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Curriculum 2016-2017

Learning Outcomes

In the submenu bar to the left you will find the components of the degree and the programme's key dates in academic year 2016-2017.

The extent of studies is measured as ECTS credits. One academic year of full-time studies corresponds to 60 ECTS credits, which is equivalent to 1600 hours of work. The extent of the Master of Science (Tech) degree is 120 ECTS credits which means two years of full-time studies.

Objectives for the Master's degree in the School of Electrical Engineering are stated in the **degree regulations** (*tähän linkki tutkintosääntöön, joka löytyy kohdasta Academic Policies and Regulations?*).

Studies leading to the Master's degree consist of the following, which are explained in more detail in the menu bar on the left:

- Advanced studies 95 ECTS, including a Master's thesis (30 ECTS)
- Elective studies (25 ECTS)

Major consists of advanced studies.

Key dates 2016-2017

Päätasolta sisällytetty lukuvuoden periodit ja yliopiston tärkeät päivät

Ohjelmakohtaiset erityiset päivämäärät (tentit, orientaatiot tms), jos sellaisia on

HUOM! Ei vanhentunutta matskua!

Orientation week (2016-2017)

Tänne ehkä tekstiä, tosin onko enää relevanttia?

Retake examinations (2016-2017)

Tarvitaanko tätäkään tietoa? Ehkä, mutta missä tieto on? Toisaalta ei löydy nyky-Intostakaan.

Dates for approval of Master's thesis topic, Master's thesis approval and of graduation (2016-2017)

✓ [Schedule of committee meetings and graduation, spring 2017](#)

Application deadline for Master's thesis topic and Master's thesis approval	Degree committee meeting dates	Application deadline for graduation	Graduation date	Graduation ceremony
		9.1.2017	23.1.2017	29.3.2017
		23.1.2017	6.2.2017	29.3.2017
23.1.2017	13.2.2017	6.2.2017	20.2.2017	29.3.2017
		20.2.2017	6.3.2017	29.3.2017
		6.3.2017	20.3.20017	14.6.2017
		20.3.2017	3.4.2017	14.6.2017
13.3.2017	3.4.2017	3.4.2017	18.4.2017	14.6.2017
		18.4.2017	8.5.2017	14.6.2017
18.4.2017	8.5.2017	8.5.2017	22.5.2017	14.6.2017
		22.5.2017	5.6.2017	27.9.2017
22.5.2017	12.6.2017 (Life Science Technologies 5.6.2017)	5.6.2017	19.6.2017	27.9.2017

Tänne syksyn 2016 aikataulu?

Control, Robotics and Autonomous Systems 2016-2017

Pääaine suomeksi: Sääntötekniikka, robotiikka ja autonomiset järjestelmät

Huvudämne på svenska: Reglerteknik, robotik och autonomiska system

Code: ELEC3025

Credits: 65 ECTS

Responsible Professors: Ville Kyrki, Valeriy Vyatkin

- *Kuvaus ja osaamistavoitteet, EI OTSIKKOA*

Control, Robotics and Autonomous Systems major provides a strong basis in control engineering and automation, allowing a student then to specialize in a particular area of interest such as factory automation, robotics, smart systems, or industrial software systems. Central topics for all students include modelling, estimation and control of dynamical systems, as well as embedded systems and software for modern automation systems. Most courses include theory as well as its application in practice. Upon completion of the Major, the student will be able to:

- Understand the need for automation
- Design models and controllers for dynamical systems
- Analyze properties of and dynamics of systems
- Design industrial software applications
- Understand in depth one of the focus areas (robotics, smart systems, control engineering, automation software, or factory automation)

Courses

Code	Course	ECTS	Teaching period
Compulsory courses: 35 ECTS			
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II

