

# Computer Science and Software Engineering, M Sc in Engineering

300 credits

Civilingenjör i mjukvaruteknik

6CMJU

Valid from:

**Determined by**

**Date determined**

## Entry requirements

### Degree in Swedish

Civilingenjör 300 hp och Teknologie master 120 hp

# Curriculum

## Semester 8 (Spring 2017)

| Course code     | Course name  | Credits | Level | Timetable module | ECV |
|-----------------|--|---------|-------|------------------|-----|
| <b>Period 1</b> |  |         |       |                  |     |
| TAOP07          | Introduction to Optimization   | 6       | G1F   | 3                | C/E |
| TANA15          | Numerical Linear Algebra   | 6       | A1N   | 1                | E   |
| TATA53          | Linear Algebra, Honours Course   | 6*      | G2F   | -                | E   |
| TATA54          | Number Theory  | 6       | G2F   | 2                | E   |
| TATA64          | Graph Theory   | 6*      | A1N   | 2                | E   |
| TBMI26          | Neural Networks and Learning Systems                                       | 6       | A1N   | 2                | E   |
| TDDA69          | Data and Program Structures  | 6*      | G2X   | 3                | E   |
| TDDD17          | Information Security, Second Course  | 6*      | A1X   | 4                | E   |
| TDDD25          | Distributed Systems  | 6       | A1N   | 2                | E   |
| TDDD38          | Advanced Programming in C++  | 6*      | A1N   | 2                | E   |
| TDDD41          | Data Mining - Clustering and Association Analysis                          | 6       | A1N   | 3                | E   |
| TDDD57          | Physical Interaction and Game Programming                                  | 6       | A1N   | 1                | E   |
| TDDD75          | Effect-Driven Development and Human-Centered Design of Interactive Systems | 6       | G2X   | 3                | E   |
| TDDD95          | Algorithmic Problem Solving  | 6*      | A1F   | 1                | E   |
| TDDD97          | Web Programming  | 6       | G2F   | 3                | E   |
| TDDE05          | AI Robotics  | 6*      | A1N   | 4                | E   |
| TDDE06          | Large-Scale Software Development - Structures and Processes                | 6*      | A1X   | 4                | E   |
| TDDE09          | Natural Language Processing  | 6       | A1F   | 2                | E   |
| TDTS07          | System Design and Methodology  | 6       | A1N   | 1                | E   |
| TEIE88          | Computer Law   | 4       | G1X   | 1                | E   |
| TEIO20          | Entrepreneurship and New Business Development                              | 6*      | G2X   | 4                | E   |
| TGTU01          | Technology and Ethics  | 6       | G1X   | 1                | E   |
| TKMJ15          | Environmental Management Strategies  | 6       | G1X   | 3                | E   |
| TNM048          | Information Visualisation  | 6       | A1X   | 3                | E   |
| TSBK07          | Computer Graphics  | 6*      | A1X   | 4                | E   |

