JÖNKÖPING UNIVERSITY
School of Engineering

PROGRAMME SYLLABUS
Preliminary, not confirmed

Industrial Engineering and Management: Sustainable Supply Chain Management, 180 credits

Industriell ekonomi och organisation: Sustainable Supply Chain Management, 180 högskolepoäng

Programme Code:	TGSC5	Programmestart:	Autumn 2028
Confirmed:		Education Cycle:	First-cycle level

Title of Qualification

Degree of Bachelor of Science in Industrial Engineering and Management specialisation in Sustainable Supply Chain Management or Degree of Bachelor of Science with a major in Industrial Engineering and Management specialisation in Sustainable Supply Chain Management

Högskoleingenjörsexamen i Industriell ekonomi och organisation inriktning Sustainable Supply Chain Management eller Teknologie kandidatexamen med huvudområdet Industriell ekonomi och organisation inriktning Sustainable Supply Chain Management

Programme Overview

Engineering field and Main field of study

Industrial Engineering and Management is an interdisciplinary field that combines technology, economics, and organization to design, manage, and develop operations in an industrial context. The field includes the development of strategies, methods, and tools to optimise resources, improve efficiency, and foster sustainable growth.

The area focuses particularly on the design, planning, and control of processes, the management and organisation of people, and the analysis and understanding of a company's financial system, all aimed at achieving organisational goals. This focus is built upon and integrated with technical understanding and innovation.

The discipline adopts a system and holistic perspective, applying both qualitative and quantitative methods.

Studies in this field develop knowledge and skills in designing, managing, and developing industrial operations, with an emphasis on identifying complex problems, formulating and comparing alternative solutions, and evaluating both consequences and risks based on factual information.

Background

Supply chain management has become a central concern for most firms to remain competitive in an ever-intensive dynamic global market. As a field, it has grown rapidly over the recent decades by drawing upon a myriad of fields and areas. Notably, sustainability of supply chains is in the forefront of academic and practice agenda, no matter if the firms are large and global, small and medium sized start-ups, or are involved in strategic, tactical or operational decision-making. This programme is designed to provide unique competencies in sustainable supply chain management by integrating the knowledge and skills from industrial engineering and management. More importantly, since contemporary industrial engineering and management has grown beyond solely focusing on production operations, this programme incorporates a variety of actors, functions, operations and industries, including retailing and distribution, services, and purchasing, while having a solid and fair emphasis on production.

Objectives

The programme aims to provide students with a deep knowledge of the design, planning and control of supply chain and industrial operations. Specifically, the programme aims to provide the students with solid understanding of sustainability issues in the various levels of contemporary supply chains, from purchasing

and supply to production, distribution and retailing. The issues include environmental, social and economic aspects, as well as planning for successful leadership and management of organizations.

Post-graduation employment areas

Upon graduation, the student is well prepared to work in different positions within various industrial actors involved within supply chains, including production, purchasing, logistics services, distribution and retail firms. Possible future careers could be entry management and/or planning positions within purchasing, supply chain sustainability and social responsibility, production engineering, transport and warehousing, as well as retail logistics. The blend of theoretical knowledge and practical education prepares the graduates with the expertise relevant for managerial, engineering, as well as consultancy careers within Industrial Engineering and Management.

Studies after graduation

The programme provides the prerequisites for further studies at advanced level. Jönköping University offers studies at the advanced level through the following programmes: Master of Science in Production Systems with specialization in Production Development and Management (120 credits), Master of Science in Engineering Management (60 credits) and Master of Science in Supply Chain Operations Management (120 credits, main field of study Production Systems).

All students in the programme are offered Multivariable calculus as an elective course in order to be given the opportunity to obtain 30 credits of mathematics and thus gain eligibility for more programmes at advanced level.

Educational concept at the School of Engineering

The education concept at the School of Engineering consists of several common elements included in the academic programmes to enhance the quality and appeal of the education, ensuring that students become professionally skilled and in demand. The concept particularly emphasizes industry collaboration and internationalization as two key components for creating successful and attractive programmes. All three- and five-year programmes include a mandatory industrial placement course (IPC) worth 15 credits and an "internationalization semester" that facilitates studying abroad. They also feature 15 credits for "broadening courses" outside the technical or core area of specialized technical knowledge.

Objectives

Common learning outcomes

After the completion of the programme, students must meet the intended learning outcomes, as described in The Higher Education Ordinance by Degree of Bachelor of Science in Engineering (1-11) and also the intended learning outcomes, as described by JTH:

Knowledge and Understanding

1. demonstrate knowledge of the disciplinary foundation of the engineering field chosen and proven experience in this field as well as awareness of current research and development work,
2. demonstrate broad knowledge in the engineering field chosen and relevant knowledge of mathematics and the natural sciences,

JTH. demonstrate broadening knowledge outside the chosen engineering field for the future professional role or demonstrate knowledge within the engineering field in an international context (study abroad).

