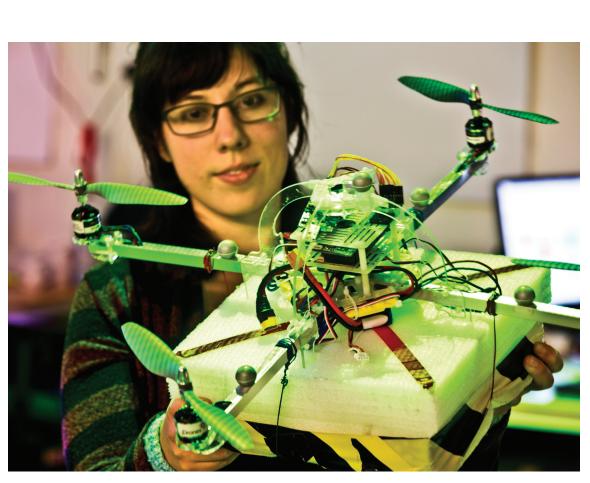# SYSTEM, CONTROL AND ROBOTICS

2016/2017

The purpose of the Master's programme in Systems, Control and Robotics is to equip students with the skills necessary to analyse, design and control complex technical systems. Such systems are key components in infrastructure and industry, and host a wide array of functions in our daily lives. Therefore, the successful integration of cutting-edge training in engineering with a balanced, holistic systems perspective will remain a crucial area of specialisation for the future.

The Master's programme is taught in English and involves team collaborations and projects emphasising the academic and cultural diversity of the field. The coursework is based around four areas of focus: Robotics and Autonomous Systems (AS), Networked Control Systems (NC), Systems and Control Theory (SC) and Electric Energy Systems (ES). Students will be able to incorporate and use KTH's strong ties with research and industry leaders for their thesis project in the second year, providing them with excellent career opportunities.

DEGREE PROJECT

The Master's thesis project is typically carried out during the second half of the second year, upon completion of the necessary programme credits. The project may involve work in a relevant industry or in a department at KTH, and may be combined with course work. For students who wish to pursue a career in research, the thesis project offers an excellent opportunity to develop contacts and the skills necessary to work within a research group; and for those wishing to go into industry, it serves as an important introduction and practical foundation for a career with a prospective employer.

Examples of degree project made by former students:

- A Decentralized Stabilization Scheme for Large-scale Interconnected Systems

- Quantized Cooperative Control

- Object Segmentation using Spatial and Spatio-Temporal Features

- Memory Consolidation through Reinstatement in a Connectionist Model of Hippocampus and Neocortex

- Event-Triggered Attitude Stabilization of a Quadcopter

CAREER PROSPECTS

A two-year Master's degree in Systems, Control and Robotics rests on a core set of courses in systems and control and related subjects, and provides the opportunity to utilise a unique cross-section of courses from different disciplines – integrating, for example, Computer Science and Control Theory – to create a comprehensive education. As systems and control engineers require extensive training in the design and analysis of complex technical systems, this Master's programme provides a strong foundation in both theory and practice. From advancements in health care and the vehicle industry, to providing a variety of important functions in all forms of manufacturing, a large variety of different system examples allow engineering students to combine several educational areas in new, innovative ways.

"We are working in this field to develop new robotic systems — which are complex systems — to be used in industry, health care and in ways that most people will benefit from in the future. For example, intelligent traffic systems that can be controlled to reduce pollution, in elderly care and with the advances in eye-tracking controlled computers."

Professor Patric Jensfelt

CONTACT

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MORE INFORMATION AND INTERVIEWS

www.kth.se/en/studies/master/kth/systems-control-robotics

SYSTEM, CONTROL AND ROBOTICS

Code	Name	Year	Credits	1	2	3	4
MANDATORY COURSES							
All tracks							
EL2220	The Sustainable Systems and Control Engineer	1	3.0	x	x	x	x
AK2036	Theory and Methodology of Science	1	7.5	x			
EL2820	Modelling of Dynamical Systems	1	7.5	x			
EL2520	Control Theory and Practice, adv.	1	7.5				x

TRACK: ROBOTICS AND AUTONOMOUS SYSTEMS

Code	Name	Year	Credits	1	2	3	4
MANDATORY COURSES							
DD2423	Image Analysis and Computer Vision	1	7.5		x		
EL2320	Applied Estimation	1	7.5		x		