| Course code     | Course name   | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| TSBK08          | Data Compression  | 6       | A1N   | 2                | E   |
| TSRT07          | Industrial Control Systems                                  | 6       | A1X   | 2                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TATA53          | Linear Algebra, Honours Course                              | 6*      | G2F   | -                | E   |
| TATA64          | Graph Theory  | 6*      | A1N   | 2                | E   |
| TBME08          | Biomedical Modeling and Simulation                          | 6       | A1N   | 3                | E   |
| TDDA69          | Data and Program Structures                                 | 6*      | G2X   | 1                | E   |
| TDDC78          | Programming of Parallel Computers - Methods and Tools       | 6       | A1X   | 3                | E   |
| TDDD05          | Component Based Software                                    | 6       | A1X   | 1                | E   |
| TDDD17          | Information Security, Second Course                         | 6*      | A1X   | 4                | E   |
| TDDD27          | Advanced Web Programming                                    | 6       | A1N   | 3                | E   |
| TDDD29          | IT-Project Management                                       | 6       | A1X   | 3                | E   |
| TDDD38          | Advanced Programming in C++                                 | 6*      | A1N   | -                | E   |
| TDDD48          | Automated Planning  | 6       | A1N   | 1                | E   |
| TDDD95          | Algorithmic Problem Solving                                 | 6*      | A1F   | 4                | E   |
| TDDE05          | AI Robotics   | 6*      | A1N   | 4                | E   |
| TDDE06          | Large-Scale Software Development - Structures and Processes | 6*      | A1X   | 4                | E   |
| TDDE07          | Bayesian Learning   | 6       | A1F   | 2                | E   |
| TEIE44          | Intellectual Property Rights                                | 4       | G1X   | 1                | E   |
| TEIE95          | Civil and Commercial Law                                    | 4       | G1X   | 2                | E   |
| TEIO20          | Entrepreneurship and New Business Development               | 6*      | G2X   | 4                | E   |
| TGTU76          | Philosophy of Science                                       | 6       | G1X   | 4                | E   |
| TNM079          | Modelling and Animation                                     | 6       | A1X   | 2                | E   |
| TSBK07          | Computer Graphics   | 6*      | A1X   | 1                | E   |
| TSFS06          | Diagnosis and Supervision                                   | 6       | A1N   | 1                | E   |
| TSRT14          | Sensor Fusion   | 6       | A1X   | 2                | E   |

*Specialisation: AI and Machine Learning*

| Course code     | Course name                                       | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TBMI26          | Neural Networks and Learning Systems              | 6       | A1N   | 2                | E   |
| TDDD41          | Data Mining - Clustering and Association Analysis | 6       | A1N   | 3                | E   |
| TDDD95          | Algorithmic Problem Solving                       | 6*      | A1F   | 1                | E   |
| TDDE05          | AI Robotics                                       | 6*      | A1N   | 4                | E   |
| TDDE09          | Natural Language Processing                       | 6       | A1F   | 2                | E   |
| TSRT07          | Industrial Control Systems                        | 6       | A1X   | 2                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TDDD48          | Automated Planning                                | 6       | A1N   | 1                | E   |
| TDDD95          | Algorithmic Problem Solving                       | 6*      | A1F   | 4                | E   |
| TDDE05          | AI Robotics                                       | 6*      | A1N   | 4                | E   |
| TDDE07          | Bayesian Learning                                 | 6       | A1F   | 2                | E   |
| TSFS06          | Diagnosis and Supervision                         | 6       | A1N   | 1                | E   |
| TSRT14          | Sensor Fusion                                     | 6       | A1X   | 2                | E   |

*Specialisation: Computer Games Programming*

| Course code     | Course name                               | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TDDD57          | Physical Interaction and Game Programming | 6       | A1N   | 1                | C   |
| TSBK07          | Computer Graphics                         | 6*      | A1X   | 4                | C   |
| TBMI26          | Neural Networks and Learning Systems      | 6       | A1N   | 2                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TSBK07          | Computer Graphics                         | 6*      | A1X   | 1                | C   |
| TNM079          | Modelling and Animation                   | 6       | A1X   | 2                | E   |

*Specialisation: Large Scale Software Engineering*

| Course code     | Course name   | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TDDE06          | Large-Scale Software Development - Structures and Processes | 6*      | A1X   | 4                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TDDD05          | Component Based Software                                    | 6       | A1X   | 1                | E   |
| TDDE06          | Large-Scale Software Development - Structures and Processes | 6*      | A1X   | 4                | E   |

