Curriculum 2025-2026

Master's programme in Communications Engineering and Data Science

In this document, you can find the curriculum for the CoDaS programme for academic year 2025-2026.

Updated on 29.10.2025.

Aalto University, Finland

Year	Area	Credits	Course Name	Credits
1st	General studies	6	ELEC-E0110 Academic skills in MSc studies I-IV	3
			Compulsory Language course	3
	Communications	10	ELEC-E7120 Wireless Systems I	5
			ELEC-E7230 Mobile communication Systems II	5
	Data Science	10	CS-C3240 Machine learning I	5
			CS-E4800 Artificial Intelligence D III-IV	5
	Mathematics and Programming	5	MS-C2111 Stochastic processes II	5
	Project	6	ELEC-E7633 Project Course III-V	6
	Electives – fulfil 60 credits		Student chooses from the list below	
	Specialization	5	ELEC-C8201 Control and Automation III-IV (Track-specific specialization course, optional)	5

Year	Area	Credits	Course Name:	Credits
2nd	General studies	3	Compulsory Language course (if not completed in Entry University)	3
	Communications	5	ELEC-E7140 Networked Systems I	5
	Data Science	5	ELEC-E7261 Ambient Intelligence D I-II	1-8
	Automation	5	ELEC-E8101 Digital and optimal control I-II	5
	MSc thesis	30	M.Sc. Thesis	30
	Electives – fulfil 60 credits		Student chooses from the list below	

Elective Studies:

Code	Course Name	ECTS	Period
CS-C3130	Information Security	5	I
CS-E4190	Cloud Software and Systems	5	I-II
CS-E4300	Network Security	5	I-Summer
CS-E4340	Cryptography	5	I-II
CS-E4370	Applied Cryptography	5	III-IV
CS-E4380/MS-E1687	Special course: Advanced Cryptography D	5	I-II
CS-E4350	Security Engineering	5	III-IV
CS-E4650	Methods of Data Mining	5	I-II
CS-E4825	Probabilistic Machine Learning D	5	III-IV
CS-E4715	Supervised Machine Learning D	5	I-II
CS-E4890	Deep Learning	5	IV-V
CS-E5480	Digital Ethics	3-5	V-Summer
CS-E5710	Bayesian Data Analysis	5	I-II
ELEC-E4420	Microwave Engineering	5	III-IV
ELEC-E5410	Signal Processing for Communications	5	I-II
ELEC-E5424	Convex Optimization D	5	I-II
ELEC-E5431	Large Scale Data Analysis	5	III-IV
ELEC-E5440	Statistical Signal Processing	5	I-II
ELEC-E7120	Wireless Systems	5	I
ELEC-E7131	Internet Traffic Measurements and Analysis	10	I-II
ELEC-E7230	Mobile Communication Systems	5	I
ELEC-E7240	Coding Methods	5	III
ELEC-E7311	SDN Fundamentals & Techniques	5	III-IV
ELEC-E7470	Cybersecurity	5	V
ELEC-E8001	Embedded Real-Time Systems	5	I-II
ELEC-E8101	Digital and Optimal Control	5	I-II
ELEC-E8102	Distributed and Intelligent Automation Systems	5	I-II
ELEC-E8103	Modelling, Estimation and Dynamic Systems	5	I-II
ELEC-E8740	Basics of Sensor Fusion	5	I-II
ELEC-E5810	Biosignal processing	5	I
ELEC-E7340	Machine learning for Wireless Communications D	5	III-IV
MS-C1620	Statistical inference	5	III-IV

Grenoble INP, France

NOTE: Only second year studies are offered at this university.
This is a preliminary curriculum and is subject to change.
Students may choose 30 ECTS worth of courses from the following tracks:

Cloud Computing & Data Infrastructures track:

Mandatory (18 ECTS)
- Large-Scale Data Management (6 ECTS - 36h)
- Cloud Computing, From Infrastructures to Applications (6 ECTS - 36h)
- Information Security (3ECTS - 21h)
- Advanced Computer Science Topics (3ECTS - 24h)

Specialization (Choose 12 ECTS)
- Next Generation Software Development (3 ECTS - 18h)
- Process Engineering (3 ECTS - 18h)
- Distributed Systems (3ECTS - 18h)
- Virtualization (3 ECTS - 18h)
- Scientific methodology and performance evaluation (3 ECTS-18h)
- Advanced Data Networks (6ECTS - 36h)

