

**Master's Programme in Automation and Electrical
Engineering
Study Guide 2015-2016**

Kirjoituspohjan tyylipaletin saa auki painamalla Alt+Ctrl+Vaihto+S

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PS: 1 Degree

In Aalto University school of electrical engineering students complete first the Bachelor of Science (Tech) degree and then Master of Science (Tech.) degree.

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.

Structure

Studies leading to a master's degree consist of

- Advanced studies 90 ECTS, including a Master's thesis (30 ECTS)
- Elective studies 30 ECTS

Major consists of advanced studies.

AS: 1.1 Objectives

The Master's Programme in Automation and Electrical Engineering is a broad multi-disciplinary study programme providing graduates with the ability to work in and between a wide variety of fields ranging from traditional electrical engineering and energy sector to biomedical engineering and robotics. Drawing from a strong mathematical and natural science basis, the curriculum is flexible, allowing each student to compile her/his own unique combination of courses according to her/his own interests.

The main fields of the programme are automation, biomedical engineering, and electrical power and energy engineering. Within these, the available focus areas include electrical grids, electric motor drives, lighting technology, control engineering, robotics, embedded systems, imaging and machine perception as well as microsystems, new hybrid carbon nanomaterials, and personalized health care.

To prepare the graduates for their future work with large and often complex systems, the programme includes several practical project works in groups which provide skills for solving multifaceted and ill-defined problems similar to those faced in the actual professional life. These projects typically include experimental and practical components as well as fundamental theoretical aspects. The programme also gives the student a comprehensive foundation for doctoral studies.

The programme features three Majors, which offer several study paths. The learning outcome of the Master's programme and its Majors are as follows:

Upon completion of the program the student will be able to

- Apply acquired skills for industrial tasks as well as academic research
- Develop and manage complex and multidisciplinary problems
- Design and perform research in the respective fields of the programme
- Design real-time systems and their related information and communication operations
- Work individually and as a part of a project team
- Understand technology-based entrepreneurship

Further, specific learning outcomes of each Major are given in the description of the majors.

AS: 1.2 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).

PS: 2 Master's thesis

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.

PS: 3 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. (SCI students: max. 5 credits. ELEC students: see the internships credit application instructions of the School of Electrical Engineering.)



