JÖNKÖPING UNIVERSITY
School of Engineering

PROGRAMME SYLLABUS

Industrial Design (master), 120 credits

Programmestart: Autumn 2020

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Programme code:	TAPI7	**Programmestart:**	Autumn 2020
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Version:	4		

Title of qualification

Degree of Master of Science (120 credits) with a major in Product Development, specialisation in Industrial Design

Programme overview

Background

There are ever-increasing demands on firms to develop well-designed products in an effective and lean manner. Their products must be competitive in the face of a growing supply of new products offered to consumers and companies on today's world market. We want products that are well adapted to users' requirements while at the same time being efficiently produced and distributed in line with increasing environmental influence demands. These days products compete on a global 24/7 market. Consumers can choose products based on price, quality, performance, reliability and feeling. On such a market, design is crucial for the success or failure of a product. Developing well-designed products often requires a competent staff with a holistic and interdisciplinary approach and a good understanding of the whole product development process. Traditionally, Sweden has had an interdisciplinary approach in product development and design. We have many small and medium-sized enterprises with efficient decision processes and a flat organisation. Consequently there is a great need for qualified product designers being able to handle complex issues as well as having detailed knowledge of the integral components of a product. Nowell materials are being developed at a rapid pace with the increasing demands for sustainable development. Technical as well as aesthetic functions become more and more important when it comes to materials. An increased expertise and cooperation between different competences in materials is a success factor for successful product solutions.
Industrial Design as a skill has a holistic focus and aims at developing products that can communicate meaning and content through their design, thus enhancing technology and content quality.
Industrial Designers are trained in handling complex issues as well as having detailed knowledge of the various components that make up a product. The combination of technical skills and artistic ability provides a solid basis of education in line with industry demands.

Objectives

The aim of the Master Programme in Industrial Design is to develop the knowledge, skills and experience required to be able to work in product developing and manufacturing companies with the development of products with a focus on product design. The programme is intended to offer an interdisciplinary approach with a main focus on advanced knowledge of the design and management of colour, shape, surface and material. The programme also aims at practising skills in developing and communicating ideas and suggestions. It further aims at giving a good

understanding of the interaction between man and machine and the qualifications and opportunities man has to manage products and systems. Further the programme aims at giving a broad understanding of the context in which products work, covering the entire product life cycle from production via market and utilisation to destruction. The programme also aims at providing skills in functioning and working in teams with different competencies. The aim of the education is to deepen artistic design in the product development field as well as technical skills.

Post-graduation employment areas

The programme qualifies graduates to work as industrial designers in many various areas, for instance as consultants or SME designers or in a team of product developers with different competencies. The programme provides a platform for work in product-developing companies with tasks requiring both good skills in visualising problems and alternatives using simple as well as advanced visualisation methods along with considerable technical skills.

Programme Supportive Research

In the main field of study of product development, research is conducted in the areas of Product Development specialization in Industrial Design, focusing on Functional Surfaces and Design Driven Innovation also Materials and Manufacturing, focusing on Casting.

Industrial Design

Affective Engineering

Today, a product's visual and tactile qualities has become more important to achieve a high quality of the perceived value of a product. It is therefore important to increase knowledge and understanding of the aspects that affect and control the design of products with a focus on experience and customer requirements. Many factors contribute to how a product is perceived and experienced constituted by subjective judgments that are affected over time and context, but surprisingly many of the characteristics that affect the experience of a product and puts the customer requirements, is fairly objective and robust. These properties can be measured and verified in different ways and thus make the process more robust, and characteristics of the products more stable. It leads to increased design freedom and contributes to a focus on the characteristics that make a product successful in the market, better adapted to the climate, simplified production, shorter lead times, increased impementation processes etc. A product's surface texture affect eminently how a product is perceived and understood both visually as tactile. It is desirable that the surface properties to a greater extent become a design parameters early in the design process, and that these can be quality assured and maintained until the finished product. The research in affective surface engineering has the ambition to be a cross-border meeting between technical features and aesthetic functions linked to production functions. By measuring the properties in different ways and link measurement result, connection may be mapped in various properties and thus be controlled in a more robust manner. The link between surface characteristics and material properties is clear.

Design Driven innovation

In mature markets it is difficult for companies to compete solely based on functionality. Product features and functionalities are easily copied by competitors. Therefore, the development of meaningful designs becomes more important Design-driven innovation focuses on innovating product meanings. This concept has been studied since the early 2000s from a variety of perspectives, and in different contexts.

The value of design-driven innovation is created by including a focus on the intangible values of products. Five facets of design-driven innovation which contribute to value creation have can be described as: (1) understanding new product meanings; (2) required knowledge; (3) actors and collaborations; (4) capabilities; and, (5) process. The main practical implication is that the five facets are connected and reinforce each other. Therefore, companies need to approach design-driven innovation from a holistic perspective.

Materials and manufacturing focused on casting

The research within Materials and manufaturing is multidisciplinary and could comprise research areas such as product development, properties of components, internal material structures and related properties of components, production/manufacturing aspects etc. The research has support within a wide spectrum of subject areas: e.g. fluid dynamics, solid mechanics, material science, material technology, material physics, chemistry, as well as simulation and optimization. In the product development chain, the main part of the research is conducted in the interface between engineering design on one side and manufacturing/usage aspects on the other, with a special focus on product properties. The overall goal of the operation is to conduct fundamental research with the purpose of solving problems related to material science and manufacturing of advanced cast metal components, in close cooperation with industry and research institutes.

The different steps in the product development process, from conceptual design to material selection and manufacturing method, all have a decisive influence on the final properties of the component. This is especially true for metal casting and for shaping of polymers. As a consequence, it is natural that simulation and optimization tools/methodologies today are indispensable when designing and manufacturing complex shaped components of advanced materials.

