



## Programme Description

### Master in Software Engineering

#### TASOE – Autumn 24

<b>Decision taken by</b>	Department board
<b>Document contact</b>	Andreas de Blanche, Head of Programme
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*Programme description is a supplement to the programme syllabus which is the legally binding document.*

## Basic data

Department	Engineering Science
Division	Computer Science and Engineering
Name of Programme, Swedish	Magister i Software Engineering
Name of Programme, English	Master in Software Engineering
HE credits (number of credits)	60
Level (1st Cycle, 2nd Cycle)	2nd Cycle
Entry requirements, Swedish	Kandidatexamen eller högskoleingenjörsexamen om 180 hp med 90 hp i något av huvudområdena datavetenskap, datateknik eller software engineering. Inklusive kurser omfattande minst 15 hp i programmering, 15 hp i matematik samt en kurs i datastrukturer och algoritmer. Engelska B, Engelska 6 eller motsvarande.
Entry requirements, English	Bachelor of Science in Computer Science, Computer Engineering, or Software Engineering. Additionally, the Bachelor of Science degree must include 15 HE credits in programming, 15 HE credits in mathematics, and one course in algorithms and data structures. Verified knowledge of English corresponding to the course English B/English 6 in the Swedish Upper Secondary School (high school) or equivalent.
Main field of study, Swedish	Datavetenskap
Main field of study, English	Computer Science
Degree, Swedish	Filosofie magisterexamen med huvudområdet datavetenskap
Degree, English	Degree of Master of Science (60 credits) with a major in Computer Science
Rate of study (full-time, part-time)	Full-time
Type of instruction (on campus, distance teaching)	Campus
Language of instruction (Sw, Eng)	English

## General programme information

Software engineering was established as a subject area in order to apply sound engineering principles to software development, ensuring a rigorous approach and high-quality software products. The software engineering methods and development principles have proven so successful that they are now being adopted by other engineering disciplines.

Upon completing our Master's program in Software Engineering, you will acquire expert knowledge in the complete software development lifecycle. This encompasses essential skills like requirements engineering, software processes, software modeling and analysis, software design, and ensuring software quality through verification and validation processes.

The program goes a step further, equipping you with a deep understanding of important knowledge of algorithms, how to handle complexity, human-computer interaction (HCI), and artificial intelligence (AI). With these advanced insights, you'll be well-prepared to excel in a rapidly evolving tech landscape, capable of creating software that is not just efficient and reliable but also user-friendly and capable of harnessing the power of AI for intelligent applications.

You will have acquired the skills needed to become a master software engineer.

## Programme contents, structure, and progression

The total programme consists of 60 credits in accordance with the European Credit Transfer and Accumulation System (ECTS). The courses focus on development and use of rigorous methods for designing, constructing, and quality validation and verification of effective and reliable software systems. A software engineer must be knowledgeable of the entire software development lifecycle, including but not limited to; requirements engineering, software processes, software modelling and analysis, software design, and software quality, verification, and validation.

- Requirements Engineering, 7,5 credits
- Algorithms and Complexity, 7.5 credits
- Software Analysis and Design, 7.5 credits
- Applied AI and ML, 7.5 credits
- Software Quality, Verification, and Validation, 7.5 credits
- Human-Computer Interaction, 7,5 credits
- Master of Science Thesis in Computer Science, 15 credits

### Educational methods

- Lectures (20%)
- Seminars (5%)
- Practical/group work (30%)
- Independent work or self-study (20%)
- Thesis work (25%)

### Degree

Upon completion of this master's programme, you will receive a Master of Computer Science (MSc, 60 credits).

## The research basis for the programme

Our Software Engineering program ensures that you are not only up to date with current research in software engineering but also that you are able to apply it when working on software projects. The teachers bring their expertise and knowledge about current research directly into the classroom. This provides students with direct access to ongoing research projects and the opportunity to conduct their master thesis within a research project.

Also, scientific literature, research articles, and case studies are integrated into the course curriculums. Assignments involving analyzing and applying research literature to software projects are a part of the program, ensuring that students not only understand theoretical concepts but also know how to apply them in practical situations.

## The labour market, collaboration, and work-integrated learning<sup>1</sup>

Software engineers are in exceptionally high demand in today's global job market, with the European Union (EU) and Sweden being no exceptions. Their expertise in developing and maintaining software solutions has become invaluable across industries worldwide. Nearly all larger companies rely on software, whether they

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<sup>1</sup> Work-integrated learning is a pedagogical practice in which students' learning takes place through the integration of theoretical and practical knowledge and experience, derived from an educational context within the framework of both higher education as a work environment and civil society.

operate in healthcare, manufacturing, or the software industry, employ software engineers.

