

| **Module Components** | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| JTME-990203 | Statistical Modeling with R | Lecture | 2.5 | yes |
| JTSK-350111 | Programming in Python | Lecture | 2.5 | yes |

### 2.2.3.2. Research Methods

| **MMM002 – ResMeth** | **5 ECTS** |
|---|---|
| ▪ **MMM002-051014 Operations Research in SCM**<br>▪ **MMM002-990202 Qualitative Research: Methods and Methodology** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering & Management |
| **Mandatory Status** | Mandatory for SCEM students<br>Optional for students of other programs |
| **Module Coordinator** | Prof. Dr. Margrit Schreier |
| **Content and Educational Aims** | This module consists of both qualitative and quantitative research methods.<br>The latter is about Operations Research that is an inter-disciplinary mathematical science that uses techniques such as mathematical modeling, statistical analysis, and mathematical optimization, to find optimal or near-optimal solutions to complex decision-making problems. Operations Research is concerned with determining the maximum (of profit, performance, or yield) or the minimum (of loss, risk, or cost) of some real-world objectives. Students learn modelling of decision problems and the use of quantitative methods and techniques for effective decision-making. This component of the module will mainly deal with problems in supply chain management, such as optimizing distribution systems, location selection, etc. |

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| | Qualitative research, as the second component of this module, is concerned with meaning – for instance, the meaning that events have for people, or the meaning of written texts or works of art. By applying qualitative methods, researchers seek to obtain an in-depth understanding of these meanings. This module component examines the methodological foundations of qualitative research, introduces purposive sampling strategies that are especially suitable for an in-depth discovery of meaning, discusses how researchers acquire their data (for instance through interviews, focus groups, or observation), and reviews methods for the analysis of qualitative data (such as: various types of coding, content analysis, discourse analysis, visual analysis). Special emphasis is placed on examining the 'quality of qualitative research', including the extent to which the traditional criteria of objectivity, reliability, and validity can be applied. This component of the module is held in part as a seminar and in part as a lab where students apply the methods to data from their own fields of study. During the lab sessions, students are required to participate in and report on activities involving the application and trying out of selected methods. Also, students will develop, carry out, and report on small group research projects, fostering the integration of methodological knowledge about methods and designs with practical expertise in applying these methods. Lab sessions are run with small groups to ensure optimal supervision of research projects. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ Model and formulate complex logistics problems as mathematical equations;<br>▪ Apply operations research methods, i.e. mathematical models, to solve complex problems;<br>▪ Prepare and conduct qualitative research, such as interviews;<br>▪ Analyze and contextualize the findings of qualitative research. | |
| **Assessment** | Term paper (project report) | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Seminar (17.5 hours)<br>▪ Private Study (90 hours) | |
| **Relationship to other Modules** | | |

| Module Components | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| MMM002-051014 | Operations Research in SCM | lecture | 2.5 | yes |
| MMM002-990202 | Qualitative Research: Methods and Methodology | lecture | 2.5 | yes |

### 2.2.3.3. Advanced Programming Approaches for Data Analytics

| **MMM003 – AdvProgAppr** | **5 ECTS** |
|---|---|
| ▪ **MMM003-051020 Advanced Programming for Data Analytics** | |
| **Workload** | 125 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering and Management (SCEM) |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Adalbert F.X. Wilhelm |
| **Content and Educational Aims** | Building on the knowledge and skills obtained in the module Programming for Data Analytics, students will enhance their expertise by advanced techniques for extracting information from data. Students will learn and apply algorithms and computational paradigms that allow computer-based search and detection of data patterns and regularities in business data. This process of knowledge discovery in data bases includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of data and generated patterns and structures. The module aims at providing an overview on the whole knowledge discovery process and will illustrate the predominant challenges and strategies by examples. |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ implement and apply advanced data mining methods with appropriate tools;<br>▪ evaluate and compare the suitability, scalability and efficiency of different methods in practical settings;<br>▪ perform a full cycle of data analysis;<br>▪ tackle data analysis problems in a business context. |
| **Assessment** | Two assessment components:<br>Written examination (50%)<br>Project (50%) |

