

Master's Programme in Industrial Engineering and Management: Study Guide 2015-2016

For the reader

This study guide explains the degree requirements of the programmes, and gives students the necessary information about completing the degree and its contents.

In addition to study guides, Aalto University uses various online services for planning and monitoring one's studies, and for keeping up with what is going on at the university. In planning one's studies, this study guide and the online tools complement each other and should be used side by side.

Below is an introduction to students' most important online tools:



Degree structure

Director of degree programme: Associate Professor Mikko Jääskeläinen

Degree: Master of Science (Technology), 120 ECTS

Abbreviation: IEM

Description of the programme

The Master's Programme in Industrial Engineering and Management (IEM) combines engineering with economic and human fundamentals to create value and efficiency. Unique in its multidisciplinary and integrative essence, IEM studies explore the foundations of business and engineering processes and inspire an engineering mindset to develop business. The distinctive focus of the programme is to educate graduates with knowledge, skills and will to create and transform technology-based businesses in new or established firms.

IEM professionalism is an integrated skill set consisting of mathematical, technological, economic, and social competences that focuses on proactive problem solving in value creating processes. In essence, the ethos of IEM studies emphasizes a systemic, solution oriented engineering mindset. Emphasis is on capability to solve the right problems right, i.e. identify needs, define problems accordingly, and solve them effectively. Building on these foundations, the program develops strong competencies for the creation and transformation of technology-based business combining strategic, operations, and people perspectives.

Degree structure

The degree consists of a major (45 ECTS), a minor (20 ECTS), elective studies (25 ECTS), and the Master's thesis (30 ECTS).

The major must be one of the five options described in the curriculum. For the majors in Strategy and Venturing, Operations and Service Management, and Leadership and Knowledge Management there are no restrictions or quotas concerning the major for IEM students. Students admitted directly to the major in Strategy (offered in cooperation with the Aalto School of Business) must complete this major, naturally. Students must separately apply for the major "Framtidens Industriföretag" (FIF). Each major has compulsory and optional courses. The common compulsory element in each major is one of the available Research Assignment courses in IEM best addressing the field of the major.

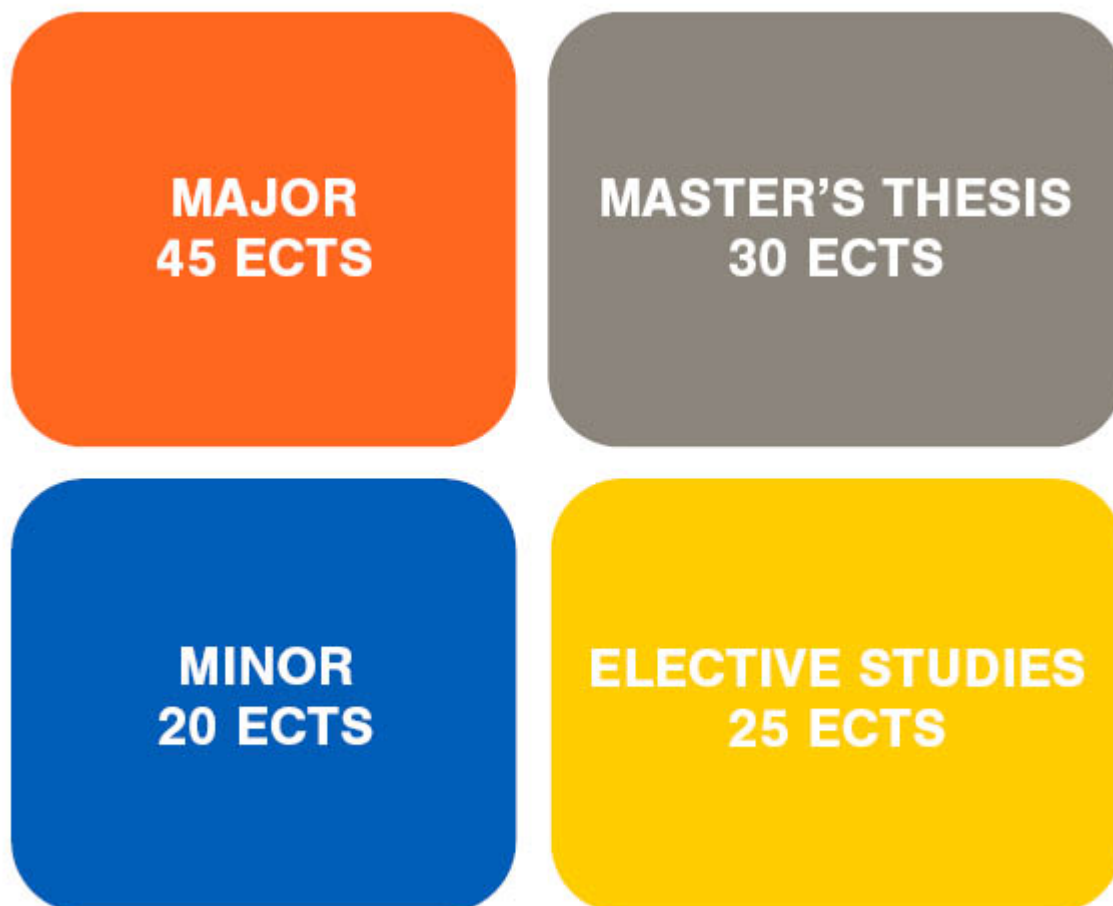
Graduates from the programme should have obtained appropriate knowledge of one technical discipline. Therefore, the selection of the minor is regulated. Students graduating from the Bachelor's programme in Science and Technology (Teknistieteellinen kandidaattihjelma) and continuing their major studies in IEM in the master's programme as well as students with equivalent educational background are required to select their minor in a field of engineering that clearly differs from industrial engineering and management. More detailed instructions for choosing the minor are described in section "Minor".

