

# Study tracks

On this page you will find the recommended study tracks of the programme. [See recommended study schedules here.](#)

Five different study tracks are given as guidelines, but students are free to choose their own unique set from [the list of optional courses](#).

## 30 ECTS

Core courses:

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<a href="#">ELEC-E8110</a>	Automation Software Synthesis and Analysis	5	IV-V
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<a href="#">ELEC-E8113</a>	Information Systems in Industry	5	I-II
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<a href="#">ELEC-E8114</a>	Manufacturing Automation Systems Modelling	5	IV-V
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Recommended optional courses:

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<a href="#">CS-C3140</a>	Operating systems	5	I
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<a href="#">CS-C3180</a>	Software Design and Modelling	5	I-II
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<a href="#">CS-C3150</a>	Software engineering	5	I-II, III-IV
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## 30 ECTS

Core courses:

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<a href="#">ELEC-E8116</a>	Model-based control systems	5	I-II
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Recommended optional courses:

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<a href="#">MS-E2140</a>	Linear programming	5	I
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<a href="#">MS-E2112</a>	Multivariate statistical analysis	5	III-IV
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<a href="#">ELEC-E8105</a>	Non-linear filtering and parameter estimation	5	III-IV
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<a href="#">MS-E2139</a>	Nonlinear programming	5	II
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## 30 ECTS

Core courses:

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<a href="#">ELEC-E8113</a>	Information systems in industry	5	I-II
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<a href="#">ELEC-E8114</a>	Manufacturing automation systems modelling	5	IV-V
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<a href="#">ELEC-C1320</a>	Robotics	5	I-II
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Recommended optional courses:

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<a href="#">ELEC-E8110</a>	Automation software synthesis and analysis P	5	IV-V
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<a href="#">ELEC-E8118</a>	Robotic vision	5	III
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## 30 ECTS

Core courses:

<a href="#">ELEC-E8111</a>	Autonomous mobile robots P	5	IV
<a href="#">ELEC-E8115</a>	Micro and nano robotics	5	III-IV
<a href="#">ELEC-C1320</a>	Robotics**	5	I-II
<a href="#">ELEC-E8119</a>	Robotics: manipulation, decision making and learning	5	I-II
<a href="#">ELEC-E8118</a>	Robotic vision	5	III

\*\*Choose only if you haven't studied Robotics at undergraduate level

Recommended optional courses:

<a href="#">CS-E4800</a>	Artificial intelligence	5	III - IV
<a href="#">CS-E4850</a>	Computer vision	5	I-II
<a href="#">CS-E3210</a>	Machine learning: basic principles	5	I
<a href="#">ELEC-E8105</a>	Non-linear filtering and parameter estimation	5	III-IV

30 ECTS

Core courses:

<a href="#">ELEC-E8408</a>	Embedded Systems Development	5	III-IV
<a href="#">ELEC-E8115</a>	Micro and Nano Robotics	5	III-IV

Recommended optional courses:

<a href="#">CS-E4850</a>	Computer Vision	5	I-II
<a href="#">CS-E3210</a>	Machine Learning: Basic Principles	5	I
<a href="#">ELEC-E7120</a>	Wireless Systems	5	I

Four different study paths are given as guidelines, but students are free to choose their own unique set from the [list of optional courses](#).

30 ECTS

Core courses

<a href="#">ELEC-E8402</a>	Control of Electric Drives and Power Converters	5	IV-V
<a href="#">ELEC-E8404</a>	Design of Electrical Machines	5	IV
<a href="#">ELEC-E8410</a>	Materials in Energy Applications	5	IV-V
<a href="#">ELEC-E8411</a>	Numerical Methods in Electromechanics	5	III

Recommended optional courses:

<a href="#">KJR-C2001</a>	Kiinteän aineen mekaniikan perusteet	5	IV-V
<a href="#">ELEC-E8103</a>	Modelling, Estimation and Dynamic Systems	5	II

<a href="#">MS-E1659</a>	Seminar on applied mathematics V	1-5	I-II
<a href="#">ELEC-E8104</a>	Stochastic Models and Estimation	5	I

### 30 ECTS

Core courses:

<a href="#">ELEC-E8702</a>	Electrical Installations in Buildings	5	IV-V
<a href="#">ELEC-E8124</a>	Intelligent Buildings	5	II
<a href="#">ELEC-E8701</a>	Lighting Technology and Applications	5	III-V
<a href="#">ELEC-E8700</a>	Principles and Fundamentals of Lighting	5	I-II

Recommended optional courses:

