Aalto University School of Electrical Engineering, 2022-2023

Course name	Autumn, Spring, Summer or whole year long	Teaching period	ECTS	At Aalto it is a part of degree programme:	Category	Prerequisites
ELEC-A4930 - Astronomical View of the World	Spring only	Spring III-IV	3	Suitable for all students	Multidisciplinary	-
ELEC-A7100 - Basic Course in C programming	Spring only	Spring III-V	5	Bachelor	Communications and Networking	Basics in proramming (for example CS-A1111)
ELEC-A7151 - Object oriented programming with C++	Autumn only	Autumn I-II	5	Bachelor	Communications and Networking	ELEC-A7100
ELEC-A7200 - Signals and Systems	Autumn only	Autumn I-II	5	Bachelor	Communications and Networking	1st year math courses
ELEC-A7310 - Linux Basics	Autumn only	Autumn I, Autumn II	3	Bachelor	Communications and Networking	-
ELEC-A7901 - Internet Forum V D	Autumn only	Autumn I-II	3 - 5	Bachelor	Communications and Networking	-
ELEC-C5231 - Introduction to Signal Processing	Spring only	Spring IV-V	5	Bachelor	Signal Processing and Acoustics	ELEC-A7200 Signals and Systems or equivalent knowledge
ELEC-C7420 - Basic principles in networking	Spring only	Spring III-IV	5	Bachelor	Communications and Networking	** Teachers highly recommend students to learn basics in Linux before taking this course. One option is to take ELEC-A7310 Linux Basics. ** Basic programming skills are needed. Students are expected to have taken at least one programming course, e.g. CS-A1113 Basics in Programming Y1. ** SW repositories (github) ** SW programming (C/C++, Python)
ELEC-C7430 - Industrial training	Spring only	Spring V	3	Bachelor	Multidisciplinary	
ELEC-C8201 - Control and automation	Spring only	Spring III-IV	5	Bachelor	Electrical Engineering and Automation	Basic university mathematics, signals and systems, basics of programming, boolean algebra, matrix algebra, Matlab
ELEC-C9410 - Photonics and optical communications	Autumn only	Autumn I-II	5	Bachelor	Electronics and Nanoengineering	Any basic course on networks/telecommunications systems
ELEC-C9420 - Introduction to Quantum Technology	Autumn only	Autumn I-II	5	Bachelor	Electronics and Nanoengineering	High-school level mathematics: differentiation, integration, vector calculus. ** Differential and integral calculus
ELEC-C9430 - Electromagnetism	Spring only	Spring IV	5	Bachelor	Electronics and Nanoengineering	** Basics of classical mechanics ** ELEC-C9420 Introduction to quantum technology
ELEC-C9440 - Quantum Information	Spring only	Spring V	5	Bachelor	Electronics and Nanoengineering	** MS-A0011 Matrix algebra
ELEC-C9600 - Electronic circuits	Spring only	Spring IV-V	5	Bachelor	Electronics and Nanoengineering	This course is considered to be the continuation course of "Basics in Electronics" (ELEC-C9610) happening in Period I. Hence lectures and exercises are the continuations of the ones from "Basics in Electronics". Students starting this course are expected to have a background covered in "Basics in Electronics" or equivalent as a prerequisite.
ELEC-C9610 - Basics in Electronics	Autumn only	Autumn I	2	Bachelor	Electronics and Nanoengineering	Knowledge of mathematics in high-school level, including integral, derivative and a matrix.
ELEC-C9801 - Design Thinking and Electronic Prototyping	Autumn only	Autumn I-II	5	Bachelor	Electronics and Nanoengineering	-
ELEC-C9821 - Design Thinking and Advanced Prototyping	Spring only	Spring III-V	5	Bachelor	Electronics and Nanoengineering	Students are expected to know the basics of programming (corresponding to 5 ECTS or more).
ELEC-D1320 - Robotics	Autumn only	Autumn I-II	5	Bachelor, also Master	Electrical Engineering and Automation	Basic knowledge in automation and control engineering, vector and matrix calculus as well as Matlab-programming.
ELEC-D4110 - Radio Science for Space and Environmental Applications	Autumn only	Autumn I	2	Bachelor, also Master	Electronics and Nanoengineering	-
ELEC-D7011 - Human Factors Engineering	Spring only	Spring V	5	Bachelor, also Master	Multidisciplinary	-
ELEC-D8710 - Principles of materials science	Spring only	Spring III-V	5	Bachelor, also Master	Electrical Engineering and Automation	-
ELEC-E3120 - Analysis and Design of Electronic Circuits	Autumn only	Autumn I-II	5	Master	Electronics and Nanoengineering	Basics of circuit analysis.