ELEC-E8001	Embedded Real-Time Systems	5	I-II
ELEC-E0100	Introduction to Master's Studies at Aalto ELEC	0	I-II
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
ELEC-E8002	Project Work A – Theory	5	III-IV
ELEC-E8003	Project work B – Practice	5	IV-V
ELEC-E8104	Stochastic models and estimation	5	I
Optional courses: choose 30 ECTS or one of the pre-designed study paths given below			
*Year 1 = Students are expected to study the course during their first year of studies			
CS-E4800	Artificial Intelligence	5	III – IV
ELEC-E8110	Automation Software Synthesis and Analysis	5	IV-V
ELEC-E8111	Autonomous Mobile Robots	5	IV
CS-E4850	Computer Vision	5	III-IV
ELEC-E8712	Design for Reliability	5	I-II (Year 1)*
ELEC-E8730	Design of Electronic Equipment	5	I-II
ELEC-C5230	Digitaalisen signaalinkäsittelyn perusteet	5	IV-V
ELEC-E8405	Electric Drives	5	I-II (Year 1)*
ELEC-E8408	Embedded Systems Development	5	III-IV
ELEC-E8112	Hybrid Powertrains in Vehicles	5	III
ELEC-E8113	Information Systems in Industry	5	I-II
MS-E2140	Linear Programming	5	I
CS-E3210	Machine Learning: Basic Principles	5	I
ELEC-E8114	Manufacturing Automation Systems Modelling	5	IV-V
KON-C2004	Mechatronics Basics	5	I-II
ELEC-E8115	Micro and Nano Robotics	5	III-IV
ELEC-E8116	Model-Based Control Systems	5	III-IV
ELEC-E8117	Modelling and Control of Field Systems	5	III-IV
ELEC-E8122	Multivariate Regression methods L	5	I-II
MS-E2112	Multivariate Statistical Analysis	5	III-IV
ELEC-E8105	Non-linear filtering and parameter estimation	5	III-IV
MS-E2139	Nonlinear Programming	5	II
CS-C3140	Operating systems	5	I
ELEC-D8710	Principles of Materials Science	5	III-IV
MS-E1600	Probability theory	5	III
ELEC-E8118	Robotic Vision	5	III
ELEC-C1320	Robotics	5	I-II
ELEC-E8119	Robotics: Manipulation, Decision Making and Learning	5	I-II
ELEC-E5710	Sensors and Measurement Methods	5	IV-V
CS-C3180	Software Design and Modelling	5	I-II
CS-C3150	Software engineering	5	I-II, III-IV
ELEC-E7120	Wireless Systems	5	I

Study Tracks

HUOM! Selvitettävä kiltojen opintomestareilta, mistä 2. vuoden opiskelijat etsivät tietoa lukkareista: täältä vai vuoden 2017-18 kohdalta.

Five different study paths are given as guidelines, but students are free to choose their own unique set from the list of optional courses above.

Automation Software Engineering: 30 ECTS

Core courses:			
ELEC-E8110	Automation Software Synthesis and Analysis	5	IV-V
ELEC-E8113	Information Systems in Industry	5	I-II
ELEC-E8114	Manufacturing Automation Systems Modelling	5	IV-V
Recommended optional courses:			
CS-C3140	Operating systems	5	I
CS-C3180	Software Design and Modelling	5	I-II
CS-C3150	Software engineering	5	I-II, III-IV

Control Theory / Engineering: 30 ECTS

Core courses:			
ELEC-E8116	Model-Based Control Systems	5	III-IV
ELEC-E8117	Modelling and Control of Field Systems	5	III-IV
Recommended optional courses:			
MS-E2140	Linear Programming	5	I
ELEC-8122	Multivariate Regression Methods L	5	I-II
MS-E2112	Multivariate Statistical Analysis	5	III-IV
ELEC-E8105	Non-linear Filtering and Parameter Estimation	5	III-IV
MS-E2139	Nonlinear Programming	5	II

Factory Automation: 30 ECTS

Core courses:			
ELEC-E8113	Information Systems in Industry	5	I-II
ELEC-E8114	Manufacturing Automation Systems Modelling	5	IV-V
ELEC-C1320	Robotics	5	I-II
Recommended optional courses:			
ELEC-E8110	Automation Software Synthesis and Analysis L	5	IV-V
KON-C2004	Mechatronics Basics	5	I-II
ELEC-E8118	Robotic Vision	5	III