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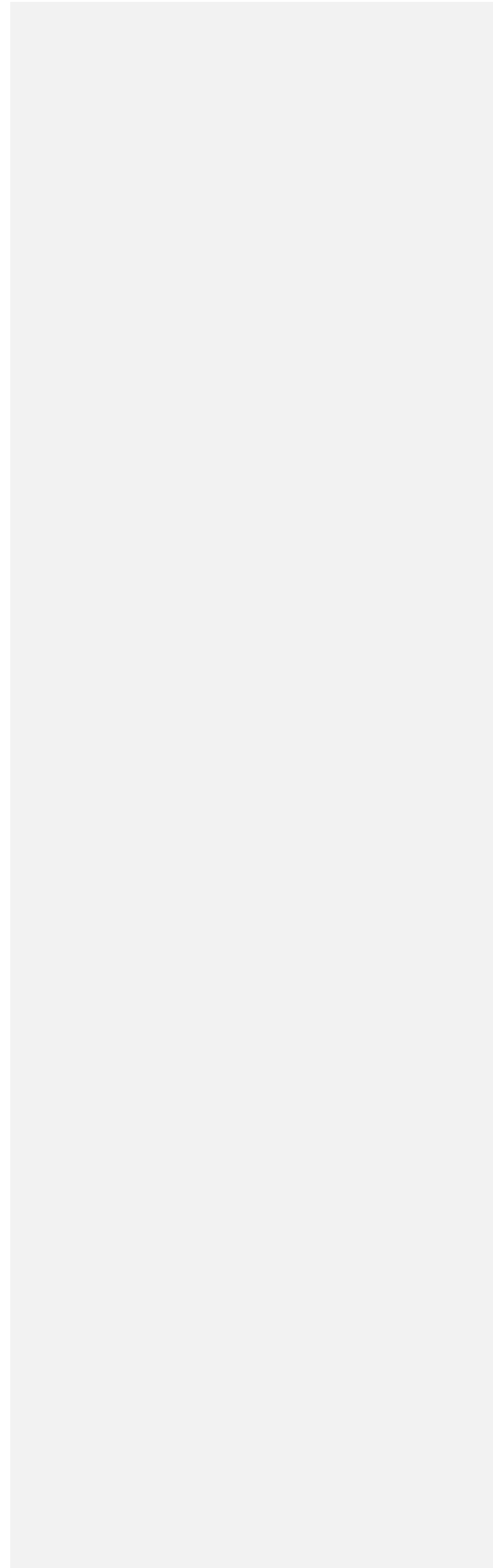
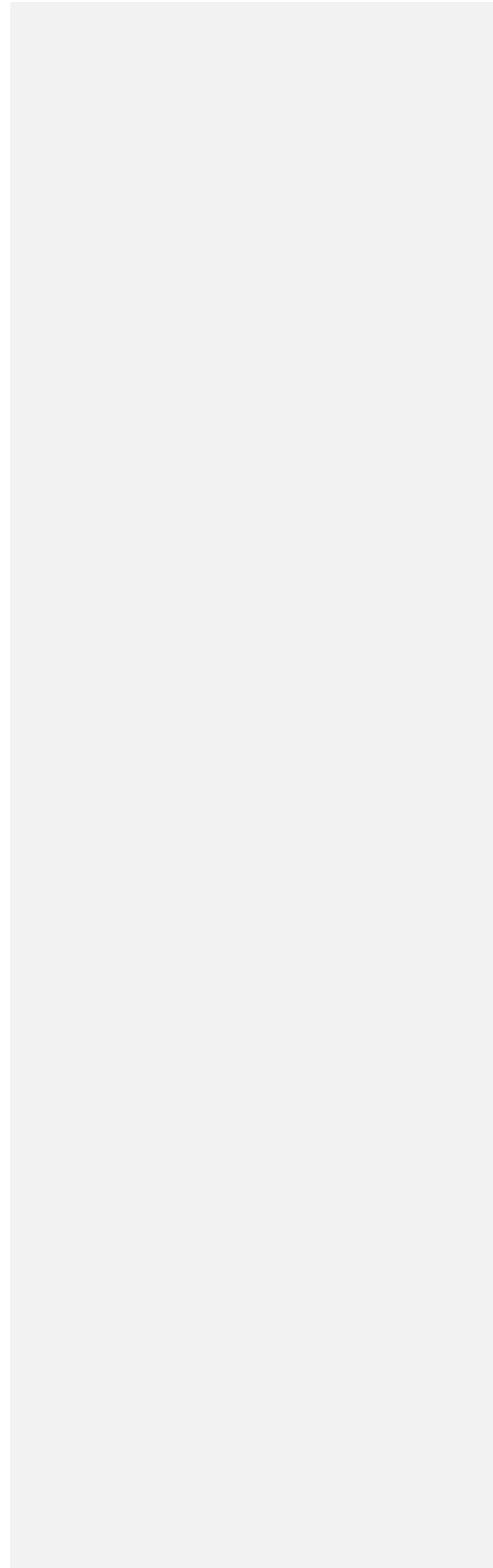


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Degree programme for Automation and Electrical
Engineering
Master of Science in Technology



PS: 1 Majors

Master's Programme in Automation and Electrical Engineering offers three different majors:

- Control, Robotics and Autonomous Systems (60 ECTS)
- Electrical Power and Energy Engineering (60 ECTS)
- Translational Engineering (65 ECTS)

Students should choose their major in the beginning of the programme. If unsure which major to choose, please contact your academic tutor or the Learning Services for advice. Major is confirmed by the approval of the personal study plan (HOPS).

PS: 2 Control, Robotics and Autonomous Systems

Pääaine suomeksi: Sääntötekniikka, robotiikka ja autonomiset järjestelmät

Huvudämne på svenska: Reglerteknik, robotik och autonomska system

Code: ELEC3025

Credits: 60 ECTS

Responsible professors: Ville Kyrki, Valeriy Vyatkin

Objectives and learning outcomes

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)