Competence and Skills

3. demonstrate the ability to identify, formulate and deal with issues autonomously and creatively using a holistic approach and to analyse and evaluate technological solutions,
4. demonstrate the ability to plan and using appropriate methods undertake tasks within predetermined parameters,
5. demonstrate the ability to use knowledge critically and systematically to model, simulate, predict and evaluate series of events on the basis of relevant information,
6. demonstrate the ability to design and manage products, processes and systems while taking into account the circumstances and needs of individuals and the targets for economically, socially and ecologically sustainable development set by the community,
7. demonstrate the capacity for teamwork and collaboration with various constellations,
8. demonstrate the ability to present and discuss information, problems and solutions in speech and writing and in dialogue with different audiences, in both national and international contexts,

JTH. demonstrate ability to apply the acquired knowledge in practical work and demonstrate insight into the future career,

Judgement and Approach

9. demonstrate the ability to make assessments informed by relevant disciplinary, social and ethical aspects,
10. demonstrate insight into the possibilities and limitations of technology, its role in society and the responsibility of the individual for how it is used, including social and economic aspects as well as

environmental and occupational health and safety aspects,
11. demonstrate the ability to identify the need for further knowledge and undertake ongoing development of his or her skills,

Programme-specific learning outcomes
Upon completion of the programme, the intended learning outcomes provided for programme must also be met.
Knowledge and Understanding
12. demonstrate knowledge of the design, planning and control of logistics flows in a sustainable fashion
13. demonstrate knowledge of the design, management and development of industrial operations in a sustainable fashion
Competence and Skills
14. demonstrate ability to design, plan and control logistics flows in a sustainable fashion
15. demonstrate ability to design, manage and develop industrial operations in a sustainable fashion
Judgement and Approach
16. demonstrate ability to propose and compare different options for the design, planning and control of logistics flows and assess their sustainability implications
17. demonstrate ability to propose and compare different options for the design, management and development of industrial operations and assess their sustainability implications

Common learning outcomes
After the completion of the programme, students must meet the intended learning outcomes, as described in The Higher Education Ordinance by Degree of Bachelor (1-8) and also the intended learning outcomes, as described by JTH:
Knowledge and understanding
1. demonstrate knowledge and understanding in the main field of study, including knowledge of the disciplinary foundation of the field, knowledge of applicable methodologies in the field, specialised study in some aspect of the field as well as awareness of current research issues
JTH. demonstrate broadening knowledge outside the chosen engineering field for the future professional role or demonstrate knowledge within the engineering field in an international context (study abroad).
Competence and skills
2. demonstrate the ability to search for, gather, evaluate and critically interpret the relevant information for a formulated problem and also discuss phenomena, issues and situations critically
3. demonstrate the ability to identify, formulate and solve problems autonomously and to complete tasks within predetermined time frames
4. demonstrate the ability to present and discuss information, problems and solutions in speech and writing and in dialogue with different audiences, in both national and international contexts
5. demonstrate the skills required to work autonomously in the main field of study
JTH. demonstrate ability to apply the acquired knowledge in practical work and demonstrate insight into the future career
Judgement and approach
6. demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues
7. demonstrate insight into the role of knowledge in society and the responsibility of the individual for how it is used
8. demonstrate the ability to identify the need for further knowledge and ongoing learning

Programme-specific learning outcomes
Upon completion of the programme, the intended learning outcomes provided for programme must also be met.
Knowledge and Understanding
9. demonstrate knowledge of the design, planning and control of logistics flows in a sustainable fashion
10. demonstrate knowledge of the design, management and development of industrial operations in a sustainable fashion
Competence and Skills
11. demonstrate ability to design, plan and control logistics flows in a sustainable fashion
12. demonstrate ability to design, manage and develop industrial operations in a sustainable fashion
Judgement and Approach
13. demonstrate ability to propose and compare different options for the design, planning and control of logistics flows and assess their sustainability implications
14. demonstrate ability to propose and compare different options for the design, management and development of industrial operations and assess their sustainability implications

Contents

Programme principles

The education encompasses deep expertise in the design, planning and control of sustainable supply chains. Upon starting the programme, core courses with a clear focus on logistics and sustainability are offered. Additionally, students acquire basic knowledge of scientific methods and skills for carrying out scientific research. The programme provides an in-depth understanding of leadership and project management principles, and of industrial finance and controlling. Moreover, students acquire basic and deeper knowledge in calculus, and mathematical statistics to enrich their engineering profile.