CONDITIONALLY ELECTIVE COURSES

At least 3 of

Code	Name	Year	Credits	1	2	3	4
DD2380	Artificial Intelligence	1-2	6.0	x			
DD2429	Computational Photography	1-2	6.0	x			
DD2431	Machine Learning	1-2	6.0	x			
DD2425	Robotics and Autonomous Systems	1-2	9.0	x	x		
EL2421	Automatic Control, Project Course	1-2	15.0	x	x		
DD2434	Machine Learning, Adv. Course	1-2	7.5		x		
EL2425	Automatic Control, Project Course, Smaller Course	1-2	7.5		x		
EL2800	Stochastic Control and Optimization	1-2	7.5		x		
EQ2300	Digital Signal Processing	1-2	7.5		x		
DD2432	Artificial Neural Networks and Other Learning Systems	1-2	6.0			x	
MF2007	Dynamics and Motion Control	1-2	9.0			x	
DD2427	Image Based Recognition and Classification	1-2	6.0				x
DT2118	Speech and Speaker Recognition	1-2	7.5				x

Code	Name	Year	Credits	1	2	3	4
TRACK: ELECTRICAL ENERGY SYSTEMS							
MANDATORY COURSES							
EG2100	Power System Analysis	1	6.0	x	x		
EL2450	Hybrid and Embedded Control Sys.	1	7.5			x	
CONDITIONALLY ELECTIVE COURSES							
At least 3 of							
EH2741	Communication and Control in Electric Power Systems	1-2	6.0	x	x		
EJ2201	Electrical Machines and Drives	1-2	6.0	x	x		
EJ2301	Power Electronics	1-2	6.0	x	x		
EL2421	Automatic Control, Project Course	1-2	15.0	x	x		
EK2360	Hands-On Microelectromechanical Systems Engineering	1-2	7.5		x		
EL2425	Automatic Control, Project Course, Smaller Course	1-2	7.5		x		
EL2800	Stochastic Control and Optimization	1-2	7.5		x		
EG2110	Power System Stability and Control	1-2	7.5			x	
IS1200	Computer Hardware Engineering	1-2	7.5			x	
EH2745	Computer Applications in Power Sys.	1-2	4.5				x
EK2350	Microsystem Technology	1-2	7.5				x
TRACK: NETWORKED CONTROL SYSTEMS							
MANDATORY COURSES							
EL2450	Hybrid and Embedded Control Sys.	1	7.5			x	
EL2745	Principles of Wireless Sensor	2	7.5	x			
CONDITIONALLY ELECTIVE COURSES							
At least 3 of							
DD2431	Machine Learning	1-2	6.0	x			
EL2421	Automatic Control, Project Course	1-2	15.0	x	x		
EL2425	Automatic Control, Project Course, Smaller Course	1-2	7.5		x		
EP2500	Networked Systems Security	1-2	7.5		x		
MF2043	Robust Mechatronics	1-2	6.0		x		

Code	Name	Year	Credits	1	2	3	4
EP2200	Queuing Theory and Teletraffic Syst.	1-2	7.5			x	
MF2007	Dynamics and Motion Control	1-2	9.0			x	
DD2427	Image Based Recognition and Classification	1-2	6.0				x
MF2044	Embedded Systems for Mechatronics, II	1-2	6.0				x
SF2852	Optimal Control Theory	1-2	7.5				x

TRACK: SYSTEMS AND CONTROL THEORY

MANDATORY COURSES

Code	Name	Year	Credits	1	2	3	4
EL2700	Model Predictive Control	1	7.5	x			
EL2620	Nonlinear Control	1	7.5		x		

CONDITIONALLY ELECTIVE COURSES

At least 3 of

Code	Name	Year	Credits	1	2	3	4
EQ2800	Optimal Filtering	1	6.0	x			
SF1628	Complex Analysis	1-2	6.0	x			
EL2421	Automatic Control, Project Course	1-2	15.0	x	x		
EL2425	Automatic Control, Project Course, Smaller Course	1-2	7.5		x		
EL2800	Stochastic Control and Optimization	1-2	7.5		x		
EQ2300	Digital Signal Processing	1-2	7.5		x		
SF2832	Mathematical Systems Theory	1-2	7.5		x		
EQ2400	Adaptive Signal Processing	1-2	6.0			x	
SF2842	Geometric Control Theory	1-2	7.5			x	
SF2852	Optimal Control Theory	1-2	7.5				x
EQ2810	Estimation Theory, Accelerated Program Course	2	6.0	x			
EQ2820	Matrix Algebra, Acce. Program	2	7.5				x