<a href="#">EEN-E4004</a>	Fundamentals of HVAC Design	5	IV-V
<a href="#">CIV-E3040</a>	Indoor Environment Technology L	5	I
<a href="#">ELEC-L8704</a>	Postgraduate Seminar on Illumination Engineering	5	varies
<a href="#">ELEC-E8703</a>	Special Assignment on Illumination Engineering and Building Electrical Design V	5	I-II, III-V
<a href="#">EEN-E4005</a>	Sustainable Building Energy Systems	5	V

### 30 ECTS

Core courses:

<a href="#">ELEC-E8402</a>	Control of Electric Drives and Power Converters	5	IV-V
<a href="#">ELEC-E8403</a>	Converter Techniques	5	III-IV
<a href="#">ELEC-E8101</a>	Digital and Optimal Control	5	I-II
<a href="#">ELEC-E8408</a>	Embedded Systems Development	5	III-IV

Recommended optional courses:

<a href="#">ELEC-E8404</a>	Design of Electrical Machines	5	IV
<a href="#">ELEC-E8102</a>	Distributed and Intelligent Automation Systems	5	I-II
<a href="#">ELEC-E8103</a>	Modelling, Estimation and Dynamic Systems	5	II
<a href="#">ELEC-E8104</a>	Stochastic models and estimation	5	I
<a href="#">ELEC-E8417</a>	Switched-Mode Power Supplies	5	IV-V
<a href="#">ELEC-E8421</a>	Tehoelektronikan komponentit	5	I-II

### 30 ECTS

Core courses:

<a href="#">ELEC-E8406</a>	Electricity Distribution and Markets	5	III-IV
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<b>ELEC-E8409</b>	High Voltage Engineering	5	I-II
<b>ELEC-E8419</b>	Sähkösiirtojärjestelmät 1 (Power Transmission Systems 1)	5	I-II
<b>ELEC-E8418</b>	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
Recommended optional courses:			
<b>ELEC-E8423</b>	Smart Grid	5	IV-V
<b>ELEC-E8418</b>	Sähköenergian käyttösovellukset	5	IV-V

### 30 ECTS

Core courses:

<b>ELEC-E8402</b>	Control of Electric Drives and Power Converters	5	IV-V
<b>ELEC-E8410</b>	Materials in Energy Applications	5	IV-V
<b>ELEC-E8700</b>	Principles and Fundamentals of Lighting	5	I-II
Recommended optional courses:			
<b>ELEC-E8406</b>	Electricity Distribution and Markets	5	III-IV
<b>PHYS-E6570</b>	Solar Energy Engineering	5	III-IV (alt. years, next time in 2018)
<b>ELEC-E8714</b>	Sustainable Electronics	5	I-II

Four different study paths are given as guidelines, but students are free to choose their own unique set from the [list of optional courses](#).

### 30 ECTS

Core courses: 20 ECTS

<b>ELEC-E8736</b>	Basics of MRI	5	III-IV
<b>ELEC-E8734</b>	Biomedical Instrumentation	5	II
<b>ELEC-E8726</b>	Biosensing	5	III-IV
<b>ELEC-E8731</b>	Design of Electronic Prototype	5	III-IV
Recommended optional courses:			
<b>ELEC-E8738</b>	Application of MRI	5	II
<b>ELEC-E8724</b>	Biomaterials Science	5	I-II
<b>ELEC-E8732</b>	Instrumentation Electronics	5	I-II
<b>ELEC-E8737</b>	Instrumentation of MRI	5	I
<b>ELEC-D8723</b>	Laboratory Course of Biomedical Engineering	5	IV-V
<b>ELEC-E8725</b>	Methods of Bioadaptive Technology	5	I-II
<b>CHEM-E8135</b>	Microfluidics and BioMEMS	5	III-V

<a href="#">NBE-E4000</a>	Principles of Biomedical Imaging	5	I-II
<a href="#">ELEC-E8728</a>	Tissue-foreign body interaction	5	I-II

### 30 ECTS

Core courses: 20 ECTS

<a href="#">ELEC-E8731</a>	Design of Electronic Prototype	5	III-IV
<a href="#">ELEC-E8732</a>	Instrumentation electronics	5	I-II
<a href="#">ELEC-E5720</a>	Virtual instrumentation	5	I-V

Recommended optional courses:

<a href="#">CS-E5500</a>	Acoustical Measurements	5	II
<a href="#">CS-E4850</a>	Computer Vision	5	III-IV
<a href="#">CS-E3210</a>	Machine Learning: Basic Principles	5	I
<a href="#">ELEC-E8105</a>	Non-linear Filtering and Parameter Estimation	5	III-IV
<a href="#">ELEC-E5730</a>	Optics	5	III
<a href="#">ELEC-E3210</a>	Optoelectronics	5	III
<a href="#">ELEC-E3240</a>	Photonics	5	V
<a href="#">ELEC-E8104</a>	Stochastic Models and Estimation	5	I