Optional (3 ECTS)
- Your may replace 3 ECTS from the Specialization list, by one of the lectures below:
  - Artificial Intelligence Project
  - Models and languages for model checking
  - Information Visualization

Applied AI and Interactive Systems:

- Natural Language Processing and Information Retrieval (6 ECTS - 36h)
- Computer Vision (6 ECTS - 36h)
- Human-Computer Interaction (6 ECTS - 36h)
- Robotics (6 ECTS - 36h)
- Computer Graphics (6 ECTS - 36h)
- Large-Scale Data Management (6 ECTS - 36h)
- Information Visualization (3 ECTS - 18h)
- Multi-Agent Systems (3 ECTS - 18h)

Students who have chosen this theme, have the possibility to replace 6 ECTS from the list above with courses from the Specialization block only of Cloud Computing & Data Infrastructures theme.

Students will complete their Master's Thesis (M.Sc.) for a total of 30 ECTS. Students should complete a total of 60 credits.

Técnico Lisboa, Portugal

[1] - The degree is structured by credits in areas, so the students will be able to choose some alternative courses within each area, depending on their choices in the other university. In all cases, the study plan for each student needs to be agreed between the student and the degree coordinator, so that if fulfils the requirements from both home and host universities.

Year	Area	Credits	Course Name	Credits
1st	General studies	6 [2]	Engineering Project Management	6
			Entrepreneurship,Innovation and Technology	6
	Communications	24 [2]	Digital Transmission	6
			Distributed Applications in the Internet	6
			High Speed Networks	6
			Learning-Based Multimedia Processing	6
			Mobile Communications Systems	6
			Mobile Networks and Internet of Things	6
			Multimedia Communication	6
			Network Algorithms and Applications	6
			Network Architecture and Management	6
			Optical Communication Systems	6
			Programmable Networks	6
	Data Science	24 [2]	Artificial Intelligence and Decision Systems	6
			Computability and Complexity	6
			Computational Statistics	6
			Cryptography and Communications Security	6
			Data Analysis and Integration	6
			Data Coding and Compression	6
			Decision Support Models	6
			Information Systems and Data Bases	6
			Machine Learning	6
			Multivariate Analysis	6
			Object Oriented Programming	6
			Optimization and Algorithms	6
			Statistical Methods in Data Mining	6
	Project [4]	6	Project in Electrical and Computers Eng.	6
2nd [3]	Communications	18 [2]	Digital Transmission[3]	6
			Distributed Applications in the Internet	6
			High Speed Networks	6
			Learning-Based Multimedia Processing	6

Year	Area	Credits	Course Name	Credits
2nd	Communications	18 [2]	Mobile Communications Systems	6
			Mobile Networks and Internet of Things	6
			Multimedia Communication	6
			Network Algorithms and Applications	6
			Network Architecture and Management	6
			Optical Communication Systems	6
			Programmable Networks	6
	Data Science	12 [2]	Artificial Intelligence and Decision Systems	6
			Computability and Complexity	6
			Computational Statistics	6
			Cryptography and Communications Security	6
			Data Analysis and Integration	6
			Data Coding and Compression	6
			Decision Support Models	6
			Information Systems and Data Bases	6
			Machine Learning	6
			Multivariate Analysis	6
			Object Oriented Programming	6
			Optimization and Algorithms	6
			Statistical Methods in Data Mining	6
	M.Sc. Thesis	30	M.Sc. Thesis	30

[2] - The student needs to choose courses that satisfy the total in the Area.

[3] - Track-specific specialization course

[4] - This course can be taken in the 2nd year, as an introduction to the Thesis.