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|---|---|---|
| | The educational aims and intended learning outcomes of this module require both a project and a written assessment. | |
| **Entry Requirements** | Pre-requisites | Programming for Data Analytics |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | Logical thinking, analytical skills |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Group sessions (17.5 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | -- | |

### 2.2.4. Career Area

#### 2.2.4.1. Communicating and Presenting

| **MCA001 – CommPres** | **5 ECTS** |
|---|---|
| ▪ **MCA001-051464 Communication & Presentation Skills for Executives**<br>▪ **MCA001-051016 Academic Writing** | |
| **Workload** | 125 hours |
| **Duration** | 2 semesters |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | MSc Supply Chain Engineering & Management (SCEM) |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Instructors of Record** | Irene Bejenke Walsh, Meron Beshewamyeleh |
| **Content and Educational Aims** | *Communication & Presentation Skills for Executives*<br>An executive career in an international business environment requires excellent communication and academic writing skills. Managers have to communicate effectively with a large variety of target audiences, often in different languages and with different cultural backgrounds. This is true for employees and/or direct reports, business partners as well as customers. The ability to present and communicate succinctly and confidently while being culturally aware building rapport and trust with different audiences is crucial. In this interactive module, students will be introduced to the basics of effective presentation and communication techniques. They will learn how to present themselves, their business project, or academic work, with impact, tailoring both the content and their delivery style to different types of audiences.<br>*Academic Writing*<br>The academically rigorous nature of graduate studies requires students to master academic writing skills and techniques. In this introductory module component, students in SCEM master's program will learn the foundations of academic writing at a graduate level, with special focus on writing academic essays, identifying organizational patterns of academic texts, and formulating arguments to produce cohesive and coherent academic papers. Through the process of drafting, continuous feedback and editing, students will improve their writing skills. This module component will also help students develop their research skills by highlighting techniques of finding and evaluating sources, and utilizing citation and referencing styles. As graduate students, adhering to The Code of Academic Integrity is a requirement. Hence, this module component will |

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| | incorporate a session on scholarly and intellectual standards set by Jacobs University.<br>The two components in this module complement each other, with one part placing strong emphasis on communication and presenting information orally, while the second is focusing on presenting and communicating academic information in a written form. |
| **Intended Learning Outcomes** | *Communication & Presentation Skills for Executives*<br>After successful completion of the module, students should be able to<br>▪ act as effective communicators – in both group and individual situations;<br>▪ understand interpersonal communication models and group dynamics in presentations;<br>▪ understand the importance of building rapport and trust with audiences;<br>▪ use presentation software (Powerpoint, Prezi) confidently and in a visually pleasant way;<br>▪ learn how to structure presentations in a coherent manner and develop captivating narratives;<br>▪ work with different presentation formats (Ignite, Pecha Kucha, Pitching etc.);<br>▪ understand and apply the basics of logical reasoning in oratory (deductive/inductive)presentations;<br>▪ develop oratory and rhetorical skills drawing on Aristotle's teaching of logos, ethos and pathos;<br>▪ apply the basics of interpersonal communication (Johari Window, 4-Ears model etc.);<br>▪ give and receive constructive feedback;<br>▪ present themselves in different business situations;<br>▪ collaborate effective in intercultural teams.<br><br>*Academic Writing*<br>▪ structure their ideas to write clear summaries, coherent paragraphs and cohesive literature reviews;<br>▪ write different segments of an academic paper employing writing styles that display advanced grammar and precise and concise language use;<br>▪ successfully find and evaluate sources for research;<br>▪ use citation and referencing styles applicable for their discipline;<br>▪ avoid unintentional plagiarism and adhere to the code of academic integrity. |
| **Assessment** | Two separate module component assessments of which both have to be passed:<br>*Communication & Presentation Skills for Executives:*<br>Oral presentation (50%)<br>*Academic writing:* Writing assignment (50%) |

| | | |
|---|---|---|
| | The educational aims and intended learning outcomes of this module require both an oral and a written assessment. | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (35 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | Part of the Career Area | |

| **Module Components** | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| MCA001-051464 | Communication & Presentation Skills for Executives | Seminar | 2.5 | yes |
| MCA001-051016 | Academic Writing | Lecture | 2.5 | yes |