Content of the major

CODE	COURSE	ECTS	TEACHING PERIOD
COMPULSORY COURSES: 35 ECTS			
ELEC-E0100	Introduction to Master's Studies at Aalto ELEC	0	I-II
ELEC-E8001	Embedded Real-Time Systems	5	I-II
ELEC-E8002	Project Work A – Theory	5	III-V
ELEC-E8003	Project work B – Practice	5	V-II
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8103	Modeling, Estimation and Dynamic Systems	5	I
ELEC-E8104	Stochastic models and estimation	5	I
ELECTIVE COURSES: CHOOSE 25 ECTS OR ONE OF THE PRE-DESIGNED STUDY PATHS GIVEN BELOW			
ELEC-E8117	Modelling and Control of Field Systems	5	III-IV
ELEC-E8113	Information Systems in Industry	5	I-II
ELEC-E8114	Manufacturing Automation Systems Modelling	5	V
ELEC-E8111	Autonomous Mobile Robots	5	IV
ELEC-E8118	Robot Vision	5	III
ELEC-E8119	Robotics: Manipulation, Decision Making and Learning	5	I-II

ELEC-E8110	Automation Software Synthesis and Analysis	5	IV-V
ELEC-E8408	Embedded Systems Development	5	III-IV
ELEC-E8115	Micro and Nano Robotics	5	III-IV
ELEC-E8116	Model-Based Control Systems	5	IV-V
ELEC-C1320	Robotics	5	I-II
ELEC-C5230	Digitaalisen signaalinkäsittelyn perusteet	5	IV-V
KON-C2002	Mechatronics Sensors and Actuators	5	I-II
CSE-C3200	Operating systems	5	I
CSE-C3610	Software engineering	5	I-II, III-IV
MS-E1600	Probability theory	5	III
MS-E2112	Multivariate Statistical Analysis	5	III-IV
MS-E2140	Linear Programming	5	I
MS-E2139	Nonlinear Programming	5	II
T-61.5100	Digital Image Processing	5	I-II
T-61.3050	Machine Learning: Basic Principles	5	I
ICS-E4000	Artificial Intelligence	5	III – IV

Study Paths

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

Automation Software Engineering

CORE COURSES:			
ELEC-E8113	Information Systems in Industry	5	I-II
ELEC-E8114	Manufacturing Automation Systems Modelling	5	V
ELEC-E8110	Automation Software Synthesis and Analysis	5	IV-V
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
CSE-C3200	Operating systems	5	I
CSE-C3610	Software engineering	5	I-II, III-IV

Control Theory / Engineering

CORE COURSES:			
ELEC-E8116	Model-Based Control Systems	5	IV-V
ELEC-E8117	Modelling and Control of Field Systems	5	III-IV
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
MS-E2112	Multivariate Statistical Analysis	5	III-IV
MS-E2140	Linear Programming	5	I
MS-E2139	Nonlinear Programming	5	II

Factory Automation

CORE COURSES:			
ELEC-E8113	Information Systems in Industry	5	I-II

ELEC-E8114	Manufacturing Automation Systems Modelling	5	V
ELEC-C1320	Robotics	5	I-II
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
ELEC-E8110	Automation Software Synthesis and Analysis L	5	IV-V
KON-C2002	Mechatronics Sensors and Actuators	5	I-II
ELEC-E8118	Robot Vision	5	III

Robotics and Autonomous Systems

CORE COURSES:			
ELEC-E8118	Robot Vision	5	Y1 III
ELEC-E8111	Autonomous mobile robots L	5	IV
ELEC-E8115	Micro and Nano Robotics	5	III-IV
ELEC-E8119	Robotics: Manipulation, Decision Making and Learning	5	Y2 I-II
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
KON-C2002	Mechatronics Sensors and Actuators	5	I-II
ICS-E4000	Artificial Intelligence	5	III - IV
ELEC-CS230	Digitaalisen signaalinkäsittelyn perusteet	5	IV-V
T-61.5100	Digital Image Processing	5	I-II
T-61.3050	Machine Learning: Basic Principles	5	I

Smart Systems

CORE COURSES:			
ELEC-E8115	Micro and Nano Robotics	5	III-IV
ELEC-E8408	Embedded Systems Development	5	III-IV
RECOMMENDED ELECTIVE COURSES: CHOOSE 15 ECTS			
T-61.5100	Digital Image Processing P	5	I-II
T-61.3050	Machine Learning: Basic Principles	5	I-II
ELEC-CS230	Digitaalisen signaalinkäsittelyn perusteet	5	IV-V

Preliminary schedule Control, Robotics and Autonomous Systems

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PS: 3 Electrical Power and Energy Engineering