ELEC-E3140 - Semiconductor Physics	Autumn only	Autumn I-II	5	Master	Electronics and Nanoengineering	Basic university physics
ELEC-E3210 - Optoelectronics D	Spring only	Spring V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-3140 Semiconductor Physics or similar knowledge
ELEC-E3220 - Semiconductor Devices	Spring only	Spring III	5	Master	Electronics and Nanoengineering	ELEC-E3140 Semiconductor Physics or corresponding background knowledge is mandatory.
ELEC-E3230 - Nanotechnology	Spring only	Spring IV	5	Master	Electronics and Nanoengineering	-
ELEC-E3240 - Photonics	Spring only	Spring III	5	Master	Electronics and Nanoengineering	-
ELEC-E3250 - Optical Fibers: Physics and Applications D	Autumn only	Autumn II	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Any basic course on optics. Familiarity with the syntax of MATLAB will be beneficial.
ELEC-E3260 - Biomolecules D	Spring only	Spring III	5	Master, suitable also for PhD students	Life Science Technologies	Basic courses in mathematics and physics on the BSc level. Basic knowledge in chemistry and biology is useful.
ELEC-E3280 - Micronova Laboratory Course	Autumn only	Autumn I-II	5	Master	Electronics and Nanoengineering	First year studies of relevant masters programme
ELEC-E3510 - Basics of IC Design	Spring only	Spring III	5	Master	Electronics and Nanoengineering	Electronics I and basic circuit analysis courses or equivalent.
ELEC-E3520 - Digital Microelectronics I D	Spring only	Spring III	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Basic knowledge of electronics.
ELEC-E3530 - Integrated Analog Systems D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E3510 Basics of IC design
ELEC-E3550 - Integrated RF-circuit D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E3510 (Basics of IC Design) or equivalent knowledge on basic electronics and some experience with a SPICE-type circuit simulator
ELEC-E3560 - IC Design Project	Spring only	Spring IV-V	5	Master	Electronics and Nanoengineering	Basics of IC design or Digital IC I
ELEC-E3570 - Special Course in Electronic Circuit Design V D	Whole year long	Autumn I-Spring V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-C3230
ELEC-E4130 - Electromagnetic fields	Autumn only	Autumn I-II	5	Master	Electronics and Nanoengineering	Working knowledge of engineering mathematics (vector calculus, complex numbers and integrals) and basic knowledge of electrical circuits and undergraduate electromagnetics (electric and magnetic fields and forces, electromagnetic induction).
ELEC-E4210 - Introduction to space	Autumn only	Autumn I-II	5	Master	Electronics and Nanoengineering	Basic knowledge of mathematics and physics.

ELEC-E4220 - Space instrumentation D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electronics and Nanoengineering	-
ELEC-E4230 - Microwave Earth observation instrumentation D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electronics and Nanoengineering	** ELEC-E4210 Introduction to space ** Electromagnetics, engineering mathematics, radio engineering basics.
ELEC-E4240 - Satellite systems D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	-
ELEC-E4410 - Electromagnetic and circuit simulations	Spring only	Spring III	5	Master	Electronics and Nanoengineering	ELEC-E4130 Electromagnetic fields and ELEC-E3210 Analysis and design of electronic circuits or similar basic knowledge of electromagnetics and circuits.
ELEC-E4420 - Microwave engineering I	Spring only	Spring III-IV	5	Master	Electronics and Nanoengineering	•bachelor's level engineering mathematics (e.g., algebra, trigonometry, linear algebra, complex numbers, complex vectors, differential and integral calculus, differential equations etc.) •circuit theory (e.g., ELEC-C4110 Piirianalyysi I and ELEC-C4120 Piirianalyysi II or ELEC-E3120 Analysis and design of electronic circuits) •electromagnetic field theory (e.g., ELEC-C4140 Kenttäteoria or ELEC-E4130 Electromagnetic fields) •mathematical software, for instance, Matlab or Wolfram Mathematica (e.g., ELEC-C4140 Matematiikkaohjelmistot or ELEC-E9111 Mathematical computing). •circuit simulations, for example, with AWR Design Environment (e.g., we recommend taking parallel in Period III the course ELEC-E4410 Electromagnetic and circuit simulations)
ELEC-E4430 - Microwave Engineering II D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E4420 Microwave Engineering I or similar knowledge, i.e. use of computer simulation tools for microwave circuits (e.g., AWR), matching circuit design, S-parameters, use of Smith chart.