Each student's major and minor are confirmed in the Personal Study Plan.

In order to support graduation in 2 years, it is important to recognize the critical path. Students are encouraged to choose their major before the 1st year starts. Thereby, the first autumn emphasizes the compulsory courses of the major enabling the research assignment already in the first spring (or the 2nd autumn). The research assignment is a prerequisite for starting the master's thesis. Although the intensive work takes place in the 2nd spring, preparations for the master's thesis should gradually start in the beginning of the second year. The choice and timing of the optional and integrative courses of the major should support the progress in the critical path.

During the 1st autumn, students should choose their minor (whether the choice is restricted or free). In the planning and scheduling of studies, students should take into consideration quotas, prerequisite knowledge and the suggested sequence for the courses in the minor. The sooner the choice of the minor is made; the more possibilities a student has to level the overall workload without delaying the graduation. Likewise, planning of a semester in a foreign university becomes easier.

The last element in making the personal study plan is choosing the electives.



The aims of the education

The generic aims of the education are listed below.

- Provide students with in-depth knowledge of the field of the major and give them the knowledge and skills needed to understand the challenges of the field from the points of view of users, technical and social systems, and the environment.
- Provide students with the knowledge and skills needed for operating as an expert and developer of the field.
- Provide students with the knowledge and skills needed to apply scientific knowledge and scientific methods independently and, eventually, needed for scientific postgraduate education.
- Provide students with the language and communication skills needed to follow the scientific development of the field and to engage in scholarly communication in the field of science and technology.

The more detailed learning objectives concerning the field of major are described by each major and each course.

An expert and developer in the field of industrial engineering and management need to understand the engineering processes and the systems in order to be able to create and transform technology-based business. He or she should be able to follow and critically analyze development in a field of technology.

Skills and in-depth knowledge acquired in the field of the major combined with technical expertise acquired in the minor give graduates the knowledge and skills needed to understand the challenges of the field from the points of view of users, technical and social systems, and the environment.

The knowledge and skills needed to apply scientific knowledge and scientific methods independently are mainly acquired in the major studies. Combined with the master's thesis, the knowledge and skills needed for scientific postgraduate education are achieved. The research assignment preceding the master's thesis has an important role.

Minor

An expert in the field of industrial engineering and management needs to understand the engineering processes and systems in order to be able to create and transform technology-based business. Therefore, graduates from the programme should have obtained knowledge and skills to follow and critically analyze development in a field of engineering. The foundations for the technical knowledge are created in Bachelor's studies and refined at the Master's level.

