



JÖNKÖPING UNIVERSITY
School of Engineering

PROGRAMME SYLLABUS
**Production Systems: Production Development and
Management (master), 120 credits**

Programmestart: Autumn 2016



PROGRAMME SYLLABUS

Production Systems: Production Development and Management (master), 120 credits

Produktionssystem: Produktionsutveckling och ledning (master), 120 högskolepoäng

Programme code: TAPL6

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Programmestart: Autumn 2016

Education Cycle: Second-cycle level

Title of qualification

Degree of Master of Science (120 credits) with a major in Production systems, specialisation in Production Development and Management.

Programme overview

Background

Today, the Swedish manufacturing industry faces one of the biggest challenges in modern time. International competition induces a pressure for transformation and threatens Swedish manufacturing industry to restructure or even shut down activities. Increasing demand for new products results in shorter product life cycles. At the same time there is a need for small scale production according to the customer requests. The manufacturing companies therefore must continuously adapt to the changing requests and expectations of the customers. This applies to both large as well as small and medium sized companies. The manufacturing companies hence need to comply with this production situation, on a long term basis as well as on a short term basis. The production has to be designed in a way which makes it possible to develop and deliver products that fulfill the customer requests, especially concerning shorter delivery time and high delivery precision. This requires that a holistic view on production is adopted including its preconditions and possibilities, respectively. On the basis of such holistic view, the production system constitutes of both technology and people. The system also has relationships with its environment such as sub-suppliers and customers. Efficient and effective production therefore require a high degree of integration between both internal and external operators and competence areas, e.g. between production, product development and logistics.

Competitive production systems, especially in small and medium sized companies, therefore require engineers with an overall understanding of production requirements and possibilities. Engineers need to have advanced knowledge about the design and operation of appropriate production systems. They also need to have a deep understanding for the integration needs between different subject fields and between operators and competencies.

Objectives

The Master programme in Production Systems, specialising in Production Development and Management is aimed at contributing knowledge and overall understanding about industrial production systems and competitive production. The programme develops the knowledge and skills that in cooperation with different actors and competencies are needed to organize and manage the design, implementation, start-up, operation, further development and maintenance of industrial production systems. Moreover, the education also prepares for postgraduate studies

and work within other public areas where the knowledge and skills gained are of importance.

Post-graduation employment areas

The programme gives a good foundation to work on a number of positions in industry-nationally as well as internationally. Possible work tasks include production development, production management, planning or logistics. The programme makes it possible to continue with postgraduate studies within production area.

Programme Supportive Research

There is a clear connection between the master programme and research carried out in the research domain Industrial Production at the School of Engineering in Jönköping. The research is focused on generating theory-related knowledge that is industrially applicable and useful. This means that research results are intended to contribute value creation for competitive industrial production. Research in the domain is mainly directed towards three areas. A production system depends on the different components of the system being oriented and coordinated towards a common goal. The first area, *coordination*, has this as a point of departure. The second area, *sustainability*, regards financial, working life and environmental influence aspects related to a production system. The third area, *controllability*, is associated with the properties and control feasibility of a production system in order to achieve desired results. The research domain includes the third-cycle subject area *production systems*, which covers the scientific study of principles, methods and tools for the manufacture of physical products.

Research results generated in the domain Industrial Production are employed in the various courses of the master programme. Students interested in further third-cycle study programmes can also be involved in ongoing research projects, for instance in their degree project.

Educational concept at the School of Engineering

All educational training at the School of Engineering in Jönköping (JTH), is determined by an educational concept. The concept offers a *holistic perspective*, where *Business Community Contacts*, *Internationalisation* and *Entrepreneurial Drive* are key words. Besides technical knowledge within the programme, *Leadership and Communication*, *Professional Attitude* and *Sustainable Development* are important parts of the concept.

Business Community Contacts means that JTH has an established collaboration with the business community in various forms throughout the training. An example is the course located directly in the business community (*Näringslivsförlagd kurs, NFK*), which is part of all programmes. The aim with this course is to provide the students with an understanding for future professional tasks, and the ability to relate these to the training.