*Specialisation: Programming and Algorithms Specialization*

| Course code     | Course name   | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TDDA69          | Data and Program Structures                           | 6*      | G2X   | 3                | E   |
| TDDD38          | Advanced Programming in C++                           | 6*      | A1N   | 2                | E   |
| TDDD41          | Data Mining - Clustering and Association Analysis     | 6       | A1N   | 3                | E   |
| TDDD95          | Algorithmic Problem Solving                           | 6*      | A1F   | 1                | E   |
| TDDE09          | Natural Language Processing                           | 6       | A1F   | 2                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TDDA69          | Data and Program Structures                           | 6*      | G2X   | 1                | E   |
| TDDC78          | Programming of Parallel Computers - Methods and Tools | 6       | A1X   | 3                | E   |
| TDDD05          | Component Based Software                              | 6       | A1X   | 1                | E   |
| TDDD14          | Formal Languages and Automata Theory                  | 6       | G2F   | 2                | E   |
| TDDD38          | Advanced Programming in C++                           | 6*      | A1N   | -                | E   |
| TDDD95          | Algorithmic Problem Solving                           | 6*      | A1F   | 4                | E   |

*Specialisation: Secure Systems*

| Course code     | Course name                         | Credits | Level | Timetable module | ECV |
|-----------------|-------------------------------------|---------|-------|------------------|-----|
| <b>Period 1</b> |                                     |         |       |                  |     |
| TDDD17          | Information Security, Second Course | 6*      | A1X   | 4                | C   |
| TDDD38          | Advanced Programming in C++         | 6*      | A1N   | 2                | E   |
| TDDD97          | Web Programming                     | 6       | G2F   | 3                | E   |
| <b>Period 2</b> |                                     |         |       |                  |     |
| TDDD17          | Information Security, Second Course | 6*      | A1X   | 4                | C   |
| TDDD27          | Advanced Web Programming            | 6       | A1N   | 3                | E   |
| TDDD38          | Advanced Programming in C++         | 6*      | A1N   | -                | E   |

**Semester 9 (Autumn 2017)**

| Course code     | Course name  | Credits | Level | Timetable module | ECV |
|-----------------|--|---------|-------|------------------|-----|
| <b>Period 1</b> |  |         |       |                  |     |
| TDDE14          | Large-Scale Software Development: Contributions and Evolution    | 6*      | A1X   | 4                | E   |
| TDDE15          | Advanced Machine Learning  | 6       | A1F   | 1                | E   |
| TDDE19          | Advanced Project Course - AI and Machine Learning                | 6*      | A1F   | 4                | E   |
| TDDE20          | Advanced Project Course - Game, App and Web Development          | 6*      | A1F   | 4                | E   |
| TDDE21          | Advanced Project Course: Secure Distributed and Embedded Systems | 6*      | A1F   | 4                | E   |
| TDEI13          | Enterprise Resource Planning Systems: Process and Implementation | 6       | A1X   | 2                | E   |
| TNCG15          | Advanced Global Illumination and Rendering                       | 6       | A1X   | 4                | E   |
| TNM067          | Scientific Visualization   | 6       | A1X   | 3                | E   |
| TNM095          | Artificial Intelligence for Interactive Media                    | 6       | A1X   | 2                | E   |
| TSBB17          | Visual Object Recognition and Detection                          | 6       | A1X   | 2                | E   |
| TSBK03          | Advanced Game Programming  | 6*      | A1X   | 1                | E   |
| TSIN01          | Information Networks   | 6       | A1X   | 3                | E   |
| TSKS12          | Modern Channel Coding, Inference and Learning                    | 6       | A1N   | 1                | E   |
| <b>Period 2</b> |  |         |       |                  |     |