Major in Finnish: Sähköenergiatekniikka

Huvudämne på svenska: Elkraftteknik

Code: ELEC3024

Credits: 60 ECTS

Responsible professors: Marko Hinkkanen, Matti Lehtonen

Objectives and learning outcomes

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)

Content of the major

CODE	COURSE	ECTS	TEACHING PERIOD
COMPULSORY COURSES: 35 ECTS			
ELEC-E0100	Introduction to Master's Studies at Aalto ELEC	0	I-II
ELEC-E8001	Embedded Real-Time Systems	5	I-II (Y1)
ELEC-E8002	Project Work A - Theory	5	III-V
ELEC-E8003	Project work B – Practice	5	V-II
ELEC-E8405	Electric Drives	5	I-II (Y1)
ELEC-E8407	Electromechanics	5	I-II (Y1)
ELEC-E8412	Power Electronics	5	I-II (Y1)
ELEC-E8413	Power Systems	5	I-II (Y1)
ELECTIVE COURSES: CHOOSE 25 ECTS OR ONE OF THE PRE-DESIGNED STUDY PATHS GIVEN BELOW			
CSE-E4670	Introduction to Industrial Internet	5	III-IV
ELEC-D8710	Principles of materials science	5	III-IV
ELEC-E8401	Condition Monitoring of Electrical Equipment	5	IV-V
ELEC-E8408	Embedded Systems Development	5	III-IV

ELEC-E8414	Seminar on Electromechanics L	5	IV
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-E8420	Sähkönsiirtojärjestelmät 2 (Power Transmission Systems 2)	5	IV-V
ELEC-E8700	Principles and fundamentals of lighting	5	II
ELEC-E8702	Rakennussähköistys (5 op)	5	III-V
ELEC-E8712	Design for Reliability	5	
ELEC-E8730	Design of electronic equipment	5	I-II
ELEC-E8731	Design of electronic prototype	5	III-IV
ELEC-L8402	Special Topics in Industrial Electronics I P	5	I-II
ELEC-L8403	Special Topics in Industrial Electronics II P	5	III-IV
Ene-47.5140	Wind Energy P	5	I-II
KON-C2004	Mechatronics Basics	5	II
PHYS-C1380	Multi-disciplinary energy perspectives	5	III-IV
PHYS-C6370	Fundamentals of New Energy Sources	5	I-II
PHYS-E6571	Fuel Cells and Hydrogen Technology	5	III-IV (alt. years)
PHYS-E6573	Advances in New Energy Technologies	5	III-IV
ELEC-E8702	Rakennussähköistys	5	III-V
ELEC-D8710	Principles of materials science	5	III-V
ELEC-E8700	Principles and fundamentals of lighting	5	II
ELEC-E8730	Design of electronic equipment	5	I-II
ELEC-E8731	Design of electronic prototype	5	III-V

Study Paths

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

Electromechanics

CORE COURSES			
ELEC-E8404	Design of Electrical Machines	5	IV
ELEC-E8411	Numerical Methods in Electromechanics	5	III
ELEC-E8410	Materials in Energy Applications	5	IV-V (2017->)
ELEC-E8402	Control of Electric Drives and Power Converters	5	IV-V
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
KJR-C2001	Kiinteän aineen mekaniikan perusteet	5	IV-V
MS-E1659	Seminar on applied mathematics V	1-5	I-II

ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
ELEC-E8104	Stochastic models and estimation	5	III-IV

Power-Electronic Systems

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 ELECTIVE COURSES: CHOOSE 5 ECTS			
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8404	Design of Electrical Machines	5	IV
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I
ELEC-E8104	Stochastic models and estimation	5	III-IV
ELEC-E8417	Switched-Mode Power Supplies	5	IV-V
ELEC-E8421	Tehoelektroniikan komponentit	5	I-II

Power Systems and High Voltage Engineering

CORE COURSES:			
ELEC-E8409	High Voltage Engineering	5	I-II
ELEC-E8406	Electricity Distribution and Markets	5	III-IV
ELEC-E8418	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
ELEC-E8419	Sähkönsiirtojärjestelmät 1 (Power Transmission Systems 1)	5	I-II
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
ELEC-E8420	Sähkönsiirtojärjestelmät 2	5	III
ELEC-E8418	Sähköenergian käyttösovellukset	5	IV-V