Robotics and Autonomous Systems: 30 ECTS

Core courses:			
ELEC-E8111	Autonomous mobile robots L	5	IV
ELEC-E8115	Micro and Nano Robotics	5	III-IV
ELEC-C1320	Robotics**	5	I-II
ELEC-E8119	Robotics: Manipulation, Decision Making and Learning	5	I-II
ELEC-E8118	Robotic Vision	5	III
**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	III-IV
ELEC-C5230	Digitaalisen signaalinkäsittelyn perusteet	5	IV-V
CS-E3210	Machine Learning: Basic Principles	5	I
KON-C2004	Mechatronics Basics	5	I-II
ELEC-E8105	Non-linear Filtering and Parameter Estimation	5	III-IV

Smart Systems: 30 ECTS

Core courses:			
ELEC-E8408	Embedded Systems Development	5	III-IV
ELEC-E8115	Micro and Nano Robotics	5	III-IV
Recommended optional courses:			
CS-E3210	Computer Vision	5	III-IV
ELEC-C5230	Digitaalisen signaalinkäsittelyn perusteet	5	IV-V
CS-E4850	Machine Learning: Basic Principles	5	I
ELEC-E7120	Wireless Systems	5	I

Alle opintopolut (myös) lukukausittain siten, että 1st Year, Fall Term alle tulisi expandeina opintopolut ja niiden alle kurssilistat?

▼ 1st Year, Fall Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 1st Year, Spring Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 2nd Year, Fall Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 2nd Year, Spring Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

Electrical Power and Energy Engineering 2016-2017

Pääaine suomeksi: Sähköenergiatekniikka

Huvudämne på svenska: Elkraftteknik

Code: ELEC024

Credits: 65 ECTS

Responsible Professors: Marko Hinkkanen, Matti Lehtonen

- Kuvaus ja osaamistavoitteet, EI OTSIKKOA

Electrical power and energy systems form the backbone of societies. Intelligent systems, spanning from production to end-user, ensure optimal utilisation of resources — minimal impact on environment, maximal benefits for society. This major offers a firm theoretical base as well as practical tools and skills needed by engineers working on the field of electrical power and energy engineering. The field includes transmission, distribution, smart grid, and sustainable generation and utilisation of electrical power, as well as power-conversion devices such as motors, generators, and power-electronic converters. In order to prepare students for understanding complex and multidisciplinary problems of the field, the major is designed to be flexible and a systems perspective is emphasised. Courses include theoretical considerations, experimental work, industrial applications, and first-hand experience in real research environments. This major prepares students for current and future challenges faced by electrical energy and network companies, power manufacturing industry, and society. Students are well-prepared to pursue doctoral studies. Upon completion of the Major, the student will be able to:

- Identify fundamental aspects and considerations for electrical energy systems
- Develop applications for energy efficiency, integration of renewables, and distributed generation
- Analyze and evaluate existing and future challenges in the field of electrical power and energy engineering
- Design and analyze power systems or energy conversion devices
- Understand in depth one of the focus areas (electromechanics, power electronic systems, power systems, or sustainable electrical energy)

Courses

Code	Course	ECTS	Teaching period
Compulsory courses: 35 ECTS			
*Year 1 = Students are expected to study the course during their first year of studies			
ELEC-E8407	Electromechanics	5	I-II (Year 1)*
ELEC-E8001	Embedded Real-Time Systems	5	I-II (Year 1)*
ELEC-E0100	Introduction to Master's Studies at Aalto ELEC	0	I-II
ELEC-E8412	Power Electronics	5	I-II (Year 1)*
ELEC-E8413	Power Systems	5	I-II (Year 1)*
ELEC-E8002	Project Work A - Theory	5	III-IV (Year 1)*
ELEC-E8003	Project work B – Practice	5	IV-V (Year 1)*
Choose one of the following:			
ELEC-E8405	Electric Drives	5	I-II (Year 1)*
ELEC-E8700	Principles and Fundamentals of Lighting	5	I-II (Year 1)*
Optional courses: choose 30 ECTS or one of the pre-designed study paths given below			
PHYS-E0483	Advances in New Energy Technologies	5	III-IV
ELEC-E8402	Control of Electric Drives and Power Converters	5	IV-V
ELEC-E8403	Converter Techniques	5	III-IV
ELEC-E8712	Design for Reliability	5	
ELEC-E8404	Design of Electrical Machines	5	IV
ELEC-E8730	Design of Electronic Equipment	5	I-II