The second year includes courses that deepen the knowledge base within the field of industrial engineering and management with a focus on distribution and warehousing, quality management, purchasing, and retailing. The knowledge on sustainability in supply chains is deepened by covering the principles of lean and sustainable engineering. The year ends with the *Industrial Placement Course*, in which most of the practical course work is carried out at a company.

The final year provides a unique opportunity for the students to take elective courses either at JU or at our partner universities. Students can further specialize in the area of their preference within the framework of industrial engineering and management. Elective courses are offered in areas such as IT/data analysis, simulation, mathematics, and circular economy. In the final semester, students gain further knowledge on leadership in different organizational settings and within corporate social responsibility. Moreover, in the final semester of the programme, students carry out a degree project within the main field of study.

During the programme, students work on practical cases where they apply their theoretical knowledge in dealing with real-world problems. Laboratory and business games are other tools that are used to facilitate understanding of the contemporary management of supply chains. Group work and exercises are frequent. Several courses include field trips or guest speakers from industry to further strengthen the link between education and practice. Students can also strengthen their international profile by studying at our partner universities for one or two semesters.

Education in this international programme is carried out in English.

Preparatory Mathematics

Students who have been admitted to the programme with eligibility Mathematics 3B (or equivalent) from upper secondary school take the course Preparatory Mathematics (7.5 credits) in semester 1. This is in addition to the 180 credits required to obtain a Degree of Bachelor of Science in Industrial Engineering and Management or a Degree of Bachelor of Science with a major in Industrial Engineering and Management.

Basic Physics 1 and 2, and Chemistry 1

Students who have been admitted to the programme without eligibility Physics 1, Physics 2 and Chemistry 1 (or equivalent) from upper secondary school and who wish to obtain a Degree of Bachelor of Science in Industrial Engineering and Management are offered the opportunity to take courses in these subjects in addition to the programme's 180 credits. Students who instead wish to obtain a Degree of Bachelor of Science with a major in Industrial Engineering and Management specialisation in Sustainable Supply Chain Management do not need to take the Basic Physics 1 and 2 and Chemistry 1 courses.

Research connection

The research connection in the programme is ensured by allocating research teachers to the courses. Of the programme's subject courses, at least 80% are led by staff engaged in research and/or teachers with a PhD. In addition, there are stated goals to integrate the department's own research into teaching.

In addition to the above, the research connection is ensured by the fact that the teaching of models and methods is always based on scientific methods and proven experience.

Equal terms, gender equality and diversity

The School of Engineering (JTH) strives in all its activities to ensure that all individuals are given equal opportunities and treated equally. At both the JU and JTH levels, this is reflected in governing documents concerning organizational and personnel matters, the establishment and delivery of programmes and courses, as well as the monitoring of educational quality. At JTH, student influence is also ensured through student representation in various educational and industry councils.

Issues relating to equal terms, gender equality, and diversity are addressed in the programme, in for example the courses *Leadership and Project Management* (7.5 credits) and *Industrial Placement Course* (15 credits).

Study abroad

JTH has internationalization as a focus area where the educational programmes include opportunities for

both international experiences at home as well as various opportunities to do internships and study abroad, giving students valuable experiences and skills to prepare them for a global labour market.

Semesters 4 and 5 are intended as exchange semesters. In Semester 4, students may study abroad for the full semester at one of the higher education institutions with which the School of Engineering has an agreement, and with a predetermined alternative study plan where the courses *Retailing* and *Project course – Distribution and Warehousing* can be replaced with other courses that meet the programme objectives. The *Industrial Placement Course* is carried out at a local company in the country in question. In semester 4, students may also choose to study abroad only in study period 4 by carrying out the *Industrial Placement Course* at a local company in the country in question. In semester 5, students who choose to go on exchange select courses within the field of Industrial Engineering and Management that do not significantly overlap with the contents of the programme courses. The choice of courses is made in consultation with the programme manager via Jönköping University's internal system for study abroad.

Students who choose not to study abroad follow a predetermined course package at the School of Engineering.

Programme progression

The programme courses, goals and progression are continuously assessed. The programme is based on a system-wide perspective, which means that (1) knowledge and understanding, (2) the skill and ability, and (3) judgment and approach are built up continuously during the programme. Each course is part of the system and provides all three levels of knowledge and for the whole programme, the students have knowledge of the entire system at all three levels. Examination takes place in different forms in different courses continuously during the programme with progressively higher requirements as the courses follow. Final examination takes place in the form of the final thesis.

