IT-FACULTY

Programme Syllabus for Software Engineering and Management Bachelor's programme, 180 credits

Software Engineering and Management kandidatprogram, 180 högskolepoäng

First Cycle/N1SOF

1. Confirmation

The syllabus is confirmed by the IT Faculty Board 2016-06-17. This syllabus is to be valid from 2017-08-28 (autumn semester 2017).

The Division of Software Engineering at the Department of Computer Science and Engineering is responsible for the study programme.

2. Purpose of the study programme

By designing smart and efficient IT-solutions we can influence the future of peoples' lives. People who – with the help of technology and management – create innovative products are sought after around the world.

The aim of the programme in Software Engineering and Management is to provide students with theoretical knowledge and practical skills required in a knowledge-intensive and changing IT industry. The Software Engineering and Management programme is about methods and techniques for developing computer applications, asking the right questions to the customer, translating customer answers into design and managing projects, organizations and development teams. The programme will help students to develop good technical skills, the capability to analyze a problem, the ability to estimate time and cost for a larger development project and the capacity to communicate and interact with customers and other partners in a big software development project.

Student will be confronted with engineering and management problems from all areas of software engineering: 'how do large organizations specify software?', 'how can they ensure sound architectures?', 'what language tools and platforms are available to realize software?', 'how is quality obtained and managed?', 'what are the challenges of decade long software lifetimes?', 'how to turn ideas into successful software startups?', and 'how to act in an industrial development context?'.

The programme is international and open to students from around the world. The programme offers the students a technical and social environment in which they apply and develop both theoretical knowledge and practical skills. The programme has tight relationship to the IT industry and the students are introduced to realistic problems experienced in the IT industry. Within the courses and projects we collaborate with practitioners from industry and the students are introduced to guest lecturers, supervisors and workshops from industry. The close relationship to industry is an important profile of the programme. Our students are offered an academic environment in which theoretical knowledge is important – and at the same time an environment in which they grow as professional practitioners.

After completing the programme the student is suited for working in the IT industry in professions as for example system developers, programmers or testers.

3. Higher education qualifications to which the study programme leads

After the completion of the programme with 180 credits of which 150 credits are specialised study in the main field Software Engineering, on request a degree certificate is issued with the designation Degree of Bachelor of Science with a major in Software Engineering. For a Degree of Bachelor of Science the student must have accomplished an independent project (degree project) of at least 15 credits within the specialised study in the main field.

4. Main field of study for the programme

Main field of study for the programme is Software Engineering. Responsible department is the Department of Computer Science and Engineering.

5. Learning outcomes

First-cycle courses and study programmes shall develop:

- the ability of students to make independent and critical assessments,
- the ability of students to identify, formulate and solve problems autonomously, and
- the preparedness of students to deal with changes in working life.

In addition to knowledge and skills in their field of study, students shall develop the ability to:

- gather and interpret information at a scholarly level,
- stay abreast of the development of knowledge, and
- communicate their knowledge to others, including those who lack specialist knowledge in the field.

(The Swedish Higher Education Act (Ordinance 2009:1037), chapter 1, section 8.)

5.1. Learning outcomes for Degree of Bachelor of Science according to the Higher Education Ordinance

Knowledge and understanding

For a Degree of Bachelor of Science the student shall

- 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.

Competence and skills

For a Degree of Bachelor of Science the student shall

- 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
- demonstrate the ability to identify, formulate and solve problems autonomously and to complete tasks within predetermined time frames
- demonstrate the ability to present and discuss information, problems and solutions in speech and writing and in dialogue with different audiences, and
- demonstrate the skills required to work autonomously in the main field of study.

Judgement and approach

For a Degree of Bachelor of Science the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues
- demonstrate insight into the role of knowledge in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the need for further knowledge and ongoing learning.

(Higher Education Ordinance, Qualifications Ordinance, Annex 2)

5.2. Local learning outcomes

Knowledge and understanding

For a Degree of Bachelor of Science with a major in Software Engineering the student shall

- explain the basic concepts of programming languages,
- understand the various factors affecting the success of a software development project,
- know about project and time management techniques, which may be used to achieve software engineering objectives,
- know about effective methods, techniques, and tools to design and implement software projects,
- explain the role of team work in software development,

- describe the various phases of software development life cycles,
- understand the challenges involved in managing process changes in software development organizations,
- understand the business, commercial and economic context of software development, and
- understand the importance and role of ethics in software engineering.

Competence and skills

For a Degree of Bachelor of Science with a major in Software Engineering the student shall

- apply problem-solving and analytical skills to software development,
- express and assess computer programs algorithmically,
- work effectively in different phases of software development life cycle,
- be able to analyze requirements of computing problems and design solutions,
- construct, test and document software systems,
- be effective member of a large software development team,
- apply theoretical knowledge and practical skills to turn ideas into successful software startups,
- use appropriate programming languages and diagramming techniques to develop high quality software systems using a variety of software tools and technologies,
- establish and apply metrics to determine the readiness, quality, and operability of software, systems and products,
- develop high quality products and solutions in various domains such as embedded systems, web, and mobile applications,
- identify relevant theories and best practices in managing process change in software development organizations,
- work effectively on open-ended software development problems using suitable theories and methods, and
- identify, investigate and critically assess published work in software engineering.

Judgement and approach

For a Degree of Bachelor of Science with a major in Software Engineering the student shall

- demonstrate theoretical and practical knowledge of designing, developing and assessing software systems against their design requirements, and
- demonstrate knowledge and understanding of programming fundamentals, software development methods and tools, development environments, and human factors of software development.