RECOMMENDED COURSES

Complement up to 120 credits

Code	Name	Year	Credits	1	2	3	4
EL1010	Automatic Control, General Course	1	6.0		x		
EL2222	Systems and Control in Practice	1	1.5	x	x	x	x
EQ1220	Signal Theory	1	7.5	x			

Code	Name	Year	Credits	1	2	3	4
SF2568	Parallel Computations for Large- Scale Problems	1	7.5			x	x
DD2380	Artificial Intelligence	2	6.0	x			
DD2425	Robotics and Autonomous Systems	2	9.0	x	x		
DD2427	Image Based Recognition and Classification	2	6.0				x
DD2429	Computational Photography	2	6.0	x			
DD2432	Artificial Neural Networks and Other Learning Systems	2	6.0			x	
DT2118	Speech and Speaker Recognition	2	7.5				x
EG2110	Power System Stability and Control	2	7.5			x	
EH2741	Communication and Control in Electric Power Systems	2	6.0	x	x		
EJ2201	Electrical Machines and Drives	2	6.0	x	x		
EJ2301	Power Electronics	2	6.0	x	x		
EK2350	Microsystem Technology	2	7.5				x
EK2360	Hands-On Microelectromechanical Systems Engineering	2	7.5			x	
EL2421	Automatic Control, Project Course	2	15.0	x	x		
EL2620	Nonlinear Control	2	7.5			x	
EP2200	Queuing Theory and Teletraffic Systems	2	7.5			x	
EP2500	Networked Systems Security	2	7.5			x	
EQ2300	Digital Signal Processing	2	7.5			x	
EQ2400	Adaptive Signal Processing	2	6.0			x	
IS1200	Computer Hardware Engineering	2	7.5			x	
MF2007	Dynamics and Motion Control	2	9.0			x	
MF2043	Robust Mechatronics	2	6.0			x	
MF2044	Embedded Systems for Mechatronics, II	2	6.0				x
SF1628	Complex Analysis	2	6.0	x			
SF2832	Mathematical Systems Theory	2	7.5			x	
SF2842	Geometric Control Theory	2	7.5			x	
SF2852	Optimal Control Theory	2	7.5				x
DD1387	Program System Construction Using C++	1-2	6.0	x	x		
DD2352	Algorithms and Complexity	1-2	7.5			x	x
DD2385	Software Engineering	1-2	6.0				x
DD2401	Neuroscience	1-2	7.5				x
DD2418	Language Engineering	1-2	6.0		x		

Code	Name	Year	Credits	1	2	3	4
DD2435	Mathematical Modelling of Biological Systems	1-2	9.0	x	x		
DD2447	Statistical Methods in Applied Computer Science	1-2	6.0		x		
DD2459	Software Reliability	1-2	7.5			x	
DD2464	Bigger Advanced, Individual Course in Computer Science	1-2	9.0	x	x		
DD2476	Search Engines and Information Retrieval Systems	1-2	9.0			x	x
DT2140	Multimodal Interaction and Interfaces	1-2	7.5		x		
EG2210	Electricity Market Analysis	1-2	7.5			x	
EL2310	Scientific Programming	1-2	7.5	x			
EP2520	Building Networked Systems Secu.	1-2	7.5			x	
EQ2310	Digital Communications	1-2	9.0	x	x		
EQ2320	Speech Signal Processing	1-2	6.0			x	
II2302	Sensor Based Systems	1-2	7.5		x		
IL2206	Embedded Systems	1-2	7.5	x			
IL2212	Embedded Software	1-2	7.5			x	
SF1811	Optimization	1-2	6.0		x		
SF2812	Applied Linear Optimization	1-2	7.5			x	
SF2940	Probability Theory	1-2	7.5	x			
SF2943	Time Series Analysis	1-2	7.5				x

RECOMMENDED NON-TECHNICAL COURSES

Code	Name	Year	Credits	1	2	3	4
EH2720	Management of Projects	1	7.5	x			
LS2439	English for Writing and Presenting	1	7.5		x		
LS1419	English for Employment	1	7.5		x		
LS2429	Technical Communication in Eng.	1	7.5	x			
ME1003	Industrial Management, Basic	1	6.0	x			
DH2620	Human-Computer Interaction	1	6.0	x	x		
LS1464	Rhetoric - the Art of Persuasion	1	7.5	x	x		
EH2030	Business Development and Quality Management	1	7.5		x		
ME2089	Leadership in Cross-Cultural and Industrial Contexts	1-2	6.0		x		

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