### 30 ECTS

Core courses: 15 ECTS

<a href="#">CIV-E3040</a>	Indoor Environment Technology	5	I
<a href="#">ELEC-E8124</a>	Intelligent Buildings	5	II

Recommended optional courses:

<a href="#">EEN-E4001</a>	Comfortable and Healthy Indoor Environments	5	III
<a href="#">ELEC-E7851</a>	Computational User Interface Design	5	II
<a href="#">ELEC-E8101</a>	Digital and Optimal Control	5	I-II
<a href="#">ELEC-E8102</a>	Distributed and Intelligent Automation Systems P	5	I-II
<a href="#">EEN-E4004</a>	Fundamentals of HVAC Design	5	IV-V
<a href="#">ELEC-E8701</a>	Lighting Technologies and Applications	5	IV-V
<a href="#">ELEC-E8700</a>	Principles and fundamentals of lighting	5	I-II
<a href="#">ELEC-E8702</a>	Rakennussähköistys (Electrical Installations in Buildings)	5	III-IV
<a href="#">EEN-E4005</a>	Sustainable Building Energy Systems	5	V

### 30 ECTS

Core courses: 15 ECTS

<a href="#">ELEC-E8713</a>	Materials and Microsystems Integration	5	I-II
<a href="#">ELEC-E8711</a>	Materials Compatibility	5	III-V
<a href="#">CHEM-E5115</a>	Microfabrication	5	III-V
<a href="#">ELEC-E8714</a>	Sustainable Electronics	5	I-II
Recommended optional courses:			
<a href="#">ELEC-E3280</a>	Micronova Laboratory Course	5	I-II
<a href="#">ELEC-E3230</a>	Nanotechnology	5	IV
<a href="#">ELEC-E3210</a>	Optoelectronics	5	III
<a href="#">ELEC-E3240</a>	Photonics	5	V
<a href="#">ELEC-E8412</a>	Power Electronics	5	II
<a href="#">ELEC-E3220</a>	Semiconductor Devices	5	III
<a href="#">ELEC-E8421</a>	Tehoelektronikan komponentit	5	I-II
<a href="#">CHEM-E5125</a>	Thin Film Technology	5	II

Five different study tracks are given as guidelines, but students are free to choose their own unique set from [the list of optional courses](#).

## 25 ECTS

Core courses:

<a href="#">ELEC-E8110</a>	Automation Software Synthesis and Analysis	5	IV-V
<a href="#">ELEC-E8113</a>	Information Systems in Industry	5	I-II
Recommended optional courses:			
<a href="#">CS-C3140</a>	Operating systems	5	I
<a href="#">CS-C3180</a>	Software Design and Modelling	5	I-II
<a href="#">CS-C3150</a>	Software engineering	5	I-II, III-IV

## 25 ECTS

Core courses:

<a href="#">ELEC-E8116</a>	Model-based control systems	5	I-II
<a href="#">ELEC-E8123</a>	Networked Control Systems	5	III
Recommended optional courses:			

MS-E2134	Decision Making and Problem Solving	5	IV
MS-E2148	Dynamic Optimization	5	III
ELEC-E8105	Non-linear filtering and parameter estimation	5	III-IV
ELEC-E5422	Convex Optimization I	5	I
ELEC-E5423	Convex Optimization II	5	II

**25 ECTS**

Core courses:

ELEC-E8113	Information systems in industry	5	I-II
ELEC-C1320	Robotics	5	I-II

Recommended optional courses:

ELEC-E8110	Automation software synthesis and analysis P	5	IV-V
CS-E4850	Computer Vision	5	I-II
CS-E3210	Machine Learning: Basic Principles	5	I-II

**25 ECTS**

Core courses:

ELEC-E8111	Autonomous mobile robots P	5	IV
ELEC-E8115	Micro and nano robotics	5	III-IV
ELEC-C1320	Robotics**	5	I-II
ELEC-E8125	Reinforcement Learning	5	I-II
ELEC-E8126	Robotic Manipulation	5	III-IV

\*\*Choose only if you haven't studied Robotics at undergraduate level

Recommended optional courses:

CS-E4800	Artificial intelligence	5	III - IV
CS-E4850	Computer vision	5	I-II
CS-E3210	Machine learning: basic principles	5	I
ELEC-E8105	Non-linear filtering and parameter estimation	5	III-IV

**25 ECTS**

Core courses:

ELEC-E8408	Embedded Systems Development	5	III-IV
ELEC-E8115	Micro and Nano Robotics	5	III-IV

**Recommended optional courses:**

<a href="#">CS-E4850</a>	Computer Vision	5	I-II
<a href="#">CS-E3210</a>	Machine Learning: Basic Principles	5	I-II
<a href="#">ELEC-E7120</a>	Wireless Systems	5	I

Four different study paths are given as guidelines, but students are free to choose their own unique set from the [list of optional courses](#).