Internationalisation means that students e.g. are given the opportunity to train languages and intercultural communication through exchanges with foreign universities. JTH has approximately 70 partner universities all over the world, and participates in several international exchange programmes for students. There are opportunities to spend parts of the training abroad and account to the foreign credits in the exam. Due to this student exchange, a great number of courses at JTH are given in English.

Entrepreneurial Drive is received through the holistic perspective of the training programme. Significant is the exchange with the business community, the leadership training, the association with professional work in project based courses, and the economy elements, among other things.

Leadership and Communication includes e.g. training in verbal and written communication, project based work, leading and motivating people and also to understand decision processes in companies and organizations.

Professional Attitude comes through basic knowledges in economics, marketing, and business planning. These knowledges are further developed and integrated in technical contexts. Engineers and technicians with such experiences are useful within a great number of areas in the business community.

Sustainable Development includes understanding of compatibility with a sustainable society and environmental and human aspects in the future productivity and products. The instructions are fully integrated in their technical context and treat social, economical and ecological aspects of sustainable development.

Project based Training is also a part of the educational concept. Assuming responsibility for projects of various sizes frequently occurs as a professional. As a preparatory step, the students are responsible for real projects in connection with the business community in some of the courses.

Student influence is a great and important part in JTH's continuous quality development. Through student representatives in all boards, councils and decision-making committees, the students actively influence their education.

Objectives

After the completion of the programme, students must meet the intended learning outcomes, as described in the Ordinance by Higher Education (m), and also the intended learning outcomes, as described by JTH (j):

Common learning outcomes

Knowledge and Understanding

1. demonstrate knowledge and understanding in their main field of study, including both broad knowledge in the field and substantially deeper knowledge of certain parts of the field, together with deeper insight into current research and development work; and,(m)
2. demonstrate deeper methodological knowledge in their main field of study.(m)

Skills and Abilities

3. demonstrate an ability to critically and systematically integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available,(m)
4. demonstrate an ability to critically, independently and creatively identify and formulate issues and to plan and, using appropriate methods, carry out advanced tasks within specified time limits, so as to contribute to the development of knowledge and to evaluate this work,(m)
5. demonstrate an ability to clearly present and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts; and,(m)
6. demonstrate the skill required to participate in research and development work or to work independently in other advanced contexts.(m)
7. prove ability to independently apply acquired knowledge in practical work, and insights in future professional positions,(j)

Judgement and Approach

8. demonstrate an ability to make assessments in their main field of study, taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work,(m)
9. demonstrate insight into the potential and limitations of science, its role in society and people's responsibility for how it is used; and(m)
10. demonstrate an ability to identify their need of further knowledge and to take re-sponsibility for developing their knowledge.(m)
11. prove insights in the professional engineering role and responsibility in the society, assuming human conditions and needs and the goals for economical, social and ecological sustainable development in the society,(j)
12. prove immersed ability to interdisciplinary manners and to apply a system perspective,(j)

Programme-specific learning outcomes

The intended learning outcomes provided for programmes, must also be met.

Knowledge and Understanding

13. demonstrate an understanding of the demands on the production system based on market needs, business objectives, competitive situation and societal sustainability requirements

Skills and Abilities

14. demonstrate the ability to apply different methods and tools for the development, deployment, operation, improvement and maintenance of production systems
15. demonstrate the ability to theoretically and practically measure and evaluate different

production capabilities and to understand the connection between these capabilities, the company's organization and overall corporate goals

16. demonstrate the ability to describe the interaction between man, technology and organization in a production system as well as analyze this interaction

17. demonstrate proficiency in the application of project work, be able to go into the role of leader or project manager and take responsibility for working towards goals and schedule and make decisions individually and in groups.

Judgement and Approach

18. show insight into how efficient flows can be developed and be able to control these

19. demonstrate an understanding of how product-related activities and decisions affect the ability to achieve efficient production and be able to contribute to the development of products that support this

20. demonstrate the ability to interact in a group with people who have different skills and roles, and understand the importance of leadership to create the conditions for effective and efficient production

21. demonstrate the ability to evaluate a production system based on market demands, societal and social demands and ethical aspects.