| Course code | Course name  | Credits | Level | Timetable module | ECV |
|-------------|--|---------|-------|------------------|-----|
| TDDD89      | Scientific Method  | 6       | A1F   | 3                | C   |
| TAOP61      | Optimization of Realistic Complex Systems                        | 6       | A1N   | 3                | E   |
| TBMI02      | Medical Image Analysis   | 6       | A1N   | 1                | E   |
| Tddb44      | Compiler Construction  | 6       | A1X   | 1                | E   |
| TDDC90      | Software Security  | 6       | A1N   | 1                | E   |
| TDDD30      | Advanced Software Engineering                                    | 6       | A1X   | 4                | E   |
| TDDD56      | Multicore and GPU Programming                                    | 6       | A1N   | 2                | E   |
| TDDE13      | Multi Agent Systems  | 6       | A1N   | 1                | E   |
| TDDE14      | Large-Scale Software Development: Contributions and Evolution    | 6*      | A1X   | 4                | E   |
| TDDE16      | Text Mining  | 6       | A1F   | 2                | E   |
| TDDE19      | Advanced Project Course - AI and Machine Learning                | 6*      | A1F   | 4                | E   |
| TDDE20      | Advanced Project Course - Game, App and Web Development          | 6*      | A1F   | 4                | E   |
| TDDE21      | Advanced Project Course: Secure Distributed and Embedded Systems | 6*      | A1F   | 4                | E   |
| TNM086      | Virtual Reality Techniques                                       | 6       | A1X   | 2                | E   |
| TSBK03      | Advanced Game Programming  | 6*      | A1X   | -                | E   |
| TSIN02      | Internetworking  | 6       | A1N   | 1                | E   |

*Specialisation: AI and Machine Learning*

| Course code     | Course name                                       | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TDDE19          | Advanced Project Course - AI and Machine Learning | 6*      | A1F   | 4                | C   |
| TDDE15          | Advanced Machine Learning                         | 6       | A1F   | 1                | E   |
| TSBB17          | Visual Object Recognition and Detection           | 6       | A1X   | 2                | E   |
| TSRT62          | Modelling and Simulation                          | 6       | A1X   | 3                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TDDE19          | Advanced Project Course - AI and Machine Learning | 6*      | A1F   | 4                | C   |
| TDDE13          | Multi Agent Systems                               | 6       | A1N   | 1                | E   |
| TDDE16          | Text Mining                                       | 6       | A1F   | 2                | E   |



*Specialisation: Computer Games Programming*

| Course code     | Course name   | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TSBK03          | Advanced Game Programming                               | 6*      | A1X   | 1                | C   |
| TDDE20          | Advanced Project Course - Game, App and Web Development | 6*      | A1F   | 4                | E   |
| TNCG15          | Advanced Global Illumination and Rendering              | 6       | A1X   | 4                | E   |
| TSBB11          | Images and Graphics, Project Course CDIO                | 12*     | A1F   | 4                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TSBK03          | Advanced Game Programming                               | 6*      | A1X   | -                | C   |
| TDDE20          | Advanced Project Course - Game, App and Web Development | 6*      | A1F   | 4                | E   |
| TSBB11          | Images and Graphics, Project Course CDIO                | 12*     | A1F   | 4                | E   |
| TSIN02          | Internetworking   | 6       | A1N   | 1                | E   |

*Specialisation: International Software Engineering*

| Course code     | Course name  | Credits | Level | Timetable module | ECV |
|-----------------|--|---------|-------|------------------|-----|
| <b>Period 1</b> |  |         |       |                  |     |
| TDDC34          | Technical, Economic and Societal Evaluation of IT-products       | 6       | A1X   | 3                | C   |
| TDDD69          | Software Engineering - Company Project                           | 6*      | A1N   | 1                | C   |
| Tddb84          | Design Patterns  | 6       | A1X   | 4                | E   |
| TDDD38          | Advanced Programming in C++                                      | 6*      | A1N   | 2                | E   |
| TDDD43          | Advanced Data Models and Databases                               | 6*      | A1N   | 2                | E   |
| TDEI13          | Enterprise Resource Planning Systems: Process and Implementation | 6       | A1X   | 2                | E   |
| <b>Period 2</b> |  |         |       |                  |     |
| TDDD69          | Software Engineering - Company Project                           | 6*      | A1N   | 1                | C   |
| TDDC90          | Software Security  | 6       | A1N   | 1                | E   |
| TDDD07          | Real Time Systems  | 6       | A1N   | 4                | E   |
| TDDD30          | Advanced Software Engineering                                    | 6       | A1X   | 4                | E   |
| TDDD38          | Advanced Programming in C++                                      | 6*      | A1N   | -                | E   |
| TDDD43          | Advanced Data Models and Databases                               | 6*      | A1N   | 2                | E   |
| TDEI19          | Management Control   | 6       | A1X   | 2                | E   |
| TEIM03          | Intercultural Communication                                      | 4       | G1X   | 4                | E   |