### 2.2.4.2. Language Skills

| **MCA002 – LanguageMa** | | **5 ECTS** |
|---|---|---|
| ▪ **0100XX German (A1 – C1) or**<br>▪ **0110XX French (A1 – C1) or**<br>▪ **0120XX Spanish (A1 – C1) or**<br>▪ **0130XX Chinese (A1 – A2)** | | |
| **Workload** | 125 hours | |
| **Duration** | 2 semesters | |
| **Frequency of Module Offer** | Continuously | |
| **Program Affiliation** | This module is offered in all study programs. | |
| **Mandatory Status** | The module is mandatory for all students of the programs MSc Data Engineering and MSc Supply Chain Engineering and Management.<br>▪ Students whose native language is not German are required to obtain 5 credit points in German language modules (2 module components worth 2.5 credit points each). | |

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| | ▪ Students whose native language is German are required to obtain 5 credit points in language modules in a language other than German (2 module components worth 2.5 credit points each).<br>At the beginning of their first semester students are required to take a placement test to determine the level of language module components to be taken. | |
| **Module Coordinator** | Dr. Silke Cramer | |
| **Instructors of Record** | Language trainers | |
| **Content and Educational Aims** | Foreign language skills foster students' intercultural awareness and enhance their employability in a globalized and inter-connected world. Jacobs University supports its students in acquiring and improving these skills by offering a variety of language modules at a broad range of proficiency levels.<br>Emphasis is put on fostering German language skills as they are an important prerequisite for students to learn about, explore and integrate into their host country. German language skills facilitate exchange with the local neighborhood, enable students to do internships at German companies and pave the way for professional and academic careers in Germany.<br>Language modules are taught along the Common European Framework of Reference for Languages (CEFR). Students progress along the CEFR levels A1 to C1 by taking consecutive language modules based on their individual language proficiency. Placement tests are conducted at the beginning of the semester. | |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ understand and communicate in a language other than English at the CEFR level defined in the respective language classes. | |
| **Assessment** | ▪ Written examination | |
| **Entry Requirements** | Pre-requisites | Proficiency level test |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | Depending on the level, adequate language skills are required. |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | Forms of learning and teaching vary depending on the level of the modules taken by the students. | |
| **Relationship to other Modules** | Part of the Career Area | |

| Module Components (see CampusNet for current offerings) | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| 0100XX | German (A1 – C1) or | Language class | 2.5 | taking two module components of the same language is mandatory. |
| 0110XX | French (A1 – C1) or | Language class | 2.5 | |
| 0120XX r | Spanish (A1 – C1) or | Language class | 2.5 | |
| 0130XX | Chinese (A1 – A2) | Language class | 2.5 | |

### 2.2.4.3. Business in Practice and Theory

| **MCA003 – Business** | **5 ECTS** |
|---|---|
| ▪ **MCA003-051522 Ethics & Sustainable Business**<br>▪ **MCA003-051017 Business in Germany Today**<br>▪ **MCA003-051018 Negotiation Skills** | |
| **Workload** | 125 hours |
| **Duration** | 2 semesters |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | ▪ MSc Supply Chain Engineering and Management (SCEM)<br>▪ MSc Data Engineering |
| **Mandatory Status** | Mandatory for SCEM students |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Instructors of Record** | Dr. Silke Cramer, Prof. Dr. Michael Rüdiger, N.N. |
| **Content and Educational Aims** | This module focuses on special aspects of business, preparing students for leading positions in the business world by establishing and navigating businesses especially in the German business landscape, dealing with ethical issues in business operations, and managing negotiations in the business context.<br><br>The first component of this module will ensure that graduates are able to navigate the often difficult terrain of national and international business operations. Ethics and integrity in more and more digitalized supply chain management are an important condition for the effective functioning of any company and for creating the conditions for sustainable growth and economic success. Ethics or morality have to do with the principles, standards, rules and norms of conduct that enable business cooperation and that allow companies to flourish; it provides a philosophically based touchstone for an ideal of justice, right relationship, and the proper use of power and authority. The focus of this component is two-fold. First, it looks at ethical |