TU Braunschweig, Germany

Year	Area	Credits	Course Name	Credits
1st	General studies	5	Seminar: Computer Science	5
	Communication	10	Computer Networks 2	5
			Mobile Communications	5
	Data science	10	Machine Learning for Data Science	5
			Pattern Recognition	5
	Mathematics and Algorithms	10	Student chooses from the elective studies "Mathematics and Algorithms" list below	10
	Project course	6	Project course "Communication Engineering and Data Science Project"	6
	Electives – fulfil 60 credits	13	Student chooses from the elective studies list below	
	Specialization (remote preparation for 2nd year)	6	Health-Enabling Technologies A	6
2nd	Communications	5	Recent Topics in Computer Networking	5
	Medical informatics and biomedicine	10	Biomedical Image and Signal Analysis	5
			Network Biology	5
	Data and Information	5	Student chooses from the elective studies "Data and Information" list below	5
	MSc thesis	30	MSc Thesis	30
	Electives – fulfil 60 credits	10	Student chooses from the elective studies list below	10

Elective Studies:

Course Name	Credits
Elective Studies	
Seminar: Computer Science (for year 2; only possible if no other seminar has been taken before in year 1)	5
Elective studies "Networking"	
Practical Course Computer Networks	5
Practical Course Computer Network Administration	5
Mobile Computing Lab	5
Wireless Networking Lab	10
Advanced Networking 1	6
Advanced Networking 2	5
Elective studies "Mathematics and Algorithms"	
Mathematical Foundations of Data Science	10
Continuous Optimization in Data Science	5
The Mathematics of Data Science	6
Computational Geometry	5
Approximation Algorithms	5
Online Algorithms	5
Machine Learning with Neural Networks	5
Elective Studies "Data and Information"	
Warehousing and Data Mining Techniques	5
Python Lab	5
Computer Lab Pattern Recognition	5
Constraint Solving	5
Health-Enabling Technologies B	5
Software Product Lines	5
Information Retrieval and Web Search Engines	5
Knowledge based systems and deductive database systems	5
Biomedical Image and Signal Analysis*	5
Network Biology*	5

Elective studies Communication Theory	
Spoken Language Processing	5
AI Engineering	5

Information Theory	5
Network Information Theory	6
Physical Layer Security I	5
Physical Layer Security II	5
Optimization and Game Theory in Communications	5
Machine Learning and its Application in the Communication Technology	6
Quantum Communication Networks	5

* As an elective it is only available in first year of studies

** A total of 120 credit points must be earned to successfully complete the programme. In addition to the 30-credit Master's thesis module, at least 60 credit points must be earned through graded modules that require an examination (not just a course achievement!).

UPC, Spain

Year	Area	Credits	Course Name	Credits
1st	General studies	12	ICT-Based entrepreneurship	3
			Project on ICT based business model	3
			Service Engineering	3
			Creativity and engineering	3
	Communications	5	Mobile communications	5
	Data science	14	Machine learning	5
			Big data and data mining	6
			Distributed and federated learning	3
	Mathematics and programming	15	Software Engineering	5
			Network Science	5
			Optimization techniques	5
	Project course	6	Project course	6
	Elective courses	8	At least 8 ECTS from the list below	5
2nd	Communications, Internet of Things and Data Science	15	Network support for 5G	3
			5G mobile network planning	3
			Next-generation optical network for future cloud-based services	3
			Network security: authentication and authorization	3
			IoT and ubiquitous IP	3
	Elective courses	15	At least 15 ECTS from the list below	
	MSc thesis	30	MSc thesis	30

Optional courses for 1st year:

- Software Defined Radio (3 ECTS)
- Network support for 5G (3 ECTS)
- 5G mobile network planning (3 ECTS)
- Next-generation optical network for future cloud-based services (3 ECTS)
- Network security: authentication and authorization (3 ECTS)
- IoT and ubiquitous IP (3 ECTS)
- Low-power systems with energy harvesting (3 ECTS)
- Applied image processing (3 ECTS)
- Augmented reality and smart objects (3 ECTS)
- Sensors and interfaces (3 ECTS)
- Body sensor nodes (3 ECTS)
- Seminars (2 ECTS)

Optional courses for 2nd year:

- Low-power systems with energy harvesting (3 ECTS)
- Applied image processing (3 ECTS)
- Augmented reality and smart objects (3 ECTS)
- Sensors and interfaces (3 ECTS)
- Body sensor nodes (3 ECTS)
- ICT-based entrepreneurship (3 ECTS)
- Project on ICT-based business models (3 ECTS)
- Software Engineering (5 ECTS)
- Optimization techniques (5 ECTS)
- Seminars (2 ECTS)