ELEC-E4440 - Microwave Engineering Workshop D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E4430 Microwave Engineering II or equivalent knowledge, i.e. understanding and design of active RF components (diode/transistor - biasing, -stability, -matching), microstrip-line design of passive components (filters, couplers, etc.). As well as basic vector network analyzer/spectrum analyzer measurements.
ELEC-E4450 - Antennas	Spring only	Spring IV-V	5	Master	Electronics and Nanoengineering	** engineering mathematics, ** circuit theory (e.g., ELEC-C4110 Piirianalyysi I and ELEC-C4120 Piirianalyysi II or ELEC-E3120 Analysis and design of electronic circuits), ** electromagnetic field theory (e.g., ELEC-C4140 Kenttäteoria or ELEC-E4130 Electromagnetic fields), ** microwave engineering (e.g., course ELEC-E4420 Microwave engineering I), ** electromagnetic and circuit simulations (e.g., ELEC-E4410 Electromagnetic and circuit simulations), ** mathematical software (e.g., ELEC-E9111 Mathematical computing)
ELEC-E4520 - Space Physics D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E4210 Introduction to space. Good knowledge of mathematics and physics.
ELEC-E4530 - Radio Astronomy D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E4210 Introduction to space. Basic knowledge of mathematics, physics and radio technology.
ELEC-E4540 - Space Climate D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Good knowledge on mathematics and physics. Useful: Introduction to space ELEC-E4210 and Space Physics ELEC-E4520.
ELEC-E4710 - Computational Electromagnetics D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Basic knowledge of electromagnetic field theory, antenna and waveguide theory, engineering mathematics (vector differential and integral calculus), and MATLAB programming.
ELEC-E4740 - Antennas Workshop D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electronics and Nanoengineering	•engineering mathematics, •circuit theory (e.g., ELEC-C4110 Piirianalyysi I and ELEC-C4120 Piirianalyysi II or ELEC-E3120 Analysis and design of electronic circuits), •electromagnetic field theory (e.g., ELEC-C4140 Kenttäteoria or ELEC-E4130 Electromagnetic fields) •microwave engineering (e.g., courses ELEC-E4420 Microwave engineering I, ELEC-E4430 Microwave engineering II) •electromagnetic and circuit simulations (e.g., ELEC-E4410 Electromagnetic and circuit simulations) •antenna fundamentals (e.g., ELEC-E4450 Antennas)
ELEC-E4750 - Radiowave Scattering and Propagation D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Engineering mathematics, basics of electromagnetics and RF engineering, i.e., •ELEC-E4130 Electromagnetic fields (periods I-II) •ELEC-E3150 Mathematical methods (periods I-II) •ELEC-E4420 Microwave engineering I (periods III-IV)
ELEC-E4920 - Special assignment in radio science and engineering V	Whole year long	Autumn I-Spring V	5 - 10	Master	Electronics and Nanoengineering	Core courses as appropriate for the topic, to be agreed with the instructor.

ELEC-E4930 - Space technology project V	Whole year long	Autumn I-Summer	5 - 10	Master	Electronics and Nanoengineering	ELEC-E4240 Satellite Systems is recommended. Good skills in some engineering discipline.
ELEC-E4940 - Special assignment in space science and technology V	Whole year long	Autumn I-Summer	5 - 10	Master	Electronics and Nanoengineering	-
ELEC-E5400 - Project Work in Signal Processing V D	Whole year long	Autumn I-Spring V	1 - 10	Master, suitable also for PhD students	Signal Processing and Acoustics	Advanced level in studies
ELEC-E5410 - Signal Processing for Communications	Autumn only	Autumn I-II	5	Master	Signal Processing and Acoustics	ELEC-C7200 Signals and Systems ELEC-C5230 Digital Signal Processing Basics or equivalent skills ELEC-C7230 Tietoliikenteen siirtomenetelmät or similar might be useful to understand the basic building blocks of wireless communication systems
ELEC-E5424 - Convex optimization D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Signal Processing and Acoustics	Recommended a course on Linear Algebra or Matrix Computations.