The restrictions concerning the selection of the minor concern the graduates from the Bachelor's Programme in Science and Technology (Teknistieteellinen kandidaattiohjelmalla) majoring in industrial engineering and management, and all other students with equivalent educational background. The educational background is assessed during the admission process. Students belonging to the aforementioned categories are required to choose the minor of their master's studies in a field of engineering that clearly differs from industrial engineering and management. The minor may be in a different field of engineering than the minor of their bachelor's degree. The minor should be selected from the offering by Aalto schools of technology. However, the programme may disallow some minors because of overlap with industrial engineering and management. For the same reason, the programme may also restrict the choice of optional courses within a minor.

In contrast, if a student has a bachelor's degree with the major in a field of engineering that clearly differs from industrial engineering and management, the programme does not restrict the choice of the minor.

Any student may also include a second minor in the elective studies. The programme has no restrictions concerning the second minor.

In every case, the minor may be of master's level or bachelor's level. The minor is confirmed in the Personal Study Plan.

More information on Aalto University's minor subjects:

- [Aalto University Minors Guide 2015-2016](#)

Elective studies

Students choose 25 ECTS of elective studies. As elective studies, students can complete a minor and/or take individual courses from other programmes at Aalto University or other Finnish universities. Students can also participate in an international student exchange programme or include 1-5 ECTS of work experience completed in Finland or abroad in elective studies.

For more information on internationalisation or Aalto University's minor subjects:

- [Aalto University Minor's Guide 2015-2016](#)
- [Internationalisation and studies abroad](#)

Language studies

Compulsory language studies for students whose language of education is Finnish or Swedish are included as part of the bachelor's degree. If the language studies have not been completed in the phase preceding master's studies, they must be taken during the master's degree studies. In this case, the student must take 2 ECTS in second national language and 3 ECTS in one foreign language (including both oral (o) and written (w) proficiency).

Students who have received their education in a language other than Finnish or Swedish or received their education abroad are required to complete only 3 ECTS in one foreign language.

Students with excellent command of English (e.g. English as a first language) may apply for the exemption from the compulsory foreign language requirement and take 3 ECTS of Finnish courses instead. In this case, according to the Degree Regulations, the student has not demonstrated the requisite written and oral language requirement in a foreign language, which is reflected in the appendix of the degree certificate. Students may apply for an exemption in the beginning of each term (deadlines 15 September and 15 January) with an application form available in Into at <https://into.aalto.fi/display/enmastersci/Forms>.

Language studies are included in students' elective studies.

Master's thesis

Students are required to complete a master's thesis, which is a research assignment with a workload corresponding to 30 ECTS. The thesis is written on a topic usually related to the student's major and agreed upon between the student and a professor who specializes in the topic of the thesis. The supervisor of the thesis must be a professor in the University, whereas the thesis advisor(s) can also be from a company or from another university. Thesis advisor(s) must have at least a master's degree.

Master's thesis work includes a seminar presentation or equivalent presentation. The student is also required to write a maturity essay related to the master's thesis.

The master's thesis is a public document and cannot be concealed.

Graduation

Students can apply for the master's degree after completing the bachelor's degree, when all courses required for the master's degree have been completed and the master's thesis is done. Students can apply for the approval and evaluation of the master's thesis and for the master's degree graduation in the same Degree Programme Committee meeting. The Dean grants the degrees.

Master's degree awarded with distinction

Students who have demonstrated excellent knowledge of their field in their studies, and particular maturity and sense of judgment in the master's thesis may be awarded a diploma for the degree of Master of Science (Technology) with distinction. The decision on awarding a degree with distinction rests with the Dean of the School of Science.

A degree may be awarded with distinction if the weighted grade average of the courses included in the degree, excluding the master's thesis and the grade of the master's thesis are at least 4.0. Courses graded 'pass' or 'fail' shall not be included in the calculation.

Majors

Master's Programme in Industrial Engineering and Management offers five majors: [Leadership and Knowledge Management](#), [Operations and Service Management](#), [Strategy and Venturing](#), [Strategy and Framtidens Industriföretag](#).

Research assignment is a common element of all majors in the programme. The three majors Leadership and Knowledge Management, Operations and Service Management and Strategy, and Strategy and Venturing, have also other common structural features. In these three majors, the creation and transformation of technology-based business is examined from three complementary perspectives: strategy, operations, and people. Although each major focuses on the core of one perspective by offering 35 cr of compulsory and optional courses in the field of major, the two other perspectives are covered by the remaining 10 cr out of 45 cr (optional integrative courses in the field of the programme). Otherwise, Strategy and FIF have specific features because they are organized jointly with other schools of Aalto or with partner universities.