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 skills

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 Understandning

10. have knowledge of different stakeholders impact on product design and evaluate a product based on the meaning it has for those who will use it.
11. have knowledge of human interaction with products and design methodology and design theory (human factor).

Competence and skills

12. have developed the ability to design products with consideration to functional as well as aestheticvalues and acquired knowledge about how the choice of color, shape, surface texture and materials affect the final product.
13. have developed the ability to communicate ideas using both sketches, models, and data-driven animations orally and in writing.

Judgement and Approch

14.demonstrate ability to judge design and production aspects, and know and understand the different material properties and its importance to the design of products.
15. have developed an approach to design knowledge and the ability to reflect from an artistic as well as engineering perspective and developed a stable professional identity.
16. demonstrate an approch about entrepreneurship principles and how to run and manage projects, and have developed an ability to work together with other competencies and individuals.

Contents

Material properties and its importance to product design and the material's capabilities and limitations are taught theoretically and practiced in projects.

Programme principles

The interdisciplinary character of the programme linked with problem-based learning aims at teaching a design-oriented approach facilitating dealing with complex issues and problem presentation. The programme has three main principles: methods and tools for design, strategies for design and artistic design ability. Man/machine issues play an important role in the programme. Great importance is attached to craftsmanship in design work, and training in sketching, modelling and various computer tools to be able to rapidly visualise ideas and concepts will be provided. Practical work will be carried out in the design studio and workrooms of the University. There will be cooperation with other Master programmes. The programme has close collaboration exchange with partner universities and offers opportunities for studies abroad. Several projects are carried out together with external parties.

The study programme ends with a degree project in which the students apply the knowledge and experience acquired during their studies to carry out a research and/or development work based on an issue relevant to industry and society.

Programme progression

The programme begins with a block where an introduction to the science of product Development and industrial design methodology starts. Students are given the knowledge of stakeholders' influence on product development and how a product can be given a meaning for those who will use it. In addition, students learn a methodical design approach and an introduction to various visualization tools. Students learn the basics of modelling and sketching. Material properties and its importance to product design and the material's capabilities and limitations are taught theoretically and practiced in projects. Students practice their ability to work in projects and learn the principles of project work in groups and as individuals. They get learn to deal with different areas of expertise in Product Realisation. Different cultural and anthropological differences and similarities in dynamic work. Artistic development and capacity for artistic reflection theorized and practiced. Great emphasis is placed on the individual's approach to product and the first level of understanding of product design and one owns reflection.

During the second block, human factors and the second order of understanding of product design are to be studied. Students practice their ability to communicate with models, sketches and data-driven animations. Great emphasis is placed on oral presentation of project work and feedback to their gestalt. Teaching is in the form of a project in collaboration with external companies.

Students will learn the principles of entrepreneurship and develop products in collaboration with companies. Design Communications spans over the whole block.

During the second year of the education, a major focus on how to manage the entire product development process in projects are to be trained. Science of Design and design theory is taught and practiced. Great emphasis is placed on the individual's ability to communicate their knowledge in words and pictures. The programme ends with a thesis in which the knowledge obtained during the education is theorized and practiced by a project in collaboration with a company or institution. The thesis is examined in the form of an exam, exhibition and report.

Prerequisite mathematics qualifications

For a degree of Master of Science, 21 credits in mathematics are required. Students admitted to the programme having 15 credits in mathematics will be offered an elective course in mathematics within the programme.

Courses

Mandatory courses

Course Name	Credits	Main field of study	Specialised in	Course Code
Design and Emotion (Human Factors 3)	6	Product Development	A1F	TDUS28
Design Philosophy and Practice (Human Factors 1)	9	Product Development	A1N	TDPR28
Design Communication 1	9	Product Development	A1N	TD1R29
Design Communication 2	9	Product Development	A1F	TD2S20
Design Communication 3	6	Product Development	A1F	TD3S29
Ergonomics (Human Factors 2)	15	Product Development	A1F	TERS27
Final Project Work in Product Development	30	Product Development	A2E	TEUV24
Industrial Design Project	9	Product Development	A1F	TIDS29
Industrial Product Realization in Collaboration	6	Production Systems, Product Development	A1N	TIPR28
Materials and Design	6	Product Development	A1N	TMDR26
Industrial Placement Course in Product Development	9	Product Development	A1F	TNFS24

Elective courses

Course Name	Credits	Main field of study	Specialised in	Course Code
Business and Economy[I]	6		G1F	TFEK17
Mathematical Statistics[I]	6		G1F	TMAK17

Programme overview

Year 1

Semester 1		Semester 2	
Period 1	Period 2	Period 3	Period 4
Design Philosophy and Practice (Human Factors 1), 9 credits	Materials and Design, 6 credits	Design Communication 2, 9 credits	
Industrial Product Realization in Collaboration, 6 credits		Ergonomics (Human Factors 2), 15 credits	
Design Communication 1, 9 credits		*Business and Economy [I], 6 credits*	
		Mathematical Statistics [I], 6 credits	

Year 2

Semester 3		Semester 4	
Period 1	Period 2	Period 3	Period 4
Industrial Placement Course in Product Development, 9 credits	Design and Emotion (Human Factors 3), 6 credits	Final Project Work in Product Development, 30 credits	
	Design Communication 3, 6 credits		
	Industrial Design Project, 9 credits		

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 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, civil engineering, architecture (with relevant courses in construction and design), or equivalent. The bachelor's degree should comprise a minimum of 15 ECTS credits in mathematics. Additionally, a home assignment must be submitted that shows artistic skills and aptitude for the profession. 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 Industrial Design, 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

Information regarding eligibility

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.

Courses included in the programme can be taken separately to a limited extent, as several of the courses are linked through project work..

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"