ELEC-E5431 - Large scale data analysis D	Spring only	Spring III	5	Master, suitable also for PhD students	Signal Processing and Acoustics	Recommended ELEC-E5422 Convex Optimization I P and ELEC-E5440 Statistical Signal Processing P
ELEC-E5440 - Statistical Signal Processing D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Signal Processing and Acoustics	Basic knowledge of matrix algebra, probability and statistics.
ELEC-E5500 - Speech Processing	Autumn only	Autumn I	5	Master	Signal Processing and Acoustics	Basics of digital signal processing, for example ELEC-C5230
ELEC-E5510 - Speech Recognition D	Autumn only	Autumn II	5	Master, suitable also for PhD students	Signal Processing and Acoustics	Basic mathematics and probability courses.
ELEC-E5550 - Statistical Natural Language Processing D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Signal Processing and Acoustics	Basic mathematics and probability courses.
ELEC-E5600 - Communication Acoustics	Autumn only	Autumn I	5	Master	Signal Processing and Acoustics	Basic university mathematics, physics and signal processing
ELEC-E5610 - Acoustics and the Physics of Sound	Autumn only	Autumn II	5	Master	Signal Processing and Acoustics	ELEC-E5600 Communication Acoustics
ELEC-E5620 - Audio Signal Processing D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Signal Processing and Acoustics	ELEC-C5230 and ELEC-E5600 or equivalent knowledge.
ELEC-E5632 - Audio Technology Seminar V D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Signal Processing and Acoustics	At least one acoustic course and digital signal processing course. At Aalto these can be: ELEC-E5600 Communications Acoustics and ELEC-C5231 Introduction to Signal Processing
ELEC-E5640 - Noise Control D	Autumn only	Autumn II	5	Master, suitable also for PhD students	Signal Processing and Acoustics	-
ELEC-E5650 - Electroacoustics D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Signal Processing and Acoustics	ELEC-E5600 Communication Acoustics, ELEC-E5610 Acoustics and Physics of Sound, Basic knowledge of electrical circuits
ELEC-E5660 - Special Assignment in Acoustics and Audio Technology V D	Whole year long	Autumn I-Summer	1 - 10	Master, suitable also for PhD students	Signal Processing and Acoustics	ELEC-E5600 Communication Acoustics
ELEC-E5670 - Acoustical Measurements D	Autumn only	Autumn I	5	Master, suitable also for PhD students	Signal Processing and Acoustics	Basic skills in matlab.
ELEC-E5680 - Virtual Acoustics D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Signal Processing and Acoustics	ELEC-E5670 Acoustical Measurements or equal knowledge
ELEC-E5710 - Sensors and Measurement Methods	Spring only	Spring IV-V	5	Master	Signal Processing and Acoustics	Bachelor degree including major or minor in the fields of electronics or electrical engineering, or corresponding skills.
ELEC-E5720 - Virtual Instrumentation	Whole year long	Autumn I-Summer	5	Master	Signal Processing and Acoustics	S-108.191, S-108.195, S-108.1010 or S-108.1020.
ELEC-E5730 - Optics	Spring only	Spring III	5	Master	Signal Processing and Acoustics	-
ELEC-E5740 - Research Seminar on Measurement Science and Technology V D	Spring only	Spring III-V	2	Master, suitable also for PhD students	Signal Processing and Acoustics	-
ELEC-E5750 - Project Work in Measurement Science and Technology V	Whole year long	Autumn I-Summer	2 - 10	Master	Signal Processing and Acoustics	Basic courses in measurement science or optics.
ELEC-E5760 - Project Work in Optical Technology V	Whole year long	Autumn I-Summer	2 - 10	Master	Signal Processing and Acoustics	Basic courses in measurements science or optics.
ELEC-E5780 - Postgraduate Course in Measurement Science and Technology V D	Spring only	Spring III-V	10	Master, suitable also for PhD students	Signal Processing and Acoustics	M.Sc. degree in measurement science, electronics or physics, or corresponding skills and knowledge.
ELEC-E7110 - Trends in Communications Engineering Research	Autumn only	Autumn I-II	5	Master	Communications and Networking	Bachelor's degree
ELEC-E7120 - Wireless Systems	Autumn only	Autumn I	5	Master	Communications and Networking	ELEC-C7110 (recommended), ELEC-C7230 (or equal knowledge)
ELEC-E7130 - Internet Traffic Measurements and Analysis	Autumn only	Autumn I-II	5	Master	Communications and Networking	Basic probability theory and statistics (e.g., MS-A0510), and basics on internet technology
ELEC-E7210 - Communication Theory D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Communications and Networking	ELEC-C7230 or corresponding B.Sc-level communications course.
