JÖNKÖPING UNIVERSITY
School of Engineering

PROGRAMME SYLLABUS

Production Development and Management (master), 120 credits

Programmestart: Autumn 2020

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Programme code:	TAPL7	**Programmestart:**	Autumn 2020
Confirmed by:	Dean 2020-03-01	**Education Cycle:**	Second-cycle level
Version:	4		

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. 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 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 the research carried out in the research area 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. The principle of coproduction is important both in research and in the programme, specifically the joint creation of knowledge involving the university, companies and other organizations.

The research area is related to the entire product realization process, including the supply chain, and involves strategy formulation, design and implementation to identify and define key aspects of the production system, planning and execution of the production system and improvement of the production system performance. A production system depends on the different components of the system being oriented and coordinated towards a common goal. The research is based on a systems approach including processes, technology, organization, and people.

Both research and the programme are based on the key concepts Innovation, Digitalization, Culture, and Sustainability. The research area 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 area 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 degree programmes at the School of Engineering at Jönköping University (JTH) follow an education concept. The concept can be seen as consisting of a number of different aspects that have to be included in the degree programmes in order to guarantee their quality and appeal as well as their ability to produce professionally skilled, in-demand students. The concept places special emphasis on collaboration with industry and internationalisation as two essential tools in developing successful programmes attracting many applicants.

In the concept for the Master's programmes, there are common learning outcomes regarding the areas leadership, project management, internationalisation, and sustainable development. There is also an Industrial Placement Course (IPC) included in all programmes, whereby students put their theoretical knowledge into practice. IPC is a 9 credit course (5 weeks practise at a company), and it is also possible to complete the course abroad.

Internationalisation means that, for example, the opportunity is provided to practise languages and intercultural communication through student exchanges with foreign universities. JTH has around 70 partner universities around the world, and takes part in a number of international student exchange programmes. There is an opportunity to spend part of the study period abroad and to accredit studies abroad towards the degree. All Master's programmes at JTH are given completely in English.

Objectives

After the completion of the programme, students must meet the intended learning outcomes, as described in The Higher Education Ordinance by Degree of Master (1-9), and also the intended learning outcomes, as described by JTH:

Common learning outcomes

Knowledge and Understanding

1. demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work
2. demonstrate specialised methodological knowledge in the main field of study

Competence and Abilities

3. demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
4. demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
5.demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences
6. demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity

JTH. prove ability to apply acquired knowledge in practical work

JTH. prove ability to collaborate effectively in teams, especially in the presence of a strong multicultural dimension

Judgement and Approach

7. demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
8. demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used
9. demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning

JTH. prove understanding of future professional engineering roles, including a sound awareness of an engineer's ethical responsibilities towards society and the need for economic, social and ecological sustainable development

JTH. prove ability to embrace interdisciplinary approaches through the application of a system perspective

Programme-specific learning outcomes

Upon completion of the program, the intended learning outcomes provided for programme must also be met.

Knowledge and Understanding

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

Competence and Skills

11.demonstrate the ability to apply different methods and tools for the development, deployment, operation, improvement and maintenance of production systems
12. 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
13. demonstrate the ability to describe the interaction between man, technology and organization

in a production system as well as analyze this interaction
14. 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

15. show insight into how efficient flows can be developed and be able to control these
16. 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
17. 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
18. 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 first part of the programme focuses on design and development of production systems to give the student a deep understanding in the subject. Thereafter, management of production systems are in focus 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. 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.

The programme also gives opportunity for students to deepen their international profile by studying at our partner universities or international campuses for one semester. The second year the students can take elective courses either at JU or abroad (elective block 2). Students can further specialize in the area of their preference within the framework of production systems.

Programme progression

The program begins with a course in *Industrial Product Realization in Collaboration* 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 are also the courses *Production Development I* follow by *Production Development II*

where knowledge is built up about guiding production strategies, technical design and system design of the production. In Production Development I knowledge on production theories and principles are provided while Production Development II focuses methods and tools to use in production development such as value stream analysis methods and simulation tools.These methods and tools are subsequently applied in following courses.