ELEC-E8731	Design of Electronic Prototype	5	III-IV
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8405	Electric Drives	5	I-II
ELEC-E8406	Electricity Distribution and Markets	5	III-IV
ELEC-E8408	Embedded Systems Development	5	III-IV
PHYS-E6571	Fuel Cells and Hydrogen Technology	5	III-IV (alt. years)
PHYS-C6370	Fundamentals of New Energy Sources	5	I-II
ELEC-E8409	High Voltage Engineering	5	I-II
ELEC-E8112	Hybrid Powertrains in Vehicles	5	III
CSE-E4670	Introduction to Industrial Internet	5	III-IV
KJR-C2001	Kiinteään aineen mekaniikan perusteet	5	IV-V
ELEC-E8410	Materials in Energy Applications	5	IV-V
KON-C2004	Mechatronics Basics	5	II
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
PHYS-C1380	Multi-disciplinary energy perspectives	5	III-IV
ELEC-E8411	Numerical Methods in Electromechanics	5	III
ELEC-E8700	Principles and Fundamentals of Lighting	5	I-II
ELEC-D8710	Principles of Materials Science	5	III-V
ELEC-E8702	Rakennussähköistys	5	III-V
MS-E1659	Seminar on Applied Mathematics V	1-5	I-II
ELEC-E8414	Seminar on Electromechanics L	5	IV
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)
ELEC-E8415	Special Assignment in Electrical Power and Energy Engineering	5	I, II, III, IV, V
ELEC-E8416	Special Course on Electromechanics	5	I-II
ELEC-L8402	Special Topics in Industrial Electronics I P	5	I-II
ELEC-L8403	Special Topics in Industrial Electronics II P	5	III-IV
ELEC-E8104	Stochastic models and estimation	5	I
ELEC-E8714	Sustainable Electronics	5	I-II
ELEC-E8417	Switched-Mode Power Supplies	5	IV-V
ELEC-E8418	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
ELEC-E8419	Sähkönsiirtojärjestelmät 1 (Power Transmission Systems 1)	5	I-II
ELEC-E8420	Sähkönsiirtojärjestelmät 2 (Power Transmission Systems 2)	5	IV-V
ELEC-E8421	Tehoelektroniikan komponentit	5	I-II

Study Paths

Ks. CRASIN 2016-17 kommentti

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

Electromechanics: 30 ECTS

Core courses			
ELEC-E8402	Control of Electric Drives and Power Converters	5	IV-V
ELEC-E8404	Design of Electrical Machines	5	IV
ELEC-E8410	Materials in Energy Applications	5	IV-V (2017->)
ELEC-E8411	Numerical Methods in Electromechanics	5	III
Recommended optional courses:			
KJR-C2001	Kiinteän aineen mekaniikan perusteet	5	IV-V
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
MS-E1659	Seminar on applied mathematics V	1-5	I-II
ELEC-E8104	Stochastic models and estimation	5	I

Power-Electronic Systems: 30 ECTS

Core courses			
ELEC-E8402	Control of Electric Drives and Power Converters	5	IV-V
ELEC-E8403	Converter Techniques	5	III-IV
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8408	Embedded Systems Development	5	III-IV
Recommended optional courses:			
ELEC-E8404	Design of Electrical Machines	5	IV
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
ELEC-E8104	Stochastic models and estimation	5	I
ELEC-E8417	Switched-Mode Power Supplies	5	IV-V
ELEC-E8421	Tehoelektronikan komponentit	5	I-II

Power Systems and High Voltage Engineering: 30 ECTS

Core courses:			
ELEC-E8406	Electricity Distribution and Markets	5	III-IV
ELEC-E8409	High Voltage Engineering	5	I-II
ELEC-E8419	Sähkösiirtojärjestelmät 1 (Power Transmission Systems 1)	5	I-II
ELEC-E8418	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
Recommended optional courses:			
ELEC-E8420	Sähkösiirtojärjestelmät 2	5	III
ELEC-E8418	Sähköenergian käyttösovellukset	5	IV-V