ELEC-E7221 - Machine Type Communications for Internet of Things D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Communications and Networking	C-programming, basic knowledge on electronics
ELEC-E7230 - Mobile Communication Systems	Autumn only	Autumn II	5	Master	Communications and Networking	ELEC-E7120
ELEC-E7240 - Coding Methods D	Spring only	Spring III	5	Master, suitable also for PhD students	Communications and Networking	-
ELEC-E7250 - Laboratory Course in Communications Engineering	Spring only	Spring III-V	5	Master	Communications and Networking	ELEC-E7120
ELEC-E7261 - Ambient Intelligence D	Spring only	Spring III-IV	1 - 8	Master, suitable also for PhD students	Communications and Networking	Recommended but not obligatory: 3) Skilled in programming.
ELEC-E7311 - SDN Fundamentals & Techniques	Spring only	Spring III-IV	5	Master	Communications and Networking	•Basic understanding of Internet, networks and communication protocols •Basic understanding of algorithms and mechanisms •Basic understanding of Restful API •Basic programming skills in Python and Shell scripting

ELEC-E7320 - Internet Protocols	Spring only	Spring III-IV	5	Master	Communications and Networking	** Students should have basic programming skills (e.g. Python), because the course assignments include a lot of programming tasks. You can take for example CS-A1113 Basics in Programming beforehand. ** Students should learn basics in Linux before taking this course. One option is to take ELEC-A7310 Linux Basics. ** In case you have never taken any networking course and would like to attend this course, we highly recommend you to learn basics of networking principles and TCP/IP protocols beforehand. You can for example take ELEC-C7420 Basic Principles in Networking, or at least read the related chapters in a textbook (e.g. J.F. Kurose and K.W.Ross, Computer Networking - A top-down approach, 6th edition, Addison Wesley). ** We highly recommend students to take ELEC-E7130 Internet Traffic Measurements and Analysis beforehand. In case you have not taken this course, please prepare yourselves by studying the tutorials on network measurement listed on the Materials page. We also suggest you installing Wireshark on your machines beforehand.
ELEC-E7330 - Laboratory Course in Internet Technologies	Autumn only	Autumn I-II	5	Master	Communications and Networking	ELEC-E7130 & ELEC-E7310
ELEC-E7410 - Communication transmission lines	Summer	Summer	5	Master	Communications and Networking	ELEC-C7230
ELEC-E7450 - Performance Analysis D	Spring only	Spring V	5	Master, suitable also for PhD students	Communications and Networking	ELEC-C7210
ELEC-E7460 - Modelling and Simulation D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Communications and Networking	ELEC-C7210
ELEC-E7470 - Cybersecurity D	Spring only	Spring V	5	Master, suitable also for PhD students	Communications and Networking	-
ELEC-E7633 - Project course	Spring only	Spring III-V	6	Master	Communications and Networking	** ELEC-E7130 ** ELEC-E7230
ELEC-E7810 - Patterns in Communications Ecosystems D	Autumn only	Autumn II	5	Master, suitable also for PhD students	Communications and Networking	-
ELEC-E7820 - Operator Business D	Autumn only	Autumn I	5	Master, suitable also for PhD students	Communications and Networking	-
ELEC-E7830 - Value Network Design for Internet Services	Spring only	Spring III-IV	5	Master	Communications and Networking	-
ELEC-E7852 - Computational Design and Interaction D	Autumn only	Autumn II	5	Master, suitable also for PhD students	Communications and Networking	Mandatory: Python, basic courses in programming. Recommended: probability theory, data structures, algorithms, AI or machine learning. Strongly recommended: A previous course on human-computer interaction, interaction design, or human factors.
ELEC-E7861 - Research Project in Human-Computer Interaction D	Spring only	Spring III-V	5 - 10	Master, suitable also for PhD students	Communications and Networking	ELEC-E7851 or ELEC-E7852
ELEC-E7871 - Advanced Topics in Human-Computer Interaction D	Whole year long	Autumn I-Spring V	3 - 6	Master, suitable also for PhD students	Communications and Networking	Previous studies in human-computer interaction at Aalto University.