6. The main content and structure of the study programme

The programme consists of courses in Software Engineering and Software Management. The programme includes a total of 180 credits. Of these are 150 credits compulsory courses within the

main field of study Software Engineering, including 15 credits independent project (degree project).[1] Furthermore, the programme includes a maximum of 30 credits of optional courses.

A key element of the curriculum is the focus on problem-based and project-based learning. Students work on broad and complex problem definitions and they learn to structure and solve bigger problems by dividing them into smaller tasks. All students are trained in taking responsibility for their learning and the teachers, supervisors and the educational environment are all resources in this process. Each term students break out into groups to work on a project that develops or applies IT to a significant social or organizational problem. This approach allows students to work on large projects that provide them with the opportunity to create a realistic, team-oriented work environment in which they learn different roles such as, for example, project manager, software architect, quality manager and system developer. An important skill that our students are trained in is the ability to work in groups and to find their role in a project group.

The education is given in English at full time and is conducted in the form of lectures, seminars, teacher-led exercises, and supervision in connection to the exercises as well as projects in which students apply and deepen their knowledge. All literature and communication is in English.

The curriculum is taught over six academic terms spanning three years. Each academic year includes two terms. The extent of each term is 30 credits. Each term is divided into two study periods, each of 15 credits. In most study periods, students attend two courses in parallel. Each of the six terms has a specific theme that influences both the courses and the term project.

Study process

The first two years of the programme consist of compulsory courses in Software Engineering. During the third year the student can choose optional courses within or outside the main field of study.

Progression in the programme is based on the results in previous courses and projects. To graduate from the programme in the main field of study students must successfully complete all compulsory programme courses.

The following schemas show all compulsory courses in the programme.

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[1] Software Engineering and Management, Bachelor's programme, 180 credits has been revised during 2016. Many compulsory courses mentioned above are still preliminary and will be confirmed during the coming years.

Table 1. The following schema shows the study process during year 1. All courses are compulsory.

Year 1			
Term 1: Team Programming		**Term 2**: Systems Development	
Study period 1	**Study period 2**	**Study period 3**	**Study period 4**
Object-Oriented Programming 7.5 credits	Requirements and User Experience 7.5 credits	Data Management 7.5 credits	Software Analysis and Design 7.5 credits
Mathematical Foundations for Software Engineering 7.5 credits	Mini Project: Team Programming 7.5 credits	Data Structures and Algorithms 7.5 credits	Mini Project: Systems Development 7.5 credits

Table 2. The following schema shows the study process during year 2. All courses are compulsory

Year 2			
Term 3: Distributed Systems Development		**Term 4**: Cyber Physical Systems and Systems of Systems	
Study period 1	**Study period 2**	**Study period 3**	**Study period 4**
Fundamentals of Software Architecture, 7.5 credits	Software Development Methodologies 7.5 credits	Development of Embedded and Real-Time Systems 7.5 credits	Project: Cyber Physical Systems and Systems of Systems 15 credits
Mobile and Web Development 7.5 credits	Mini Project: Distributed Systems Development 7.5 credits	Software Quality and Testing 7.5 credits	

Table 3. The following schema shows the study process during year 3. Term 5 courses are optional and term 6 courses are compulsory.

Year 3			
Term 5: Global and Enterprise Software Development		**Term 6**: Software Engineering Research and Practice	
Study period 1	**Study period 2**	**Study period 3**	**Study period 4**
Optional course	Optional course	Research Methods in Software Engineering 7.5 credits	Bachelor Thesis in Software Engineering and Management 15 credits**
Optional course	Optional course		Startups and Industrial Software Product Management, 7.5 credits*

* This course starts in the middle of study period 3 and ends in the middle of study period 4.
** This course starts in the middle of study period 3 and runs during one and a half study periods.

Optional courses

Within the programme, students can study optional courses within or outside the main field of study to an extent of 30 credits. Students who wish to study optional courses within the main field but outside those offered within the programme shall consult the programme management. The curriculum includes the following optional courses within the main field of study Software Engineering:

- Project: Software Innovation, 15 credits
- Change Management in Software Development Organizations, 7.5 credits
- Global Software Development, 7.5 credits
- Project: Enterprise Software Development, 15 credits

Project: Software Innovation course is not tied to a specific term and can be used as a platform for research and industrial innovation projects. The course typically runs during 15 weeks. The course can be used to replace any Term 5 course(s).

7. Entry requirements

General entrance requirements for university studies and the Swedish course Mathematics C or equivalent.

Specific entry requirements for admission to course within the study programme

Within the study programme there can be specific entry requirements for admission to individual courses. These specific entry requirements are documented in each course syllabus and state which entry requirements are necessary to be registered on a course within the study programme.

Selection

Selection is according to the Higher Education Ordinance and the University of Gothenburg admission regulations for education on first and second cycle.

8. Guaranteed admission

Students who follow the study programme at the prescribed pace have guaranteed admission to compulsory and optional courses provided that specific entry requirements are fulfilled and the student applies to the course within the study programme within the prescribed application period.

Admission to the course Project: Software Innovation depends on the availability of project topics and the availability of a supervisor from the faculty.

For optional courses outside the study programme local admission regulations are valid and there is no guaranteed admission.

9. Transitional provisions

For discontinued courses in earlier programme syllabus for Software Engineering and Management (180 credits), see the local degree description for the Degree of Bachelor of Science with a major in Software Engineering confirmed by the IT Faculty Board 2016-06-17 (reference no. G 2016/180).

10. Additional information

Credit transfer of former education

In some cases, the student has the right to be given credit for former higher education according to the legislative regulations of the Higher Education Ordinance.

Evaluation

The courses of the study programme are evaluated according to each course syllabus. The result will be used for planning and implementation of upcoming courses. A summary is given to students at the start of the courses.