Sustainable Electrical Energy: 30 ECTS

Core courses			
ELEC-E8402	Control of Electric Drives and Power Converters	5	IV-V
ELEC-E8410	Materials in Energy Applications	5	IV-V (2017)
ELEC-E8700	Principles and Fundamentals of Lighting	5	I-II
Recommended optional courses:			

ELEC-E8406	Electricity Distribution and Markets	5	III-IV
ELEC-E8112	Hybrid Powertrains in Vehicles	5	III
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)
ELEC-E8714	Sustainable Electronics	5	I-II

Tässä tapauksessa (viime lukuvuosi) ei varmaan kannata viedä opintopolkua suositeltuihin lukukausiin (alla).

▼ 1st Year, Fall Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 1st Year, Spring Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 2nd Year, Fall Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 2nd Year, Spring Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

Translational Engineering 2016-2017

Pääaine suomeksi: Translationaalinen tekniikka

Huvudämne på svenska: Translationell teknik

Code: ELEC023

Credits: 65 ECTS

Responsible Professors: Mervi Paulasto-Kröckel, Simo Särkkä

- Kuvaus ja osaamistavoitteet, EI OTSIKKOA

Translational engineering is a multidisciplinary major dealing with ubiquitous electronics and microsystems from health care and medical technology to “smart everything” at workplace and home. The major provides the student interdisciplinary knowledge from microtechnologies, new materials, and ICT. Translational engineering also emphasizes the process of transferring results from fundamental studies into innovations and functional products. There are four study paths within the major, which are (i) Health and Wellbeing, (ii) Smart System Integration, (iii) Smart Living Environment, and (iv) Measurement Science and Technology. Students will be well-prepared to pursue doctoral studies.

Upon completion of the Major, the student will be able to:

- translate the application needs into technical requirements;
- understand the design and fabrication principles of electronic devices and systems;

- command the tools needed in the development of product innovations;
- design new devices, for example, in the fields of bioelectronics and smart systems;
- understand in depth one of the focus areas (health and wellbeing, smart system integration, smart living environment or measurement science and technology)

Courses

Code	Course	ECTS	Teaching period
Compulsory courses: 35 ECTS			
*Year 1 = Students are expected to study the course during their first year of studies			
**Year 2 = Students are expected to study the course during their second year of studies			
ELEC-E8730	Design of Electronic Equipment	5	I-II
ELEC-E8712	Design for Reliability	5	I-II (Year 1)*
ELEC-E8001	Embedded Real-Time Systems	5	I-II (Year 1)*
ELEC-E0100	Introduction to Master's Studies at Aalto ELEC	0	I-II
ELEC-D8710	Principles of materials science	5	III-IV
ELEC-E8002	Project Work A - Theory	5	III-IV
ELEC-E8003	Project work B – Practice	5	IV-V
ELEC-E5710	Sensors and Measurement Methods	5	IV-V
Optional courses: choose 30 ECTS or one of the pre-designed study paths given below			
CS-E5500	Acoustical Measurements	5	II
EEN-E4006	Advanced HVAC design	5	I-II
ELEC-E8738	Application of MRI	5	II
ELEC-C5230	Basics of Digital Signal Processing	5	IV-V
ELEC-E8736	Basics of MRI	5	IV
ELEC-E5770	Biological Effects and Measurements of Electromagnetic Fields and Optical Radiation L	5	II
ELEC-E8724	Biomaterials Science	5	I-II
ELEC-E8734	Biomedical Instrumentation	5	II
ELEC-E8726	Biosensing	5	II-III
MS-E1654	Computational Inverse Problems	5	IV
ELEC-E7851	Computational User Interface Design	5	II
CS-E4850	Computer Vision	5	III-IV
ELEC-L8742	Design for Portability in Electronics	6	I-II, III-IV
ELEC-E8731	Design of Electronic Prototype	5	III-IV
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8408	Embedded Systems Development	5	III-V
EEN-E4004	Fundamentals of HVAC Design	5	IV-V
PHYS-C6370	Fundamentals of New Energy Sources	5	I-II
ELEC-E8732	Instrumentation electronics	5	I-II (Year 2)**
ELEC-E8737	Instrumentation of MRI	5	I
ELEC-D8723	Laboratory Course of Biomedical Engineering	5	IV-V
ELEC-E8701	Lighting technology and applications	5	IV-V
ELEC-E8713	Materials & Microsystems Integration	5	I-II (Year 2)**