Leadership and Knowledge Management

Professor in charge: Matti Vartiainen

Professors: Eila Järvenpää, Esa Saarinen

Extent: 45 credits

Code: SCI3048

The major in Leadership and Knowledge Management focuses upon people in technology-based work, and investigates leadership, collaboration and the human potential as critical success factors for creating and transforming technology-based organizations.

The mission of the major is to promote the role of people for the success of companies, public organizations and society at large. Research and teaching concentrates on the fundamental human factors that affect sustainable growth in technology-intensive environments. With particular emphasis on engineering and innovation, the center of interest is upon leadership and self-leadership, interaction, knowledge sharing, learning, collaboration, wellbeing and attitudes of people in the context of work.

Objectives

The students majoring in Leadership and Knowledge Management know how to lead and inspire people in technology-intensive environments. They learn skills and knowledge required to

- lead change in organizational context,
- enhance teamwork and collaboration,
- create and utilize knowledge in emerging forms of organizations.

They learn to understand human behaviour. They learn skills and knowledge required to

- analyse and utilize individual and organisational knowledge,
- evaluate and develop organizations and work practices,
- explore human potential and growth and create better collaboration in organizations.

They learn to envision a better future. They understand

- how future organizations evolve,
- how an ethically better future for businesses and society can be built,
- the importance of self-leadership in building better life.

The major provides a wide range of areas to progress in one's career. Every business is a people business, and the success of any organization affected by its people. Combined with understanding of digitalization, operations and strategy, specialization in leadership and knowledge management enables leveraging of human potential in organizations. Therefore, the competences and capabilities learnt in this major create prerequisites for progressing in a number of areas of expertise and

management. Typical entry positions after graduation are in human potential and organizational development functions of companies, consulting in change management and people-related issues, and developing and managing knowledge work.

Content and structure

Code	Name	Credits	Period	Year
Compulsory courses 25 credits:				
TU E3090	Research Assignment in Leadership and Knowledge Management	5	III-IV, I-II	1. year or 2. year
TU-E3020	Knowledge Management in Practice	5	I-II	1. year
TU-E3010	Leading as Practice	5	III-IV	1. year
TU-E3030	Collaboration in Networks	5	I-II	1. year
TU-E3040	Human Potential	5	III-IV	1. year
Optional courses, choose min 10 credits:				
TU-E3110	Work Design in Organizations	5	III-IV	2. year
TU-E3140	Suorituksen ja palkitsemisen johtaminen	5	I-II, III-V	2. year
TU-E3150	Safety Management in Complex Sociotechnical Systems	5	IV-V	1. year
TU-E4050	Entrepreneurial Leadership	5	II	1. year
TU-E3120	Human Resources in Service Operations	5	I-II	1. year
TU-E3130	Luovan ongelmanratkaisun seminaari	5-8	II	2. year
TU-E3160	Leadership and Knowledge Management, Special Topics	2-5		2. year

Integrative courses/optional courses in the field of the programme:

Choose 5 credits from the course list of Strategy and Venturing HOPS/PSP

Choose 5 credits from the course list of Operations and Service Management HOPS/PSP

Note: Only one Research Assignment is allowed in the major! Consider pre-requisites and possible quotas when selecting integrative courses.

Operations and Service Management

Professor in charge: Kari Tanskanen

Professors: Karlos Artto, Paul Lillrank, Jan Holmström, Risto Rajala, Riitta Smeds

Extent: 45 credits

Code: SCI3049

Operations management covers issues from operations strategy to efficient execution of operations, i.e., from configuring appropriate resources and processes into a production system that best

contributes the organization's goals and competitive advantage to managing the production system in order to provide the best match with demand and supply. The major in operations and service management builds on the generic principles on operations management but emphasizes the novel ways of encountering the challenges and utilizing the opportunities related to creating and transforming technology-based business.

Advanced production systems cross organizational borders and utilize external resource networks effectively in global scale. Business models have developed beyond the conventional manufacturing-focused forms into service systems and project or solution business. As technological, social or organisational innovations emerge, resources and processes in production systems should be vigorously re-configured for improved performance from customers', network partners' and society's perspective. Sustainability, effectiveness and efficiency are all important elements of performance. Consequently, the major in operations and service management focuses on operations strategy, management of operations in inter-organizational systems, as well as the life-cycle management of production systems and their offerings to clients. Industrial service systems, project business framework, and integration of digital technologies into operations are central contextual themes.