ELEC-E7910 - Special Project in Communications Engineering	Whole year long	Autumn I-II, Spring III-V	2 - 10	Master	Communications and Networking	-
ELEC-E8001 - Embedded Real-Time Systems	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	Basic electronics and programming skills
ELEC-E8101 - Digital and Optimal Control D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basic master level course in Automation and Control Engineering. The course Control Engineering (earlier: Analog Control) or equivalent forms the necessary prerequisite knowlwdge. Programming skills in Matlab/Simulink.
ELEC-E8102 - Distributed and Intelligent Automation Systems D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Automation 1 and 2 from our bachelor or similar knowledge (PLC programming, automation systems, sensors, actuators).
ELEC-E8103 - Modelling, Estimation and Dynamic Systems	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	Programming in Matlab, Matrix and Linear Algebra, Basic course in Control Engineering or relevant knowledge.
ELEC-E8106 - Bayesian Filtering and Smoothing D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basics of (Bayesian) statistics, multivariate calculus, and matrix algebra. Basic knowledge of Python is needed for completing the exercises and project work. "ELEC-E8740 Basics of sensor fusion" is recommended, and "CS-E5710 Bayesian Data Analysis" can be useful.
ELEC-E8107 - Stochastic models, estimation and control D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basic knowledge of control engineering and robotics, basic probability theory and statistics.
ELEC-E8110 - Automation Software Synthesis and Analysis D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Required: Automation 1 and 2 or similar knowledge. Software development practice. Useful: Discrete mathematics
ELEC-E8111 - Autonomous Mobile Robots D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basic knowledge of programming, automation and control engineering, robotics and estimation.
ELEC-E8113 - Information systems in industry	Autumn only	Autumn I	5	Master	Electrical Engineering and Automation	Required: basic courses on automation; basic courses on programming. Useful: software or automation system engineering.
ELEC-E8115 - Micro- and Nano Robotics D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basic programming skills; basic course in automation
ELEC-E8116 - Model-Based Control Systems D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basic course of continuous time control systems. Fundamentals of digital control. Use of Matlab/Simulink.
ELEC-E8120 - Smart forestry machines	Spring only	Spring IV-V	5	Master	Electrical Engineering and Automation	** Prerequisites: Basic courses in Robotics and Control Engineering ** Useful, not obligatory: ELEC-E8111 Autonomous mobile robots
ELEC-E8124 - Intelligent Buildings	Autumn only	Autumn II	5	Master	Electrical Engineering and Automation	-
ELEC-E8125 - Reinforcement learning D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Required: Basic programming skills, basic calculus (gradient), basic vector and matrix algebra, basic probability (random variables, expectation) Recommended: Artificial Intelligence Useful: Machine learning - basic principles, Digital and optimal control, Stochastics and estimation

ELEC-E8126 - Robotic manipulation D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Required: Basic programming skills, basic calculus (gradient), basic vector and matrix algebra, basic probability (random variables, expectation), basic robotics (e.g. ELEC-C1320) Recommended: Autonomous mobile robots, Digital and optimal control.
ELEC-E8127 - Special assignment in automation technologies D	Whole year long	Autumn I-Summer	1 - 10	Master, suitable also for PhD students	Electrical Engineering and Automation	-
ELEC-E8402 - Control of Electric Drives and Power Converters D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electrical Engineering and Automation	ELEC-E8405 Electric Drives (or similar knowledge)
ELEC-E8403 - Converter Techniques	Spring only	Spring III-IV	5	Master	Electrical Engineering and Automation	ELEC-E8412 Power Electronics
ELEC-E8404 - Design of Electrical Machines	Spring only	Spring IV	5	Master	Electrical Engineering and Automation	ELEC-E8405 Electric Drives, ELEC-E8407 Electromechanics, or equivalent knowledge.
ELEC-E8405 - Electric Drives	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	Circuit theory, basics of electrical power engineering, analog control.
ELEC-E8406 - Electricity Distribution and Markets	Spring only	Spring III-IV	5	Master	Electrical Engineering and Automation	ELEC-E8413 Power Systems or comparable knowledge.
ELEC-E8407 - Electromechanics	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	ELEC-C8001 Sähköenergiatekniikka (Power Engineering) or equivalent knowledge.
ELEC-E8408 - Embedded Systems Development	Spring only	Spring III-IV	5	Master	Electrical Engineering and Automation	ELEC-E8001 Embedded Real-Time Systems
ELEC-E8409 - High Voltage Engineering	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	ELEC-E8413 Power Systems or comparable knowledge
ELEC-E8411 - Numerical Methods in Electromechanics D	Spring only	Spring III	5	Master, suitable also for PhD students	Electrical Engineering and Automation	ELEC-E8405 Electric Drives, ELEC-E8407 Electromechanics, or equivalent knowledge.
