Exemplary study plan for the M.Sc. in Electrical Engineering and Information Technology

Control Systems Technology and System Dynamics

Control systems technology deals with the targeted modification of dynamic processes with the goal to achieve a desired behavior. In addition to numerous control tasks in engineering control problems nowadays arise in many scientific and also non-technical areas. Examples include economic processes, control and monitoring of traffic flow, social networks, biological and bio-chemical systems, plasma or quantum physics and their application in tokamak reactors or quantum computers.

Control systems technology makes use of the mathematical modeling and exploits this system description in terms of algebraic equations and in particular ordinary and partial differential equations for the development of suitable strategies for the solution of the arising control problems. System theoretic concepts provide the basis for model derivation and analysis so that systems arising in different scientific and engineering domains can be addressed in a consistent methodical framework.

In the study program Control Systems Technology and System Dynamics within the M.Sc. in Electrical Engineering and Information Technology students gather profound knowledge in systems and control theory, its application in science and engineering and the implementation of control systems in real-time environments. Education of students is devoted to developing a comprehensive problem-solving competence with the desire to enable holistic systematic thinking to grasp complex connections and interdependencies. Students will gain methodological competence and expertise in mathematical modeling, optimization, stabilization, feedforward and feedback control, system analysis, signal processing, as well as real-time systems. Students will furthermore acquire profound knowledge in sensor and actuator systems (smart structures), energy and electrical drives or bio-medical applications. Students will be enabled to master the scientific fundamentals and methods and will hence have an excellent starting base for a professional career or for further pursuing academic research within a doctoral study program.

Exemplary study plan

The following list of module combinations is a recommendation for structuring the individual study plan. This comprises

- fundamental *core subjects* covering 12 credit points and
- *in-depth electives* from which at least 16 credit points should be chosen.
- Complementing these modules core subjects and electives from two of the three *applied subject fields Smart Structures*, *Energy and Power Electronics* or *Bio-medical Applications* should be chosen modules totalling at least 20 credit points.

Sommer term*							
Module code	**Module title**	**Hours/Semester**				**CP**	**Lecturer**
		L	**E**	**P**	**S**		
Specialized core subjects							
etit-501	Nonlinear Control Systems	3	1			6	Prof. Meurer
Specialized in-depth electives							
etit-601	Control of PDE Systems	2	1			4	Prof. Meurer
etit-617	Adaptive Filters	2	1			4	Prof. Schmidt
etit-614	Applied Nonlinear Dynamics	2	1			4	Dr. Schaum
MS1602	Optimale Steuerung	4	2			9	Prof. Slawig
Inf-IngNum	Numerische Verfahren für Differenzialgleichungen	4	2			9	Prof. Börm
Applied subject fields							
Smart structures							
MAWI-506	Finite Element Modelling in the Mechanics of Materials	2	1			6	Dr. Steglich
Energy and electrical drives							
etit-609	Renewable Energy Systems	2	1			4	Prof. Liserre
Bio-medical applications							
etit-604	Fields and Waves in Biological Systems	2	1			4	Prof. Klinkenbusch
etit-623	Time Series Analysis	2	1			4	Dr. Galka
Practical subjects and Seminars							
etit-810[1]	Selected Topics in Control Systems Technology				3	4	Prof. Meurer

* Modules have to be chosen according to the examination regulations.

1 Will be offered both during summer and winter term but is listed only once.

Winter term*							
Module code	**Module title**	**Hours/Semester**				**CP**	**Lecturer**
		L	**E**	**P**	**S**		
Specialized core subjects							
etit-522	Optimization and Optimal Control	3	1			6	Prof. Meurer
Specialized in-depth electives							
etit-619	Mathematical Modeling	2	1			4	Prof. Meurer
Inf-EmSysDes	Embedded System Design	2	1			4	Prof. von Hanxleden
Applied subject fields							
Smart structures							
etit-521	Microsystems Technologies	4	2			6	Prof. Benecke
etit-520	Neuromorphic Engineering	2,5	1,5			6	Prof. Kohlstedt
Mawi-909	Smart Materials	2	1			4	Prof. Quandt
Energy and electrical drives							
etit-505	Modeling and Control of Power Electronics Converters	2	1			4	Prof. Liserre
etit-607	Electric Drives	2	1			4	Prof. Liserre
etit-619	Grid Converters for Renewable Energy Systems	1	-			4	Prof. Liserre
Bio-medical applications							
etit-626	Tomographical Methods in Medicine	2	1			4	Prof. Klinkenbusch
etit-629	Funkbasierte Kommunikation und Sensorik in der Medizintechnik	2	1			4	Prof. Manteuffel
Practical subjects and Seminars							
etit-701	M.Sc. Lab Control Systems			3		4	Prof. Meurer
-	Additional seminar from the course catalog of the Faculty of Engineering			3		4	-

* Modules have to be chosen according to the examination rules.