Contents

Programme principles

Holistic knowledge is required to ensure efficient production systems. This is true for large as well as small and medium-sized enterprises. Therefore the programme has a comprehensive view of production and its interaction with the entire product development process. The programme focuses on design and development as well as on planning and management of production systems where flow and organization are important features. These various parts must function well together to enable development of new as well as existing production systems so that satisfactory production results supporting a company's overall goals and strategies can be achieved. Consequently, interaction between various actors and areas of competence is a keyword, particularly in production, product development and logistics.

A fundamental principle of the programme is for students to have the opportunity to link theory to industrial practice. Therefore, it is particularly important that students apply the knowledge they have acquired during their studies. Thus a substantial part of the studies is done as projects, in which theories, models, methods and tools about which students have acquired knowledge are applied in projects covering industrial problem issues. The projects combine the various theory areas of the programme and function as important instruments giving students profound understanding of and increasing their abilities for the integration needed between different actors and competence areas. Such integration is crucial for competitive production, particularly in small and medium-sized enterprises. The projects are firmly founded in real problem issues in different manufacturing companies. The purpose of this plan is for students' knowledge to lead to a thorough understanding of the conditions of the industry.

Programme progression

The program begins with a course in *Industrial Product Realization* that provides a contextual understanding of production in relation to the other steps in the product realization process. This course provides an introduction to the entire product realization process, how knowledge is developed and produced in different steps and how leadership works through the process of product realization. Parallel is also a course in *Development of production* where knowledge is built up about guiding production strategies, technical design and system design of the production. In this first stage the production system is contextualized in terms of location in the product realization process and concerning its dependencies in the process as well as concerning its internal prerequisites and grounds.

The continued progression is based on the interaction of different courses towards an ever deeper and ever larger and more complex picture of how a production system can be understood and valued. The progression is also built to gradually move from a development focus to a service

focus to the end of the second fall focusing leadership, change and research methods for further development of the subject.

In the course *Human Factors Engineering* a more human-centered perspective regarding the production system's components and how they interact with each other is provided.

The knowledge from the first semester is the basis for the course *Integrated product and production development* where the products' impact and interaction with the design and efficiency of the production process is elaborated. Alongside students read also about sustainability aspects of the production. Terms, conditions and various aspects of sustainable production are covered in the course *Sustainable production*.

Students admitted to the programme having 15 credits in Mathematics or equivalent have to read *Mathematical Statistics*, 6 credits instead of *Sustainable Production*, 6 credits to achieve their exam.

The course *Supply chain design* focus material and information flows, especially those that are important for the efficient supply of inputs to production, and how these flows can be built up and streamlined. Efficient flow is also very important for the operation of production systems covered in the course.

Production management. In this course the focus is also the reality of a production with measurement of performance and control of technology and people.

The second year begins with the *Off Campus Integrated Theory and Practice* course in which students in a project participates in a company's operations for a period of 5 weeks and afterwards reflect on and evaluate their work in the company. In the course *Leadership* the knowledge and skills in managing people in operations, individually and in groups. This is then applied in the course *Change Management*. Here, the knowledge of production systems is further deepened using change and improvement perspectives. Project management and continuous improvement is obvious parts of this course, as well as a proper depth in change theory. In parallel are also read *Research and inquiry Methodology* that provides a deeper methodological knowledge for research and development in the field. These last courses are also a natural introduction to the *Final Project Work*, which is going on throughout the final semester and provides further scope and depth in any area taught in the program profiling courses. When writing up the thesis the student uses the knowledge and experience gained during the program to carry out a research and development project based on an industrially or socially relevant problem.