ELEC-E8412 - Power Electronics	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	-
ELEC-E8413 - Power Systems	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	Students having BSc degree from ELEC: Circuit theory (ELEC-C4110/ELEC-C4120), static and dynamic field theory (ELEC-C4140), or comparable knowledge. Students of Aalto Advanced Energy programme are recommended to take course ELEC-E8422 or ELEC-C8001 as prerequisite.
ELEC-E8415 - Special Assignment in Electrical Power and Energy Engineering V	Whole year long	Autumn I-Spring V	2 - 10	Master	Electrical Engineering and Automation	-
ELEC-E8417 - Switched-Mode Power Supplies	Spring only	Spring IV-V	5	Master	Electrical Engineering and Automation	Fundamentals of electrical engineering and electronics.
ELEC-E8421 - Components of Power Electronics	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	ELEC-E8412 Power Electronics or equivalent basic knowledge of power electronics
ELEC-E8422 - An Introduction to Electric Energy	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	-
ELEC-E8423 - Smart Grid D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electrical Engineering and Automation	ELEC-E8422 An Introduction to Electric Energy I-II (5 cr) or corresponding knowledge (ELEC-C8001) •Power electronics (e.g., basic circuits: rectifiers, converters. Basic concepts for analysis of power electronic circuits, general definition of power factor, harmonic content). •Power systems (e.g. single and 3-phase circuit analysis, power calculations, real and reactive power concepts, displacement power factor. •Control theory (e.g., when an equilibrium point of a system is stable and when it is not, modeling, feedback systems, etc.). •Familiarity with at least one computer simulation software e.g., Matlab, Pscad, Psim, .
ELEC-E8424 - Distributed generation technologies	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	•Knowledge on how to browse through professional publications.
ELEC-E8425 - Energy System Modelling and Optimization D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Some basic mathematical knowledge.
ELEC-E8427 - Power Transmission Systems	Spring only	Spring III-V	5	Master	Electrical Engineering and Automation	ELEC-E8413 Power Systems or similar knowledge
ELEC-E8429 - Vibrations and noise of electrical machines D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	-
ELEC-E8431 - Diagnosis and condition monitoring of electrical machines D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electrical Engineering and Automation	-
ELEC-E8700 - Principles and fundamentals of lighting	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	There are no prerequisites. The course is open to all degree students at other Aalto Schools.
ELEC-E8701 - Lighting technologies and applications	Spring only	Spring IV-V	5	Master	Electrical Engineering and Automation	ELEC-E8700 Principles and fundamentals of lighting (recommended) ** ELEC-E8700 Principles and fundamentals of lighting (recommended)
ELEC-E8703 - Special assignment on illumination engineering and building electrical design V	Whole year long	Autumn I-Spring V	5	Master	Electrical Engineering and Automation	** ELEC-E8701 Lighting technologies and applications (recommended)
ELEC-E8712 - Design for reliability	Autumn only	Autumn I-II	5	Master	Electrical Engineering and Automation	-
ELEC-E8713 - Materials and Microsystems Integration D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	-
ELEC-E8714 - Sustainable Electronics D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	-
ELEC-E8715 - Design and Analysis of MEMS D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	-
ELEC-E8724 - Biomaterials Science	Autumn only	Autumn I-II	5	Master	Life Science Technologies	ELEC-C8722 Molecular and cell biology and ELEC-D8710 Principles of materials science are recommended
ELEC-E8725 - Methods of bioadaptive technology	Autumn only	Autumn I-II	5	Master	Life Science Technologies	Bachelor's degree or relevant studies either in electronics or bioinformatioin technology (or equivalent)
ELEC-E8726 - Biosensing	Spring only	Spring III-IV	5	Master	Life Science Technologies	Bachelor's degree or relevant studies either in electronics or bioinformatioin technology (or equivalent)
ELEC-E8729 - Biomaterial Interfaces D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Life Science Technologies	ELEC-D8710 Principles of materials science and ELEC-E8724 Biomaterials Science are recommended
ELEC-E8734 - Biomedical Instrumentation	Autumn only	Autumn II	5	Master	Life Science Technologies	Basic courses in mathematics and physics. Basic programming skills.