Sustainable Electrical Energy

CORE COURSES			
ELEC-E8410	Materials in Energy Applications	5	IV-V (2017)
ELEC-E8402	Control of Electric Drives and Power Converters	5	IV-V
Ene-59.4210	Special Course in Energy Economics P	5	I-IV
Ene-39.4048	Natural Gas Engineering	5	I-II (2016?)
RECOMMENDED ELECTIVE COURSES: CHOOSE 5 ECTS			
ELEC-E8112	Hybrid Powertrains in Vehicles	5	III
ELEC-E8406	Electricity Distribution and Markets	5	III-IV
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)

Preliminary schedule Electrical Power and Energy Engineering

Commented [PH2]: Tähän kuva paaaine_EPEE (ei kuvatekstiä)

PS: 4 Translational Engineering

Major in Finnish: Translationaalinen tekniikka

Huvudämne på svenska: Translationell teknik

Code: ELEC3023

Credits: 65 ECTS

Responsible professors: Tomi Laurila, Liisa Halonen

Objectives and learning outcomes

Translational engineering is a multidisciplinary major dealing with number of themes from various fields, such as health care and medical technology, microsystems and issues related to smart living environment. Drawing from a strong mathematical and natural sciences basis, the major offers in depth knowledge about different application areas related, but not limited, to the above mentioned fields. The major also emphasizes the process of transferring results from fundamental studies into innovations and finally into functional products. There are three study paths within the major, which are (i) Health and Wellbeing (H&W), (ii) Smart System Integration (SSI) and (iii) Smart Living Environment (SLE). The studies in all of them consist of a well-balanced mixture of theoretical and applied knowledge and prepare the student for his/hers career equally well in industry and in academia. Upon completion of the Major, the student will be able to:

- Understand the design and fabrication principles of electronic devices
- Rationalize the use of different materials in health care, microsystems and lighting technologies based on their fundamental properties
- Understand the basic design and operation principles of lighting systems
- Understand the basic processes related to product development
- Understand in depth one of the focus areas (health and wellbeing, smart system integration, or lighting technology)

Content of the major

CODE	COURSE	ECTS	TEACHING PERIOD
COMPULSORY COURSES: 35 ECTS			
ELEC-E0100	Introduction to Master's Studies at Aalto ELEC	0	I-II
ELEC-D8710	Principles of materials science	5	III-IV
ELEC-E8001	Embedded Real-Time Systems	5	I-II (Y1)
ELEC-E8002	Project Work A - Theory	5	III-V
ELEC-E8003	Project work B – Practice	5	V-II
ELEC-E8700	Principles and fundamentals of lighting	5	II
ELEC-E8730	Design of electronic equipment	5	I-II
ELEC-E8731	Design of electronic prototype	5	III-IV
ELECTIVE COURSES: CHOOSE 30 ECTS OR ONE OF THE PRE-DESIGNED STUDY PATHS GIVEN BELOW			
ELEC-D8723	Laboratory course of biomedical engineering	5	IV-V
ELEC-E8725	Methods of Bioadaptive Technology	5	I-II
ELEC-E8733	Bioelectric Phenomena	5	I (Y2)
ELEC-E8728	Tissue-foreign body interaction	5	I-II
MT-Q.6081	Microfluidics and BioMEMS	5	III-V

ELEC-E3230	Nanotechnology	5	IV
ELEC-E8724	Biomaterials Science	5	I-II
ELEC-E8734	Biomedical Instrumentation	5	II
ELEC-E8712	Design for Reliability	5	I-II (Y1)
ELEC-E8503	Materials and Microsystem integration	5	I-II (Y2)
ELEC-E8711	Materials Compatibility	5	III-V (Y1)
CHEM-E5115	Microfabrication	5	I-II (Y1)
ELEC-E8732	Instrumentation electronics	5	I-II (Y2)
ELEC-E8421	Tehoelektroniikan komponentit	5	I-II
ELEC-E8412	Power Electronics	5	II
ELEC-E3230	Nanotechnology	5	IV
CHEM-E5125	Thin Film Technology	5	II
ELEC-E3210	Optoelectronics	5	III
ELEC-E3240	Photonics	5	V
ELEC-E3280	Micronova Laboratory Course	5	I-II
ELEC-E3220	Semiconductor Devices	5	III
ELEC-L8742	Design for portability in electronics	6	I-II, III-IV
ELEC-E8701	Lighting technology and applications	5	IV-V
ELEC-E8703	Special assignment in illumination engineering and building electrical design	2-8	I, II, III, IV, V
ELEC-E8702	Rakennussähköistys	5	III-V
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-L8704	Postgraduate seminar in illumination engineering	8	Varies
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8418	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
ELEC-E3210	Optoelectronics	5	III
ELEC-E3240	Photonics	5	V
ELEC-E8412	Power electronics	5	II
ELEC-E3220	Semiconductor Devices	5	III
ELEC-E8408	Embedded Systems Development	5	III-V
Ene-58.2101	Taloteknisten järjestelmien perusteet	4	I-II
Ene-59.4301	Energy Systems for Communities	5	II
Ene-47.5131	Life-Cycle Assessment and Environmental Auditing	3	II
Ene-58.5181	Theoretical Modelling of HVAC Systems P	6	III-V
PHYS-C6370	Fundamentals of New Energy Sources	5	I-II
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)
CHEM-E5125	Thin Film Technology	5	IV