Objectives

The students majoring in operations and service management attain comprehensive understanding of modern operations and service management practices and the underlying theories. They learn

- how to plan and control operations in multi-firm context
- how to configure and manage resources and processes in inter-organizational relationships
- how to analyse the performance of and the risks related to modern production systems through the relevant life cycle
- how to manage value in production systems according to the requirements of the dynamic business environments.

Operations Management is a wide field with a lot of diverse career paths. Operations manager is just one typical entry position, which may gradually lead to an executive role, such as COO (Chief operating officer), in a larger organization. Because managing operations means getting the right things done, it is excellent training for general management duties and it gives capabilities to run a new venture, as well. There are also several fields of specialization in operations management enabling diverse positions in a variety of organizations already in the beginning of the career. Furthermore, expert positions in consulting, research or educational organisations are possible.

Content and structure

Code	Name	Credits	Period	Year
Compulsory courses 25-27 credits:				
TU-E2010	Industrial Service Operations	5	I	1. year
TU-E2020	Advanced Operations Management	5	II	1. year
TU-E2030	Advanced Project-based Management	5	I-II	1. year
TU-E2040	Management of External Resources	5	II	1. year

TU-E2090	Research Assignment in Operations and Service Management	5-7	III-V, I-II	1.year OR 2.year
Optional courses 8-10 credits, choose from the list below:				
TU-E2110	Innovation in Operations and Services	3-5	III-IV	1. year
TU-E6110	Management of Networked Business Processes	3-5	I-II	1. year
TU-E2130	Operations Management for New Ventures	3-5	III-IV	1. year
TU-E2120	Project Business	3-5	IV-V	1. year
TU-E2210	Financial Engineering I	3-5	III-IV	1. year

Integrative courses 10 credits /optional courses in the field of the programme:

Choose at least 5 credits from the course list of Leadership and Knowledge Management	5	HOPS/PSP
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Choose at least 5 credits from the course list of Strategy and Venturing	5	HOPS/PSP
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Note: Only one Research Assignment is allowed in the major! Consider pre-requisites and possible quotas when selecting integrative courses.

Strategy and Venturing

Professor in charge: Markku Maula

Professors: Marina Biniari, Robin Gustafsson, Mikko Jääskeläinen, Ilkka Kauranen, Peter Kelly, Henri Schildt, Jens Schmidt, Timo Vuori, Hannele Wallenius

Extent: 45 credits

Code: SCI3050

The major in Strategy and Venturing in the IEM program develops leaders and experts in strategic management and new business development capable of leading and transforming existing business and building new business. The understanding of and skills in strategic management and venturing are complemented with understanding of operations and people skills and studies in the context of technology-based business.

Objectives

The primary learning objectives of the Strategy and Venturing major are:

- Capabilities to lead and organize strategy work to improve value creation
- Capabilities to analyze sources of competitive advantage in technology based-business
- Capabilities to build and renew technology-based business in new and established organizations

In addition to these primary learning objectives, studying Strategy and Venturing in the IEM program gives our graduates significant strengths including an integrative understanding of

technology and business, a combination of theoretical understanding and a pragmatic can-do attitude, analytical capabilities to solve complex real life problems using data, people skills to build and lead organizations, diverse knowledge and experience from startups to largest corporations, and a global orientation and ambition level.

Majoring in Strategy and Venturing offers students usually many attractive career options. Common entry positions after graduation include strategy and business development functions in corporations, management consulting, investment banking, founders/CEOs in startups, positions in venture capital and private equity firms or other organizations building and transforming technology-based business. Later in their careers our graduates often work as CEOs, members of top management teams, and investors.