*Specialisation: Large Scale Software Engineering*

| Course code     | Course name   | Credits | Level | Timetable module | ECV |
|-----------------|---|---------|-------|------------------|-----|
| <b>Period 1</b> |   |         |       |                  |     |
| TDDE14          | Large-Scale Software Development: Contributions and Evolution | 6*      | A1X   | 4                | E   |
| <b>Period 2</b> |   |         |       |                  |     |
| TDDD30          | Advanced Software Engineering                                 | 6       | A1X   | 4                | E   |
| TDDE14          | Large-Scale Software Development: Contributions and Evolution | 6*      | A1X   | 4                | E   |

*Specialisation: Programming and Algorithms Specialization*

| Course code     | Course name                   | Credits | Level | Timetable module | ECV |
|-----------------|-------------------------------|---------|-------|------------------|-----|
| <b>Period 1</b> |                               |         |       |                  |     |
| Tddb84          | Design Patterns               | 6       | A1X   | 4                | E   |
| TDDD08          | Logic Programming             | 6       | A1N   | 4                | E   |
| TSIT03          | Cryptology                    | 6       | A1X   | 2                | E   |
| <b>Period 2</b> |                               |         |       |                  |     |
| Tddb44          | Compiler Construction         | 6       | A1X   | 1                | E   |
| TDDD56          | Multicore and GPU Programming | 6       | A1N   | 2                | E   |

*Specialisation: Secure Systems*

| Course code     | Course name  | Credits | Level | Timetable module | ECV |
|-----------------|--|---------|-------|------------------|-----|
| <b>Period 1</b> |  |         |       |                  |     |
| TDDD04          | Software Testing   | 6       | A1N   | 2                | C   |
| TDDD38          | Advanced Programming in C++                                      | 6*      | A1N   | 2                | E   |
| TDDE21          | Advanced Project Course: Secure Distributed and Embedded Systems | 6*      | A1F   | 4                | E   |
| TDTS06          | Computer Networks  | 6       | G2F   | 1                | E   |
| TSIT03          | Cryptology   | 6       | A1X   | 2                | E   |
| <b>Period 2</b> |  |         |       |                  |     |
| TDDC90          | Software Security  | 6       | A1N   | 1                | C   |
| TDDD30          | Advanced Software Engineering                                    | 6       | A1X   | 4                | E   |
| TDDD37          | Database Technology  | 6       | G2F   | 1                | E   |
| TDDD38          | Advanced Programming in C++                                      | 6*      | A1N   | -                | E   |
| TDDE21          | Advanced Project Course: Secure Distributed and Embedded Systems | 6*      | A1F   | 4                | E   |

**Semester 10 (Spring 2018)**

| Course code     | Course name                      | Credits | Level | Timetable module | ECV |
|-----------------|----------------------------------|---------|-------|------------------|-----|
| <b>Period 1</b> |                                  |         |       |                  |     |
| TQXX33          | Degree project - Master's Thesis | 30*     | A1X   | -                | C   |
| <b>Period 2</b> |                                  |         |       |                  |     |
| TQXX33          | Degree project - Master's Thesis | 30*     | A1X   | -                | C   |

ECV = Elective / Compulsory / Voluntary

\*The course is divided into several semesters and/or periods