The first semester ends up with a course in *Human Factors Engineering* that provides a systems perspective on the production system's basic components and how they interact with each other. 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 conditions 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.

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 reading *Mathematical Statistics*, 6 credits instead of *Sustainable Production*, 6 credits (elective block 1).

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. Specifically, if the program students decide to stay at JU rather than studying abroad, the courses offered in semester 3 deepens the knowledge in management within the production system context. In the course *Leadership and Change Management* the knowledge and skills in managing people in operations, individually and in groups are developed. 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	Course Code

			in	
Final Project Work in Production Systems	30	Production Systems	A2E	TEPV25
Industrial Product Realization in Collaboration	6	Production Systems, Product Development	A1N	TIPR28
Integrated Product and Production Development	9	Production Systems	A1F	TPPS29
Human Factors Engineering	7.5	Production Systems	A1N	TMTR28
Industrial Placement Course in Production Systems	9	Production Systems	A1F	TNPS24
Production Management	7.5	Production Systems	A1F	TPLS29
Production Development I, Strategy and System	9	Production Systems	A1N	TP1R28
Production Development II, Methods and Tools	7.5	Production Systems	A1F	T2PS28
Supply Chain Design	7.5	Production Systems	A1F	TUFS29

Elective courses

Course Name	Credits	Main field of study	Specialised in	Course Code
Research and Inquiry Methodology[2]	6	Production Systems	A1F	TFUS26
Sustainable Production[1]	6	Production Systems	A1F	THPS29
Leadership and Change Management[2]	15	Production Systems	A1F	TLFS29
Mathematical Statistics[1]	6		G1F	TMAK17

[1] Elective block 1

[2] Elective block 2

Programme overview

Year 1

Semester 1		Semester 2	
Period 1	Period 2	Period 3	Period 4
Industrial Product Realization in Collaboration, 6 credits	Human Factors Engineering, 7.5 credits	Integrated Product and Production Development, 9 credits	Production Management, 7.5 credits
Production Development I, Strategy and System, 9 credits	Production Development II, Methods and Tools, 7.5 credits	*Mathematical Statistics [1], 6 credits*	Supply Chain Design, 7.5 credits
		Sustainable Production [1], 6 credits	

Year 2

Semester 3		Semester 4	
Period 1	Period 2	Period 3	Period 4
Industrial Placement Course in Production Systems, 9 credits	*Leadership and Change Management [2], 15 credits*	Final Project Work in Production Systems, 30 credits	
	Research and Inquiry Methodology [2], 6 credits		

[1] Elective block 1

[2] Elective block 2

Teaching and examination

Throughout the academic year, typically, two courses are taken in parallel. Examination forms

and grades are given by each course module, respectively. The programme overview shows the programme structure for both years and may be changed during the programme. For updated programme overview visit http://www.ju.se

Prerequisites

The applicant must hold the minimun 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. Proof of 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 (120 credits) with a major in Product Development, specialisation in Production Development and Management, students must complete a minimum of 120 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

The School of Engineering’s quality assurance process involves continuous development and quality assurance of degree programmes and courses. This means, among other things, that great importance is attributed to student feedback and that a proactive approach is taken to the development of degree programmes and courses. The quality assurance process is carried out following applicable steering documents.

Other Information

If formal competence is missing, the applicant's substantial competence is tested if the applicant has acquired equivalent knowledge in some other way. The aim is to assess the collective competence and if the applicant has the opportunity to meet selected training. Substantial competence can be about knowledge and experience from working life, long-term mobility or other courses.

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

Admission is under "Admission arrangements for first and second level" at Jönköping University.

This syllabus is based on "Regulations and guidelines for education at undergraduate, postgraduate and doctoral studies at Jönköping"