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| | principles, rules and regulations in general and, second, it covers sustainable business practices in detail. Specific topics are: economic aspects of sustainability as well as legal and ecological aspects of sustainability as they relate to business operations. Ethical principles concerning sustainability and digitalization, i.e. data security and privacy, etc., as they relate to supply chain management in a global setting are a useful and potentially critical component to prepare future professionals to be effective contributors to a company or society.<br><br>The second component of this module focuses on current topics in the German economic ecosystem. It helps students orientate themselves within Germany and understand the German business culture and landscape. Germany is an important logistics hub and many international companies are present in the German market. Therefore, a solid command of the German language as well as knowledge about its economy and institutions prepares students of SCEM both for a career within Germany as well as for an international career dealing with German suppliers and customers. The component aims at familiarizing international master students with the German business world. First, the evolution and the historical backdrop of the German economy, starting with the German "Wirtschaftswunder" to the European integration with the implications for the economy and business life will be taught. Second, the current complex business landscape in Germany with the major institutions and their relationships will be addressed. Third, on a corporate level, company-related structural aspects, such as legal forms and their pros and cons will be discussed. This is also important for starting a business in Germany. All information is intended to embed students' and graduates' lives in Germany into contexts specific to the country. If feasible, parts of the component are conducted in German.<br><br>SCEM graduates are also faced with negotiations at different stages in their career. Therefore, the third component of this module deals with negotiation as a cross-cutting skill that is indispensable in today´s business life. Not only between companies, i.e. with suppliers and customers, but also within a company, e.g. with superiors as to salary and promotion, negotiations take place at all levels. Being prepared for those negotiations is key to get a fair share of what is at stake. With interactive methods, like role plays, students will learn how best to prepare and conduct such negotiations. |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ proactively deal with a number of different topics as they relate to the ethics and sustainability dimensions of supply chain management; |

| | | |
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| | ▪ assess the economic implications of ethical/unethical as well as sustainable/unsustainable behavior on the success and growth of a business;<br>▪ deal with legal aspects of ethics and sustainability by applying means to prevent and deal with corruption and accountability;<br>▪ apply actions to contribute to the transition to a more sustainable business and society as part of their job<br>▪ implement justice and social equality as dimensions of Ethics and Sustainability;<br>▪ analyze and interpret economic developments in Germany and their effects on business operations.<br>▪ Analyze and, in the case of starting a business, find the proper legal form for a company;<br>▪ apply negotiation techniques to best prepare and conduct negotiations. | |
| **Assessment** | Separate module component assessments of which all have to be passed:<br>*Ethics & Sustainable Business*: term paper (report) (50%)<br>*Business in Germany Today*: written examination (30%)<br>*Negotiation Skills:* written examination (20%) | |
| | The educational aims and intended learning outcomes of this module require separate assessments. | |
| **Entry Requirements** | Pre-requisites | -- |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | -- |
| **Recommendations for Preparation** | Reading the syllabus is recommended. | |
| **Forms of Learning and Teaching** | ▪ Lectures (17.5 hours)<br>▪ Group sessions (17.5 hours)<br>▪ Private study (90 hours) | |
| **Relationship to other Modules** | Part of the Career Area | |

| **Module Components** | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| MCA003-051522 | Ethics & Sustainable Business | Lecture | 2.5 | yes |
| MCA003-051017 | Business in Germany Today | Seminar | 1.5 | yes |
| MCA003-051018 | Negotiation Skills | Seminar | 1 | yes |