**25 ECTS**

## Core courses

<a href="#">ELEC-E8402</a>	Control of Electric Drives and Power Converters	5	IV-V
<a href="#">ELEC-E8404</a>	Design of Electrical Machines	5	IV
<a href="#">ELEC-E8410</a>	Materials in Energy Applications	5	IV-V
<a href="#">ELEC-E8411</a>	Numerical Methods in Electromechanics	5	III

## Recommended optional courses:

<a href="#">KJR-C2001</a>	Kiinteän aineen mekaniikan perusteet	5	IV-V
<a href="#">ELEC-E8103</a>	Modelling, Estimation and Dynamic Systems	5	I-II
<a href="#">MS-E1659</a>	Seminar on applied mathematics V	1-5	I-II
<a href="#">ELEC-E8104</a>	Stochastic Models and Estimation	5	I

**25 ECTS**

## Core courses:

<a href="#">ELEC-E8702</a>	Electrical Installations in Buildings	5	IV-V
<a href="#">ELEC-E8124</a>	Intelligent Buildings	5	II
<a href="#">ELEC-E8701</a>	Lighting Technology and Applications	5	III-V
<a href="#">ELEC-E8700</a>	Principles and Fundamentals of Lighting	5	I-II

## Recommended optional courses:

<a href="#">EEN-E4004</a>	Fundamentals of HVAC Design	5	IV-V
<a href="#">CIV-E3040</a>	Indoor Environment Technology L	5	I
<a href="#">ELEC-L8704</a>	Postgraduate Seminar on Illumination Engineering	5	varies
<a href="#">ELEC-E8703</a>	Special Assignment on Illumination Engineering and Building Electrical Design V	5	I-II, III-V
<a href="#">EEN-E4005</a>	Sustainable Building Energy Systems	5	V

**25 ECTS**

## Core courses:

<a href="#">ELEC-E8402</a>	Control of Electric Drives and Power Converters	5	IV-V
<a href="#">ELEC-E8403</a>	Converter Techniques	5	III-IV
<a href="#">ELEC-E8101</a>	Digital and Optimal Control	5	I-II
<a href="#">ELEC-E8424</a>	Distributed generation technologies	5	I-II

Recommended optional courses:

<a href="#">ELEC-E8404</a>	Design of Electrical Machines	5	IV
<a href="#">ELEC-E8102</a>	Distributed and Intelligent Automation Systems	5	I-II
<a href="#">ELEC-E8408</a>	Embedded Systems Development	5	III-IV
<a href="#">ELEC-E8103</a>	Modelling, Estimation and Dynamic Systems	5	II
<a href="#">ELEC-E8417</a>	Switched-Mode Power Supplies	5	IV-V
<a href="#">ELEC-E8421</a>	Tehoelektroniikan komponentit	5	I-II

## 25 ECTS

Core courses:

<a href="#">ELEC-E8406</a>	Electricity Distribution and Markets	5	III-IV
<a href="#">ELEC-E8409</a>	High Voltage Engineering	5	I-II
<a href="#">ELEC-E8423</a>	Smart Grid	5	IV-V

Recommended optional courses:

<a href="#">ELEC-E8424</a>	Distributed generation technologies	5	I-II
<a href="#">ELEC-E8701</a>	Lighting Technology and Applications	5	III-V
<a href="#">ELEC-E8702</a>	Electrical Installations in Buildings	5	IV-V
<a href="#">EEN-E4005</a>	Sustainable Building Energy Systems	5	V

## 25 ECTS

Core courses:

<a href="#">ELEC-E8402</a>	Control of Electric Drives and Power Converters	5	IV-V
<a href="#">ELEC-E8410</a>	Materials in Energy Applications	5	IV-V
<a href="#">ELEC-E8700</a>	Principles and Fundamentals of Lighting	5	I-II

Recommended optional courses:

<a href="#">ELEC-E8406</a>	Electricity Distribution and Markets	5	III-IV
<a href="#">PHYS-E6570</a>	Solar Energy Engineering	5	III-IV (alt. years, next time in 2020)
<a href="#">ELEC-E8714</a>	Sustainable Electronics	5	I-II

Four different study paths are given as guidelines, but students are free to choose their own unique set from the [list of optional courses](#).