Content and structure

Code	Name	Credits	Period	year
Compulsory courses 24 credits				
21E00034	Strategy Process	6	I	1.year
TU-E1010	Advanced Strategic Management	5	I	1.year
TU-E1020	Strategies for Growth and Renewal	3	III-IV	1.year
TU-E1030	Advanced Case-Seminar in Strategy	5	I	2.year
TU-E1090	Research Assignment in Strategy and Venturing	5	III-IV or I-II	1.year or 2.year
Optional courses 11 credits, choose from the list below:				
TU-E4030	Entrepreneurial Finance	5	IV	1.year
TU-E4040	Opportunity Prototyping	3	I	1.year
TU-E1110	Strategic Marketing	5	IV-V	1.year
TU-E1120	Strategic Management of Technology and Innovation	5	III-V	1.year
TU-E4080	Managing Innovative Sales	3	II	1.year
TU-E1130	Financial Modeling in Strategy and Venturing	5	II	1.year
TU-E1140	Contracting in Strategy and Venturing	2	IV	1.year
TU-E1150	Managerial Economics	5	III	1.year
TU-E1160	International Economics	5	IV	1.year
Integrative courses 10 credits /optional courses in the field of the programme:				
	Choose 5 credits from the course list of Operations and Service Management	5		HOPS/PSP
	Choose 5 credits from the course list of Leadership and Knowledge Management	5		HOPS/PSP

Note: Only one Research Assignment is allowed in the major. Consider pre-requisites and possible quotas when selecting integrative courses.

Strategy

Professor in charge: Henri Schildt

Extent: 45 credits

Code: SCI3051

The Strategy specialization in Industrial Engineering and Management is closely aligned with and organized in collaboration with the Master's Programme in Strategy at the Aalto School of Business and indeed used to be a jointly-organized stand-alone Master's programme also at the School of Science. The ongoing role of this program is to combine the strengths of both schools in strategy and organization in a joint program.

Objectives

The goal of the Strategy major is to train and develop experts in the domain of business development in new organizations, established firms, and multinational corporations, apt to thrive and succeed in today's constantly changing and increasingly complex business environment. In addition to analytical skills and knowledge of key ideas in business and organizations, the major is also designed to develop participants' intercultural and interpersonal sensitivities, behaviors, attitudes as well as international connections and networks.

The learning objectives are divided into four key domains:

1. Core strategy skills

- Ability to analyze and extract insights from information
- Ability to craft and evaluate strategic initiatives

2. People & leadership

- Leading and facilitating organizational changes
- Ability to understand and participate in strategy processes

3. Organization and capabilities

- Organizational design and structures
- Organizing and strategy in multinational firms

4. Business environment, competition, and markets

- Analysis of industries and business ecosystems
- Competitor analysis and marketing strategy

Content and structure

Code	Name	Credits	Period	Year
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Compulsory courses 33 credits:

Courses offered by School of Science:

TU-E1090 Research Assignment in Strategy and Venturing	5	III-IV, I-II	1.year or 2.year
TU-E1010 Advanced Strategic Management	5	I	1. year
TU-E1030 Advanced Case-Seminar in Strategy	5	I	2. year

Courses offered by School of Business:

21E00034 Strategy Process	6	I	1.year
21E00030 Strategy Work	6	II	1.year

Choose one of the following:

26E03100 Driving Global Businesses'	6	II	
26E03200 Managing in a Global Context	6	III	

Optional courses minimum 12 credits, choose from the list below:

Courses offered by School of Science

TU-E1120 Strategic Management of Technology and Innovation	5	III-V	1.year
TU-E1020 Strategies for Growth and Renewal	3	III-IV	1.year
TU-E4080 Managing Innovative Sales	3	II	1.year

Courses offered by School of Business

21E00012 Gender and Diversity at Work	6		
21E00033 Strategic Change	6		
21E00600 Human Resources Management	6		
23E53000 Brands in Strategic Marketing	6	IV	
23E28000 Consumer Culture	6	I and III	
28C00100 Corporate Finance	6	I	

Framtidens Industriföretag

Professor in charge: Paul Lillrank

Professors: Esko Niemi, Kalevi Ekman, Olof Forsén

Extent: 60 cr

Abbreviation: FIF

Code: SCI3052

Objectives

The FIF Major is hosted by DIEM, but can be included in various fields of study programmes. The content and structure presented in this guide is meant for the students studying in the Master's Programme in Industrial Engineering and Management. The degree structure for the students

majoring in FIF is the following: major (60 ECTS), elective studies (30 ECTS), and the Master's thesis (30 ECTS).

FIF focuses on the intersection of technology and management in the evolving industrial firm. It is particularly suited for students with a strong technical background and an interest in broader management issues. As a Nordic exchange program FIF includes one semester at a Nordic partner university in Sweden, Norway, or Denmark, in addition to a semester at Aalto. The program is conducted in English and Swedish.