Courses

Mandatory courses

Course Name	Credits	Main field of study	Specialised in	Course Code
Final Project Work in Production Systems	30	Production Systems	A2E	TEPV25
Research and Inquiry Methodology	6	Production Systems	A1F	TFUS26
Industrial Product Realization, Process - Methods - Leadership	9	Production Systems, Product Development	A1N	TIFR26
Integrated Product and Production Development	9	Production Systems	A1F	TPPS27
Leadership	6	Production Systems	A1F	TLES26
Change Management	9	Production Systems	A1F	TLFS26
Human Factors Engineering	6	Production Systems	A1N	TMTR26
Industrial Placement Course in Production Systems	9	Production Systems	A1F	TNPS24
Production Management	6	Production Systems	A1F	TPLS27

Supply Chain Design	9	Production Systems	A1F	TUFS27
Production Development, Strategy-System-Technology	15	Production Systems	A1N	TUPR26

Elective courses

Course Name	Credits	Main field of study	Specialised in	Course Code
Sustainable Production [†]	6	Production Systems	A1F	THPS27
Mathematical Statistics [†]	6		G1N	TMSG14

Programme overview

Year 1

Semester 1		Semester 2	
Period 1	Period 2	Period 3	Period 4
Industrial Product Realization, Process - Methods - Leadership, 9 credits	Human Factors Engineering, 6 credits	Integrated Product and Production Development, 9 credits	Production Management, 6 credits
Production Development, Strategy-System-Technology, 15 credits		<i>Mathematical Statistics[†], 6 credits</i>	Supply Chain Design, 9 credits
		<i>Sustainable Production[†], 6 credits</i>	

Year 2

Semester 3		Semester 4	
Period 1	Period 2	Period 3	Period 4
Industrial Placement Course in Production Systems, 9 credits	Change Management, 9 credits	Final Project Work in Production Systems, 30 credits	
Leadership, 6 credits	Research and Inquiry Methodology, 6 credits		

Teaching and examination

Academic year is divided into two semesters. Examination forms and grades are given by each course plan, respectively. The programme overview shows the programme structure for both years and may be changed during the programme. For updated programme overview see <http://www.jth.hj.se>

Prerequisites

The applicant must hold the minimum of a bachelor's degree (i.e the equivalent of 180 ECTS credits at an accredited university) with at least 90 ECTS credits in mechanical engineering, industrial engineering and management, civil engineering, or equivalent. The bachelor's degree should comprise a minimum of 15 ECTS credits in mathematics. English proficiency is required.

Continuation Requirements

In order to begin the second year, at least 30 credits from the programme's first year must be completed.

Qualification Requirements

To obtain a Degree of Master of Science in Product Development, specialisation in Production Development and Management, students must complete a minimum of 120 higher education credits in accordance with the current programme syllabus, at least 60 of which must be in the main field of study Product Development and 21 credits in Mathematics.

In addition a Degree of Bachelor of Science in Engineering/Degree of Bachelor of Science or an equivalent Swedish or foreign qualification is required.

Quality Development

Student influence is an important part of JTH's constant quality improvement on programme and course levels. Student representation in the drafting and decision-making bodies affecting education and student welfare is a natural part of the work of JTH. Management committees, programme coordinators, teachers and students work jointly with programme and course improvement. All students have the opportunity to give a written evaluation of each course at the end of the course and of the whole programme at the end of the last term. The results of the surveys are returned to department heads, programme coordinators, course coordinators and the Educational Director for further improvement work. The head of department or equivalent and the programme coordinator will discuss programme improvement issues in the programme management committee. Four times a year representatives of the students, the Educational Director and the study adviser meet to discuss recently finished programme courses. The chairperson of the education committee of the Student Union is a permanent member of the education councils.

The programme is supported by a management team with members from leading positions in the business sector. This warrants the relevance and quality of the programme. The programme also has a close connection with research conducted at the School of Engineering in Jönköping, particularly in the Department of Industrial Organisation and Production. Several of the teachers in the programme are active researchers in various areas relevant to the programme, which ensures a strong link between the programme and current research results.

Other Information

Course included in the programme can be read as a separate course, subject to availability.

Prerequisites are stated in the syllabus.

Non-EU/EEA/Switzerland citizens pay tuition fees at the current rate. For further information see <http://www.hj.se>, // Tuition and Application Fee //