## 25 ECTS

Core courses: 15 ECTS

<a href="#">ELEC-E8736</a>	Basics of MRI	5	III-IV
<a href="#">ELEC-E8734</a>	Biomedical Instrumentation	5	II
<a href="#">ELEC-E8731</a>	Design of Electronic Prototype	5	III-IV

Recommended optional courses:

<a href="#">ELEC-E8739</a>	AI in Health Technologies	5	I-II
<a href="#">ELEC-E8724</a>	Biomaterials Science	5	I-II
<a href="#">ELEC-E8726</a>	Biosensing	5	III-IV
<a href="#">ELEC-E8741</a>	Electromagnetic field safety and medical applications	5	IV-V
<a href="#">ELEC-E8732</a>	Instrumentation Electronics	5	I-II
<a href="#">ELEC-E8737</a>	Instrumentation of MRI	5	I
<a href="#">ELEC-E8725</a>	Methods of Bioadaptive Technology	5	I-II
<a href="#">CHEM-E8135</a>	Microfluidics and BioMEMS	5	III-V
<a href="#">NBE-E4000</a>	Principles of Biomedical Imaging	5	I-II

## 25 ECTS

Core courses: 15 ECTS

<a href="#">ELEC-E8731</a>	Design of Electronic Prototype	5	III-IV
<a href="#">ELEC-E8732</a>	Instrumentation electronics	5	I-II
<a href="#">ELEC-E5720</a>	Virtual instrumentation	5	I-V

Recommended optional courses:

<a href="#">CS-E5500</a>	Acoustical Measurements	5	II
<a href="#">CS-E4850</a>	Computer Vision	5	III-IV
<a href="#">CS-E3210</a>	Machine Learning: Basic Principles	5	I-II
<a href="#">ELEC-E8105</a>	Non-linear Filtering and Parameter Estimation	5	III-IV
<a href="#">ELEC-E5730</a>	Optics	5	III
<a href="#">ELEC-E3210</a>	Optoelectronics	5	III
<a href="#">ELEC-E3240</a>	Photonics	5	V
<a href="#">ELEC-E8104</a>	Stochastic Models and Estimation	5	I

## 25 ECTS

Core courses: 10 ECTS

<a href="#">CIV-E3040</a>	Indoor Environment Technology	5	I
<a href="#">ELEC-E8124</a>	Intelligent Buildings	5	II
Recommended optional courses:			
<a href="#">EEN-E4001</a>	Comfortable and Healthy Indoor Environments	5	III
<a href="#">ELEC-E7851</a>	Computational User Interface Design	5	II
<a href="#">ELEC-E8101</a>	Digital and Optimal Control	5	I-II
<a href="#">ELEC-E8102</a>	Distributed and Intelligent Automation Systems P	5	I-II
<a href="#">EEN-E4004</a>	Fundamentals of HVAC Design	5	IV-V
<a href="#">ELEC-E8701</a>	Lighting Technologies and Applications	5	IV-V
<a href="#">ELEC-E8700</a>	Principles and fundamentals of lighting	5	I-II
<a href="#">ELEC-E8702</a>	Rakennussähköistys (Electrical Installations in Buildings)	5	III-IV
<a href="#">EEN-E4005</a>	Sustainable Building Energy Systems	5	V

25 ECTS

Core courses:

<a href="#">ELEC-E8713</a>	Materials and Microsystems Integration	5	I-II
<a href="#">CHEM-E5115</a>	Microfabrication	5	III-V
<a href="#">ELEC-E8714</a>	Sustainable Electronics	5	I-II
Recommended optional courses:			
<a href="#">ELEC-E8711</a>	Materials Compatibility	5	III-V
<a href="#">ELEC-E3280</a>	Micronova Laboratory Course	5	I-II
<a href="#">ELEC-E3230</a>	Nanotechnology	5	IV
<a href="#">ELEC-E3210</a>	Optoelectronics	5	III
<a href="#">ELEC-E3240</a>	Photonics	5	V
<a href="#">ELEC-E8412</a>	Power Electronics	5	II
<a href="#">ELEC-E3220</a>	Semiconductor Devices	5	III
<a href="#">ELEC-E8421</a>	Tehoelektroniikan komponentit	5	I-II
<a href="#">CHEM-E5125</a>	Thin Film Technology	5	III