The FIF program is composed of courses from various departments. The core courses are organized to give comprehensive view of the industrial firm, such as enterprise systems architecture, computer-integrated production, supply chain management, automation, service engineering, and product design. Courses in various aspects of business administration, such as marketing and corporate strategy can be selected. Students are expected to participate in practical industrial projects as a team. Studying in FIF also allows you to be part of the FIF-alumni, providing you with a prestigious contact network. Besides, program offers students many career opportunities in a broad range of industries.

All students who want to participate are interviewed. Help with scholarships and accommodation during the overseas period is provided. For more information, please see the programme [homepage](#).

Content and structure

Code	Name	Credits	Period	Year
Aalto University. The students read 30 cr at the home university and the remaining minimum 30 cr at an optional partner university.				
Compulsory courses:				
CSE-E4650	Enterprise Systems Architecture	5	I-II	HOPS
TU-EV	Marknadsföring	3	I-II	
TU-E2000	Aalto Introduction to Services	3-6	I	
TU-E2090	Research Assignment in Operations and Service Management	5-7	III-IV, I-II	
At least one of below:				
TU-E4040	Opportunity prototyping	3	I	HOPS
TU-E2030	Advanced Project-based Management	3-5	I-II	
TU-E2120	Project Business	3-5	III-IV	
Optional courses:				
PHYS-C6370	Fundamentals of New Energy Courses P	5	I-II	HOPS
CSE-E4660	ICT Enabled Service Business and Innovation	5	I-II	
KON-41.4002	Product Development Project P	10	I-II	
TU-E1020	Strategies for Growth and Renewal	3	III-IV	
TU-E4030	Entrepreneurial Finance	5	IV	
TU-E1120	Strategic Management of Technology and Innovation	5	III-V	

KTH, Sverige. Students read minimum 30 cr

Compulsory courses:

MG2020	Modularisation of Products	6	III-IV	HOPS
MG2027	Industriell Produktion, projektkurs	6	III-IV	
Recommended courses:				
MG2033	Quality	6	III-IV	
MG2202	Quality Control (inkl statistics)	9	III-IV	
MG2135	PLM	9	III-IV	
ME2063 or	Team ledarskap och human resource management	6		
	III-IV			
ME2081	Organizational Change –Leading Processes of Strategic and Technological Transformation	6	III-IV	
EH2770	IT Management with Enterprise Architecture I	7,5	III-IV	
MG1002	Automatiseringsteknik	6	III-IV	
MG2036	CAM	6	III-IV	
MG2010	Modern Industrial Metrology	6	III-IV	
MG1007	Contemporary Maintenance Techniques	6	III-IV	
TED project	Campus Värnamo	3	?	
NTNU, Norge. Students read minimum 30 cr				
Mandatory courses:				
TPK4180	Manufacturing Strategy	7,5	III-IV	HOPS
TPK4185	Industrial System Engineering	7,5	III-IV	
Optional courses:				
TPK4135	Logistics and Production Management	7,5	III-IV	
TPK4850	Experten i Team, tverrfaglig prosjekt	7,5	III-IV	
TTK4135	Optimization and Control	7,5	III-IV	
TPK4175	Rapid Manufacturing	7,5	III-IV	
TTK4125	Datastyring	7,5	III-IV	
TTK4175	Instrumentations Systems	7,5	III-IV	
TPK4105	Bearbeidingsteknikk	7,5	III-IV	
TPK4100	Kybernetikk, introduksjon	7,5	III-IV	
LiTH, Sverige. Student read minimum 30 cr				
Compulsory courses:				
TMPS22	Assembly Technology	6	III-IV	HOPS
Optional courses:				
TMPS27	Production Systems	6	III-IV	
TMPS24	Computerized Product Planning	6		
TMPS26	Industrirobotteknik	6	III-IV	
TMPM01	Projektkurs i maskinteknik	12	III-IV	
TKMM01	Proktionssimulering	6	III-IV	
TETS27	Supply Chain Logistics	6	III-IV	

TMQU04	Six Sigma Quality	6	III-IV	
DTU, Denmark. Student read minimum 30 cr				
Courses (will be completed):				
42490	Technology, economics, management and organisation	10	III-IV	HOPS
42090	Holistic Design of Systems	10	III-IV	
42091	Products and Consumption in everyday life	5	III-IV	
02582	Computational Data Analysis	5	III-IV	
42106	Financial Risk Management	5	III-IV	