ELEC-E8736 - Basics of MRI D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basic mathematics and physics courses
ELEC-E8739 - AI in health technologies D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Python progamming and linear algebra. Mathematica and Matlab skills will be useful

ELEC-E8740 - Basics of sensor fusion D	Autumn only	Autumn I-II	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Basics of linear algebra and calculus, basic programming knowledge (Python), basics of statistics.
ELEC-E8742 - Translational Engineering Forum D	Autumn only	Autumn I-II	5 - 7	Master, suitable also for PhD students	Electrical Engineering and Automation	Bachelor's studies, basics of electrical engineering
ELEC-E8743 - Neurorobotics D	Spring only	Spring III-IV	5	Master, suitable also for PhD students	Electrical Engineering and Automation	Recommended: basic programming knowledge (MATLAB), basic signal processing
ELEC-E8744 - Electromagnetic Field Safety V	Spring only	Spring III-IV	5	Master	Electrical Engineering and Automation	Basics in electromagnetic field theory and programming (MATLAB).
ELEC-E8745 - Design of electronic devices and systems	Whole year long	Autumn I-II, Spring III-IV	5	Master	Electrical Engineering and Automation	Fundamentals of electrical engineering and basics of electronics.
ELEC-E9111 - Mathematical computing	Autumn only	Autumn I-II	5	Master	Electronics and Nanoengineering	Basic courses in mathematics on the BSc level. Familiarity with MATLAB/Mathematica is beneficial.
ELEC-E9210 - Organic Electronics: Materials and Devices D	Autumn only	Autumn I	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Knowledge in semiconductor physics/devices will be beneficial for the class.
ELEC-E9250 - Advanced physics and applications of optical fibers V D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E3250 Optical fibers: Physics and Applications PHYS-E0435 Optical Physics
ELEC-E9540 - Digital Microelectronics II: Digital Design with HDL D	Spring only	Spring IV-V	5	Master, suitable also for PhD students	Electronics and Nanoengineering	ELEC-E3520
ELEC-E9550 - Magnetism and applications D	Summer	Summer	5	Master, suitable also for PhD students	Electronics and Nanoengineering	Basic knowledge on physics and mathematical methods. Not any prerequisites required.
ELEC-E9900 - Networked partnering and product innovation - NEPPI	Autumn only	Autumn II	5	Master	Electronics and Nanoengineering	JOIN-E7006 IDBM Challenge
ELEC-E9911 - Demola Project Work V	Whole year long	Autumn I-Spring V	5	Master	Electronics and Nanoengineering	The course is an option for ELEC graduate students who already have a good competence in their major.
ELEC-E9950 - Research seminar on electronics and nanoengineering V D	Whole year long	Autumn I-Spring V	1	Master, suitable also for PhD students	Electronics and Nanoengineering	-
ELEC-L3211 - Postgraduate Course in Micro and Nanosciences I V D	Autumn only	Autumn I-II	10	Master, suitable also for PhD students	Electronics and Nanoengineering	-
ELEC-L3221 - Postgraduate Course in Micro and Nanosciences II V D	Spring only	Spring III-IV	10	Master, suitable also for PhD students	Electronics and Nanoengineering	-
ELEC-L3510 - Postgraduate Course in Electronic Circuit Design I V D	Autumn only	Autumn I-II	8	Master, suitable also for PhD students	Electronics and Nanoengineering	Advanced studies in electronic circuit design.
ELEC-L3520 - Postgraduate Course in Electronic Circuit Design II V D	Spring only	Spring IV-V	1 - 8	Master, suitable also for PhD students	Electronics and Nanoengineering	Advanced studies in electronic circuit design.
ELEC-L3530 - Postgraduate Course in Electronic Circuit Design III V D	Whole year long	Autumn I-Spring V	1 - 8	Master, suitable also for PhD students	Electronics and Nanoengineering	Advanced studies in electronic circuit design.
ELEC-L3999 - Micronova Individual Study Module V D	Whole year long	Autumn I-Spring V	1 - 10	Master, suitable also for PhD students	Electronics and Nanoengineering	-
ELEC-L7100 - Postgraduate Seminar in Communications Engineering V D	Whole year long	Autumn I-II, Spring III-V	5 - 10	Master, suitable also for PhD students	Communications and Networking	The course is intended for postgraduate students
ELEC-L8743 - Radar Electronics D	Whole year long	Autumn I-II,Spring III-IV	6	Master, suitable also for PhD students	Electrical Engineering and Automation	Basics on electronics

Aaltonaut for Bc students