### 2.2.5. Master Thesis

| **MMT002 - MasterThesis** | **30 ECTS** |
|---|---|
| ▪ **MMT002-051019 Master Thesis** | |
| **Workload** | 750 hours |
| **Duration** | 1 semester |
| **Frequency of Module Offer** | Annually |
| **Program Affiliation** | Supply Chain Engineering and Management |
| **Mandatory Status** | Mandatory |
| **Module Coordinator** | Prof. Dr. Yilmaz Uygun |
| **Content and Educational Aims** | The Master thesis provides an opportunity for students to develo their interests in a specific subject area or specialization, and to demonstrate their ability to undertake independent research. The thesis constitutes a scientific exposition featuring their own research results. Students are required to independently use and apply the knowledge, methods, skills and competences acquired during their studies. Students are in regular contact with their thesis supervisor to ensure that the work progresses and meets the expectations and standards of an independent research work, and that it adheres to good scientific practice.<br><br>The selected topic of the thesis, as well as the approach must be related to a real supply chain management or logistics problem. The Study Program Chair has to approve the topic to ensure it is embedded in the program's overall topic, its aims and goals.<br><br>The thesis will be accompanied by a *research colloquium* where students have to present their thesis projects in an appropriate form, e.g. on posters, to other fellow students as well as to the thesis supervisors to get feedback and further impulses. This presentation represents a module achievement in a group setting and will hence train oral presentation skills. |
| **Intended Learning Outcomes** | By the end of this module, students will be able to:<br>▪ independently develop research questions guided by gaps in existing knowledge and determine appropriate research strategies and plans;<br>▪ independently choose and justify appropriate research methods to new unsolved problems or issues;<br>▪ critically asses scientific results and literature;<br>▪ summarize the current state of knowledge in their chosen specialization area;<br>▪ independently apply appropriate knowledge, methods and competencies acquired during their studies;<br>▪ develop conclusions based on their own analysis; |

| | | |
|---|---|---|
| | ▪ effectively communicate and discuss their research results to various audiences;<br>▪ take into consideration social and ethical consequences of their activities. | |
| **Assessment** | Master thesis | |
| **Entry Requirements** | Pre-requisites | Successful completion of at least 85 CP |
| | Co-requisites | -- |
| | Knowledge, Skills and Competencies | Proficiency in the area of the chosen thesis topic |
| **Recommendations for Preparation** | ▪ Identify an area or a topic of interest.<br>▪ Create a research proposal including a research plan to ensure timely submission.<br>▪ Ensure you possess all required technical research skills or are able to acquire them on time.<br>▪ Review again the University's Code of Academic Integrity and Guidelines to Ensure Good Academic Practice. | |
| **Forms of Learning and Teaching** | ▪ Private study (732.5 hours)<br>▪ Groups sessions (17.5 hours) | |
| **Relationship to other Modules** | Research Methods | |

| **Module Components** | | | | |
|---|---|---|---|---|
| **No.** | **Title** | **Type** | **CP** | **Mandatory** |
| MMT002-051019 | Master Thesis | Thesis | 30 | yes |

# 3. Supply Chain Engineering & Management Graduate Program Regulations

## 3.1. Scope of these Regulations

The regulations in this handbook are valid for all students who entered the Supply Chain Engineering & Management graduate program at Jacobs University in fall 2018. In case of conflict between the regulations in this handbook and the general Policies for Master Studies, the latter apply (see http://www.jacobs-university.de/academic-policies).

## 3.2. Degree

Upon successful completion of the study program, students are awarded a Master of Science (MSc) degree in Supply Chain Engineering & Management.

## 3.3. Graduation Requirements

In order to graduate, students need to obtain 120 credit points. In addition, the following graduation requirements apply:

- Students need to complete all mandatory components of the program as indicated in chapter 2 of this handbook.

## 3.4. Other Program-Specific Policies & Practices

Close contact and cooperation between program representatives and students is crucial. Therefore, regular meetings are held to continuously evaluate the program, its modules and workshops, supervision and opportunities. In doing so, the program directors gain important insights on students' experiences, demands and overall impressions of the program. On the module component level, students are asked to perform module component evaluations to ensure the high-quality of modules and to ensure necessary changes can be made by individual lecturers.

The study program chair intensively make use of this feedback and the feedback of industry partners to further improve the learning environment, the program's offering and its progress. The current program was highly shaped through such input from previous experiences and discussions with several stakeholders, including both students and industry.

Jacobs University Bremen reserves the right to substitute modules by replacements and/or reduce the number of mandatory/mandatory-elective modules offered.