ELEC-E8711	Materials Compatibility	5	III-V (Year 1)*
ELEC-E8725	Methods of Bioadaptive Technology	5	I-II
CHEM-E5115	Microfabrication	5	I-II (Year 1)*
CHEM-E8105	Microfluids and BioMEMS	5	III-IV
ELEC-E3280	Micronova Laboratory Course	5	I-II
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
ELEC-E3230	Nanotechnology	5	IV
ELEC-E8105	Non-linear Filtering and Parameter Estimation	5	III-IV
ELEC-E5730	Optics	5	III
ELEC-E3210	Optoelectronics	5	III
ELEC-E3240	Photonics	5	V
ELEC-L8704	Postgraduate seminar in illumination engineering	8	Varies
ELEC-E8412	Power Electronics	5	II
ELEC-E8700	Principles and Fundamentals of Lighting	5	I-II (Year 1)*
NBE-E4000	Principles of Biomedical Imaging	5	I-II
ELEC-E8702	Rakennussähköistys	5	III-V
ELEC-E3220	Semiconductor Devices	5	III
ELEC-E5710	Sensors and measurement methods	5	III
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)
ELEC-E8703	Special assignment in illumination engineering and building electrical design	2-8	I, II, III, IV, V
ELEC-E5440	Statistical Signal Processing L	5	I-II
ELEC-E8104	Stochastic Models and Estimation	5	I
EEN-E4005	Sustainable Building Energy Systems	5	V
ELEC-E8714	Sustainable Electronics	5	I-II
ELEC-E8418	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
ELEC-E8421	Tehoelektronikan komponentit	5	I-II
CHEM-E5125	Thin Film Technology	5	IV
ELEC-E8728	Tissue-foreign body interaction	5	I-II
ELEC-E5720	Virtual instrumentation	5	I-V

Study Tracks

Ks. CRASIN 2016-17 kommentti

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

Health and Wellbeing: 30 ECTS

Core courses: 20 ECTS			
ELEC-E8736	Basics of MRI	5	IV
ELEC-E8734	Biomedical Instrumentation	5	II
ELEC-E8726	Biosensing	5	II-III
ELEC-E8731	Design of Electronic Prototype	5	III-IV
Recommended optional courses:			
ELEC-E8738	Application of MRI	5	II

ELEC-E5770	Biological Effects and Measurements of Electromagnetic Fields and Optical Radiation L	5	II
ELEC-E8724	Biomaterials Science	5	I-II
ELEC-E8732	Instrumentation Electronics	5	I-II
ELEC-E8737	Instrumentation of MRI	5	I
ELEC-D8723	Laboratory Course of Biomedical Engineering	5	IV-V
ELEC-E8725	Methods of Bioadaptive Technology	5	I-II
CHEM-E8135	Microfluids and BioMEMS	5	III-IV
NBE-E4000	Principles of Biomedical Imaging	5	I-II
ELEC-E8728	Tissue-foreign body interaction	5	I-II

Smart System Integration: 30 ECTS

Core courses: 15 ECTS			
ELEC-E8713	Materials & Microsystems Integration	5	I-II
ELEC-E8711	Materials Compatibility	5	III-V
CHEM-E5115	Microfabrication	5	I-II
ELEC-E8714	Sustainable Electronics	5	I-II
Recommended optional courses:			
ELEC-E3280	Micronova Laboratory Course	5	I-II
ELEC-E3230	Nanotechnology	5	IV
ELEC-E3210	Optoelectronics	5	III
ELEC-E3240	Photonics	5	V
ELEC-E8412	Power Electronics	5	II
ELEC-E3220	Semiconductor Devices	5	III
ELEC-E8421	Tehoelektronikan komponentit	5	I-II
CHEM-E5125	Thin Film Technology	5	II