This programme is comprised of courses which focus on various aspects of industrial engineering and management and sustainable supply chain management. The first course offered, *Logistics Engineering*, provides a solid cornerstone to the programme. In this course, students become familiar with the primary knowledge and skills in relation to logistics flows, including materials planning and control, production, and distribution. This knowledge is further developed in several other subsequent courses including *Lean and Green Engineering*, *Purchasing*, *Quality Management and Engineering*, *Project course – Distribution and Warehousing, and Retailing.*

Related to the first semester, students taking *Preparatory Mathematics* may postpone *Leadership and Project Management* to semester 5, and subsequently take one of the elective courses in semester 7. In semester 2, the course *Industrial Finance and Controlling* introduces students to industrial organizations from a financial perspective, whilst the basics of supply chain management and the related sustainability implications are covered in *Principles of Sustainable Supply Chain Management*. This course serves as a premise for a number of other courses in the programme including *Supply Chains and Social Responsibility*, *Lean and Green Engineering*, and partially *Purchasing* among others.

In the courses *Leadership and Project Management* and *Leading and Organizing*, the students become familiarized with the principles of leadership and change management in organizations and projects. The mathematics and optimization courses provided in the programme give an essential engineering edge to the knowledge and skills of the students, which is central to several operations-related courses throughout the programme, and potentially the elective courses. Specifically, if the programme students decide to stay at JU rather than studying abroad, the courses offered in semester 5 build on the various courses and topics studied in several other courses in the programme. For instance, *Circular Economy* deepens the knowledge and skills on the sustainability principles that have been introduced prior in the programme.

IT in Supply Chains, Simulation in Industrial Engineering, and *Supply Chain Analytics*deal with the modelling and application of data and IT in contemporary industrial settings. The *Industrial Placement Course* and Final*Project Work* courses provide a unique opportunity for students to further practically experience their knowledge during an internship and thesis work. The latter-mentioned practice-oriented courses are supported by the knowledge and skills gained in the various courses provided throughout the programme.

Elective credits

In Semester 5, students choose to take four out of the five elective courses *Circular Economy*, *IT in Supply Chains*, *Multivariable Calculus, Simulation in Industrial Engineering and Supply Chain Analytics.*

Elective courses can be taken in Semester 7 for students who do not have Physics 2 and want to obtain a Degree of Bachelor of Science in Industrial Engineering and Management, specialisation in Sustainable Supply Chain Management, and/or for students who have studied *Preparatory Mathematics* 7.5 (pre-education credits) with a normal study pace.

Courses

Course changes can occur, as long as they do not substantially affect the programme's content and learning goals.

Teaching and Examination

The academic year is divided into two semesters, and the semesters into two study periods. In each study period two courses are generally taken in parallel. Assessment is part of each course or module. Modes of assessment and grades are shown in each course syllabus.

Entry Requirements

General entry requirements and Mathematics 3b, English 6 with required grade passed in the Swedish upper secondary school system or international equivalent. Or: Mathematics further level 1b, English level 2 (or the equivalent).

Continuation Requirements

In order to begin the second year, at least 37,5 credits from the programme's first year must be completed. In order to begin the third year, at least 90 credits from the programme's first and second year must be completed.

Qualification Requirements

To obtain a Degree of Bachelor of Science in Industrial Engineering and Management, specialisation in Sustainable Supply Chain Management, the student shall complete the course requirements of at least 180 credits in accordance with the current programme syllabus. The student also needs to have passed the courses Preparatory Mathematics, 7,5 pre-education credits, Basic Physics 1, 8 pre-education credits, Basic Physics 2, 6 pre-education credits and Chemistry 1, 5 pre-education credits or the equivalent.

To obtain a Degree of Bachelor of Science with a major in Industrial Engineering and Management, specialisation in Sustainable Supply Chain Management, the student shall complete the course requirements of at least 180 credits in accordance with the current programme syllabus, with at least 90 credits in the major Industrial Engineering and Management and 15 credits in Mathematics. The student also needs to have passed the course Preparatory Mathematics, 7,5 pre-education credits or the equivalent.

Quality Development

At JTH, systematic quality assurance is carried out within JU's established quality system. This system, based on the requirements of the Higher Education Act, the Higher Education Ordinance, and the *Standards and Guidelines for Quality Assurance in the European Higher Education Area*, has been reviewed and approved by the Swedish Higher Education Authority.

Active and continuous course evaluation, including student feedback through course surveys, forms one of the cornerstones of this system. Annual programme evaluations and student representation in JTH's various educational and industry councils are two additional examples.

Other Information

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 University"