Study Paths

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

Health and Wellbeing: 30 ECTS

CORE COURSES: 20 ECTS			
ELEC-D8723	Laboratory course of biomedical engineering	5	IV-V
ELEC-E8725	Methods of Bioadaptive Technology	5	I-II
ELEC-E8733	Bioelectric Phenomena	5	I (Y2)
ELEC-E8728	Tissue-foreign body interaction	5	I-II
RECOMMENDED ELECTIVE COURSES: CHOOSE 10 ECTS			
MT-0.6081	Microfluidics and BioMEMS	5	III-V
ELEC-E3230	Nanotechnology	5	IV
ELEC-E8724	Biomaterials Science	5	I-II
ELEC-E8734	Biomedical Instrumentation	5	II

Smart System Integration: 30 ECTS

CORE COURSES: 20 ECTS			
ELEC-E8712	Design for Reliability	5	I-II (Y1)
ELEC-E8503	Materials and Microsystem integration	5	I-II (Y2)
ELEC-E8711	Materials Compatibility	5	III-V (Y1)
CHEM-E5115	Microfabrication	5	I-II (Y1)
RECOMMENDED ELECTIVE COURSES: CHOOSE 10 ECTS			
ELEC-E8732	Instrumentation electronics	5	I-II (Y2)
ELEC-E8421	Tehoelektroniikan komponentit	5	I-II
ELEC-E8412	Power Electronics	5	II
ELEC-E3230	Nanotechnology	5	IV
CHEM-E5125	Thin Film Technology	5	II
ELEC-E3210	Optoelectronics	5	III
ELEC-E3240	Photonics	5	V
ELEC-E3280	Micronova Laboratory Course	5	I-II
ELEC-E3220	Semiconductor Devices	5	III
ELEC-L8742	Design for portability in electronics	6	I-II, III-IV

Smart Living Environment: 30 ECTS

CORE COURSES: 17-23 ECTS			
ELEC-E8701	Lighting technology and applications	5	IV-V
ELEC-E8703	Special assignment in illumination engineering and building electrical design	2-8	I, II, III, IV, V
ELEC-E8702	Rakennussähköistys	5	III-V
ELEC-E8101	Digital and Optimal Control	5	I-II
RECOMMENDED ELECTIVE COURSES: CHOOSE 7-13 ECTS FOR A TOTAL OF 30 ECTS			
ELEC-L8704	Postgraduate seminar in illumination engineering	8	Varies
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8418	Sähköenergian käyttösovelluksia (Applications of Electric Energy)	5	IV-V
ELEC-E3210	Optoelectronics	5	III

ELEC-E3240	Photonics	5	V
ELEC-E8412	Power electronics	5	II
ELEC-E3220	Semiconductor Devices	5	III
ELEC-E8408	Embedded Systems Development	5	III-V
Ene-58.2101	Taloteknisten järjestelmien perusteet	4	I-II
Ene-59.4301	Energy Systems for Communities	5	II
Ene-47.5131	Life-Cycle Assessment and Environmental Auditing	3	II
Ene-58.5181	Theoretical Modelling of HVAC Systems P	6	III-V
PHYS-C6370	Fundamentals of New Energy Sources	5	I-II
PHYS-E6570	Solar Energy Engineering	5	III-IV (alt. years)
CHEM-E5125	Thin Film Technology	5	IV

Preliminary schedule Translational Engineering

Commented [PH3]: Tähän kuva paaaine_TE (ei kuvatekstiä)