Sweden offers numerous job opportunities for software engineers, hence it is a good place for those looking to start their careers. The Swedish industry features high tech companies like Spotify, Ericsson, Volvo and Klarna, offering a range of roles in software development, system architecture, data analysis, and cybersecurity. Sweden's investment in research and development ensures graduates have access to innovative projects and opportunities. Its education system emphasizes practical experience and collaboration with local companies, often leading to job offers upon graduation. The country's openness to international talent, English proficiency, and work-life balance makes it a favorable environment for software engineering professionals to pursue their careers. Graduates are well-positioned for roles in both the private and public sectors or for further studies worldwide.

### Positions

A master's degree in software engineering qualifies you to excel in a variety of roles, with your specific focus often determined by the nature of your degree project.

Potential career paths include:

1. **Software Developer:** Designing, coding, and maintaining software applications.
2. **Requirements Engineer:** Gather and prioritize system requirements, facilitating effective communication between teams and clients.
3. **Quality Assurance Engineer:** Testing software to identify and fix bugs and ensure it meets quality standards.
4. **Systems Engineer:** Building and managing complex computer systems, make sure they run efficiently and securely.
5. **DevOps Engineer:** Focusing on the integration of development and IT operations to streamline software deployment and infrastructure management.
6. **Data Scientist:** Analyzing and interpreting data to derive insights and build data-driven applications.
7. **Cloud Solutions Architect:** Designing and implementing cloud-based solutions, often utilizing platforms like AWS Lambda, Azure Functions, or Google firebase.
8. **Software Product Manager:** Overseeing the development of software products, from requirements to deployment.
9. **IT Consultant:** Providing expertise to organizations on technology solutions, system improvements, and IT strategy.

10. Machine Learning Engineer: Building and deploying machine learning models for various applications, such as recommendation systems and natural language processing.
11. Software Development Manager: Leading and coordinating development teams, overseeing project timelines and budgets.
12. Big Data Engineer: Managing and processing large volumes of data using tools like Hadoop and Spark.
13. Entrepreneur: Starting your own software development company or tech startup to bring innovative ideas to market.
14. UX-designer: Crafts user-friendly software interfaces to enhance the overall user experience and user efficiency of a software.
15. Usability analyst: Evaluates and improves software usability, working with UX-designers and developers to enhance the user interface and user experience.

### **Potential employers**

Many organizations around the globe are actively seeking these professionals to drive their digital initiatives, create cutting-edge applications, and enhance their competitive edge. In the Trollhättan and Gothenburg region, where University West is located, there are promising opportunities in multinational companies such as:

- Capgemini
- Combitech
- GKN Aerospace
- Volvo Group
- Sigma Technology
- SKF

### **Sustainable development**

The Software Engineering master programme integrates the three sustainability aspects; ecological, economic, and social sustainability, into our courses at the design stage and communicate them clearly to students during the courses. For instance, in the AI course, ethical considerations are explicitly addressed and in foundational courses like requirements engineering, sustainability requirements are incorporated in the projects. The course on software analysis and design includes the sustainability aspect when deciding on a software architecture as well as in maintenance and configuration management. Inclusivity and democracy are embedded in group projects, ensuring diverse perspectives. This is especially true for the course on human computer interaction.

## Internationalisation

Students from around the globe come together in your program to create a unique and international environment. The program is fully taught in English, and you will study together with students from Sweden as well as international students from countries in Asia, Europe, Africa, and North and South America.

Most of your instructors also have international experience in both research and education. This will enhance your cultural experience and English-language proficiency.

## Other information

### WORK-INTEGRATED LEARNING

University West is Sweden's leading university when it comes to work-integrated learning (WIL). The university was tasked with the development of WIL by the Swedish government 15+ years ago and continues to lead the field today. WIL allows you to focus on problem-based learning for industry, with real projects from partner companies.

The master program in Software Engineering has been built in close collaboration with software companies and industry experts and is founded on the pressing needs for skilled software engineering professionals with a comprehensive understanding of modern software engineering and industry best practice.

Professors and instructors have a wealth of research and industry experience and will introduce you to both frontline research and industry best practices within the software engineering area. Through guest lectures, company visits, and company-proposed topics for degree projects, you'll gain hands-on experience in all aspects of software engineering and development. There are also real-life case studies where you can discuss your understanding, raise questions and propose ideas to experts in the field – and to potential employers.