Smart Living Environment: 30 ECTS

Core courses: 15 ECTS			
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8702	Electrical Installations in Buildings	5	III-IV
Recommended optional courses:			
EEN-E4006	Advanced HVAC design	5	I-II
ELEC-E7851	Computational User Interface Design	5	II
ELEC-E8408	Embedded Systems Development	5	III-V
EEN-E4004	Fundamentals of HVAC Design	5	IV-V
PHYS-C6370	Fundamentals of New Energy Sources	5	I-II
ELEC-E8701	Lighting technology and applications	5	IV-V
ELEC-E8700	Principles and fundamentals of lighting	5	I-II
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)
EEN-E4005	Sustainable Building Energy Systems	5	V

Measurement Science and Technology: 30 ECTS

Core courses: 20 ECTS			
ELEC-C5230	Basics of Digital Signal Processing	5	IV-V
ELEC-E8731	Design of Electronic Prototype	5	III-IV
ELEC-E8732	Instrumentation electronics	5	I-II
ELEC-E5720	Virtual instrumentation	5	I-V
Recommended optional courses:			
CS-E5500	Acoustical Measurements	5	II
CS-E4850	Computer Vision	5	III-IV
ELEC-E8105	Non-linear Filtering and Parameter Estimation	5	III-IV
ELEC-E5730	Optics	5	III
ELEC-E3210	Optoelectronics	5	III
ELEC-E3240	Photonics	5	V
ELEC-E8104	Stochastic Models and Estimation	5	I

Tässä tapauksessa (viime lukuvuosi) ei varmaan kannata viedä opintopolkuja suositeltuihin lukukausiin (alla).

▼ 1st Year, Fall Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 1st Year, Spring Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 2nd Year, Fall Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

▼ 2nd Year, Spring Term

Code	Name	ECTS credits	Period
AAAA-A101	Something...	5	I-II
	etc		

Elective studies 2016-2017

Tässä on kuvaus vapaavalintaisista opinnoista mahdollisine kurssilistoineen jos sellaisia halutaan esittää. Jokainen kurssi kuitenkin sisältää linkin weboodin kurssin tietoihin.

Tässä on myös linkki sivuaineiden yhteisesti ylläpidetyille koontisivulle.

Elective studies

Students choose 25-35 credits of elective studies. As elective studies, students can complete a minor and/or take individual courses. Individual elective courses can also be taken from other programmes at Aalto University or other Finnish universities through Flexible Study Right (JOO).

Entrepreneurial and multidisciplinary Aalto studies are recommended. Foreign students are encouraged to take Finnish courses.

Also studies completed abroad during student exchange can be included in the elective studies (exchange studies can also form an international minor or be included in the major). Work experience completed in Finland or abroad can also be included in Elective Studies.

Compulsory language studies

Compulsory language studies are included as part of the Finnish bachelor's degree for students who have studied in Finland and whose language of education is Finnish or Swedish. If the language studies have not been completed in the student's bachelor's degree, the student must take 2 ECTS in the second national language and 3 ECTS in one foreign language, including both oral and written proficiency.

Students who have received their education in a language other than Finnish or Swedish, or received their education abroad, are required to complete only 3 ECTS in one foreign language, including both oral and written proficiency. Relevant courses (marked with 'o' and 'w') are offered by the Aalto University Language Center. There students who have received their education abroad and who already have excellent command of English (e.g. English as their first language) may choose 3 credits of Finnish courses instead, hence not covering the requirement of oral/written proficiency but meeting the language requirement of the degree. If this applies to you, please contact your school's Learning Services for further advice, as different schools have different procedures for validating this exemption.

Language studies are included in students' elective studies and are agreed in the personal study plan (HOPS).

Master's thesis 2016-2017

Ohjelmakohtainen opinnäytteen tekemisen, luonteen ja sisällön kuvaus

Students are required to complete a master's thesis, which is a research assignment with a workload corresponding to 30 credits. The thesis is written on a topic usually related to the student's major and agreed upon between the student and a professor who specializes in the topic of the thesis. The supervisor of the thesis must be a professor in the Aalto University. The thesis instructor(s) can be from a company or from another university. Thesis instructor(s) must have at least a master's degree.

Master's thesis work includes a seminar presentation or equivalent presentation. The student is also required to write a maturity essay related to the master's thesis.

The master's thesis is a public document and cannot be concealed.