## 4. Appendix - Mandatory Study and Examination Plan

| Supply Chain Engineering & Management (SCEM) | | | | | | |
|---|---|---|---|---|---|---|
| **Matriculation Fall 2018** | | | | | | |
| Module Component | | Status[1] | Assessment type | Examination period[2] | Semester | Credits |
| **First Semester** | | | | | | **30** |
| | **Core Area** | | | | | **15** |
| MCO001-052101<br>MCO001-051412 | Advanced Project, Quality and Risk Management | m | Oral + written | 8-14 + 15/16 | 1 | 5 |
| MCO002-051002 | Supply Chain Management, Logistics & Transportation | m | Written Exam | 15/16 | 1 | 5 |
| MCO0003-051003 | Big Data Challenge | m | Term paper (project report) | 8-14 | 1 | 5 |
| | **Math & Methods Area** | | | | | **5** |
| JTME-990203<br>JTSK-350111 | Programming Approaches for Data Analytics | m | Written examination | 15/16 | 1 | 5 |
| | **Research & Discovery Area** | | | | | **5** |
| MRD001-051011 | Applied Modeling & Simulation | m | Term paper (project report) | 8-14 | 1 | 5 |
| | **Career Area** | | | | | **5** |
| MCA002 | Language Skills | m | Written examination (not graded) | | 1 | 2.5 |
| MCA001-051464 | Communication and Presentation Skills | m | Presentation | 8-14 | 1 | 2.5 |
| **Second Semester** | | | | | | **30** |
| | **Core Area** | | | | | **15** |
| MCO004-051004 | Trends & Challenges in SCM | m | Term paper (group project report) | 8-14 | 2 | 5 |
| MCO005-051005 | Advanced Supply Chain Management | m | Term paper (project report) | 8-14 | 2 | 5 |
| MCO006-051432<br>MCO006-051501 | Purchasing & Distribution | m | Term paper (group project report) + Written Exam | 8-14 + 15/16 | 2 | 5 |
| | **Math & Methods Area** | | | | | **5** |
| MMM002-051014<br>MMM002-990202 | Research Methods | m | Term paper (report) | 8-14 | 2 | 5 |
| | **Research & Discovery Area** | | | | | **5** |
| MRD002-051012 | Supply Chain Engineering | m | Term paper (group project report) + Written examination | 8-14 + 15/16 | 2 | 5 |

| Module Component | | Status[1] | Examination type | Examination period[2] | Semester | Credits |
|---|---|---|---|---|---|---|
| | **Career Area** | | | | | **5** |
| MCA002 | Language Skills | m | Written examination | 15/16 | 2 | 2.5 |
| MCA001-051016 | Academic Writing | m | Written Assingment | 8-14 | 2 | 2.5 |
| **Third Semester** | | | | | | **30** |
| | **Core Area (choose 3 modules)** | | | | | **15** |
| MCO007-051007 | Supply Chain Finance | me | Written examination | 15/16 | 3 | 5 |
| MCO008-051008 | Data Analytics in Supply Chain Management | me | Term paper (project report) | 8-14 | 3 | 5 |
| MCO009-051009 | Smart Cities and Transportation Concepts | me | Term paper (project report) | 8-14 | 3 | 5 |
| MCO010-051010 | Principles of Consulting | me | Term paper (project report) | 8-14 | 3 | 5 |
| | **Math & Methods Area** | | | | | **5** |
| MMM003-051020 | Advanced Programming Approaches for Data Analytics | m | Written examination + Project | 8-14 | 3 | 5 |
| | **Research & Discovery Area** | | | | | **5** |
| MRD003-051013 | Research Project | m | Term paper (report) | 8-14 | 3 | 5 |
| | **Career Area** | | | | | **5** |
| MCA003-051522 | Ethics & Sustainable Business | m | Term Paper (Report) | 8-14 | 3 | 2.5 |
| MCA003-051017 | Business in Germany Today | m | Written examination | 15/16 | 3 | 1.5 |
| MCA003-051018 | Negotiation Skills | m | Written examination | 15/16 | 3 | 1.0 |
| **Fourth Semester** | | | | | | **30** |
| MMT002-051019 | Master Thesis | m | Thesis | individual | 4 | 30 |
| **Total ECTS** | | | | | | **120** |

[1] Status (m = mandatory, me = mandatory elective)
[2] Each lecture period lasts 14 semester weeks and is followed by reading and examination days. Written examinations are centrally scheduled during weeks 15 and 16. For all other assessment types, the timeframes indicated in the above table stipulate during which period module work has to be handed in or presented. Specific information on dates of topic announcement as well as submission deadlines is communicated in the syllabus that is made available to the students at the beginning of each semester. Academic dates are published in the university-wide Academic Calendar (www.jacobs-university.de/academic-calendar).