School of Electrical Engineering

Graduate School Programs[1]

Course layers

4000 Layer – Specialized undergraduate courses, for 3 credit points each. MSc students may not take the Computer Structure course or labs from the 4000 layer.
5000 Layer – Foundations in Mathematics and Science
6000 Layer – Core Engineering courses
7000 Layer – Specialization courses

Course requirements

Research Track

Students must take at least 2 courses from the **5000 layer** (including at least one in Mathematics); and at least 2 courses from the **6000 layer**. Students may take up to 3 courses from the **4000 layer** and a 4th with permission from the supervisor and the School's MSc Committee.

Final Project Track

Students must take at least 2 courses from the **5000 layer** (including at least one in Mathematics); and at least 4 courses from the **6000 layer**. Students may take up to 4 courses from the 4000 layer.

In both tracks - all other courses may be chosen from the 5000, 6000 & 7000 layers.

[1] Students may register for a maximum of 3 courses outside the curriculum. Courses outside the Faculty must be approved by a permanent supervisor or a representative of the study unit in the Unit Committee. Courses should be relevant to the student's study or research program. Courses outside the curriculum will be graded and weighted according to their original Departments and can be worth up to 3 credit points.

Courses in Electrical Engineering

Legend:

1 – Communication
2 – Signal Processing
3 – Control
4 – Computers
5 – Energy
6 – Electro-Optics
7 - Devices
8 - Electromagnetism
90 - Plasma
95 - Picture Processing and Computer Vision

No.	Course name	Hrs. / Pts.	Prerequisites	1	2	3	4	5	6	7	8	90	95	Sem.
0510.5001	Differential and Integral Equations	3	--		+	+		+	+	+	+	+	+	1,2
0510.5002	Functional Analysis	3	--	+	+	+		+			+	+	+	2
0510.5003	Discrete Mathematics	3	--	+	+		+						+	1
0510.5004	Quantum Electronics	3	Physics (3); Electronic Devices **or** equivalent course							+	+	+		1
0510.5005	Random Processes	3	Random Signals and Noise	+	+	+	+				+		+	1
0510.6101	Information Theory (1)	3	Random Signals and Noise; Digital Communications (recommended, not mandatory)	+	+	+	+							1
0510.6102	Principles of Coding and Detection in Communication	3	Digital Communications; Information Theory (recommended, not mandatory)	+	+									2
0510.6201	Digital Processing of Single and Multi-Dimensional Signals[1]	3	Introduction to Digital Signal Processing; Image Processing (recommended)	+	+	+	+				+		+	2
0510.6202	Estimation Theory[1]	3	Random Signals and Noise	+	+	+	+				+			2
0510.6205	Statistical Machine Learning	3	Random Signals and Noise		+		+							1
0510.6251	Computer Vision[2]	3	Image Processing										+	1
0510.6301	Optimal Control	3	Introduction to Modern Linear Theory		+	+		+						2
0510.6401	Design and Analysis of Algorithms	3	Data Structures and Algorithms	+	+		+							1
0510.6402	Principles of Communication Networks	3	Introduction to Computer Communications	+			+							2

0510.6501	Power Processing	3	Energy Conversion			+		+				+		1
0510.6602	Electro-Optics and Nonlinear Optics	3	Classical Optics						+					2
0510.6610	Photonic Devices: Principles and Applications	3	Classical Optics						+	+	+			2
0510.6701	Advanced Semiconductor Physics	3	Electronic Devices						+	+		+		2
0510.6801	Classical Electrodynamics	3	Wave Transmission and Distributed Systems					+	+		+	+		2
0510.6802	Radiation and Propagation of Electrodynamic Waves	3	--								+			1
0510.7001	Technology Transfer – On the Interplay Between Academia and Industry	2	--											*
0510.7002	Optimization[1]	3	Partial Differential Equations	+	+	+	+	+	+	+	+	+	+	2
0510.7003	Scientific Writing in English	2+2 No credit pts.	Personal instruction, recommended for the Research Track (Thesis)	+	+	+	+	+	+	+	+	+	+	1,2
0510.7004	Asymptotic Methods in Engineering	2	--	+		+			+		+			*
0510.7101	Advanced Topics in Information Theory	2	Information Theory (1)	+	+		+							2
0510.7103	Selected Topics in Digital Communication OFDM-MIMO	2	Random Processes; Estimation Theory	+										1
0510.7104	Data and Signal Compression	2	Information Theory (1); Digital Signal Transmission	+	+		+						+	*
0510.7105	Wireless Communication Systems	2	Digital Communications	+							+			1
0510.7107	Information Theoretic Approach to Communication Over Linear Gaussian Channels	2	Digital Signal Transmission; Information Theory (recommended)	+	+									1
0510.7108	Iterative Coding Methods	2	Information Theory (1)	+										*

0510.7112	Codes and Sequences	2	Introduction to Error Correction Codes	+	+									*
0510.7114	RFIC Amplifier Design	2	Wave Transmission and Distributed Systems; Analog Electronic Circuits	+						+	+			*
0510.7115	RFIC Communication Circuit Design	2	RFIC Amplifier Design	+						+	+			1
0510.7117	Introduction to 5th Generation Cellular Communication		Digital Communications; Introduction to Computer Communications	+										2
0510.7125	Information Theory (2)	2	Information Theory (1)	+	+	+	+							2
0510.7130	Interactive Compression and Communication	2	Information Theory (1)	+	+	+	+							*
0510.7140	Probability in High Dimension and Applications[1]	2	Random Signals and Noise; Recommended: Information Theory (1); Random Processes	+	+	+	+						+	1
0510.7201	Spatial Signal Processing	2	Random Processes; Detection Theory (simultaneously); Functional Analysis **or** knowledge in Advanced Algebra	+	+						+			*
0510.7202	Artificial Neural Networks	2	Random Signals and Noise		+	+	+							*
0510.7204	Radar Principles - Extended	3	Random Signals and Noise	+	+						+			1
0510.7206	Digital Processing of Speech Signals	2	Introduction to Digital Signal Processing		+									*
0510.7207	Signal Processing in Sensory Systems	2	Introduction to Statistical Signal Processing (simultaneously)		+								+	*
0510.7211	Advanced Image Processing	3	Image Processing		+								+	*
0510.7212	Advanced Topics in Computer Vision	2	Image Processing		+								+	*
0510.7213	Advanced Laboratory in Digital Image Processing	2	--		+								+	*

0510.7214	Fundamentals of Underwater Acoustics	2	Differential and Integral Equations **or** Mathematical Methods in Engineering		+	+							*
0510.7218	Vision - Mechanisms, Models and Algorithms	2	Image Processing	+	+				+			+	2
0510.7225	Adaptive Filters	2	Introduction to Statistical Signal Processing or Random Processes and Estimation Theory		+								*
0510.7230	Applications of Coding in Big Data and Networks	2	Introduction to Error Correction Codes; Discrete Mathematics (recommended)	+	+								2
0510.7250	Sparse Representations of Coding in Big Data and Networks	2	--		+							+	*
0510.7255	Deep Learning	2	Computer Vision or Statistical Machine Learning		+							+	1
0510.7301	Robust Control	2	Optimal Control			+							*
0510.7306	Switched Control Systems	2	Introduction to Control Theory	+		+	+						*
0510.7307	Control Techniques in Electronics and Power Systems	3	--			+		+					*
0510.7310	Stochastic Control	2	--			+							*
0510.7312	Advanced Topics in Linear Algebra with Applications to Dynamical Systems		Linear Algebra for Electrical Engineering; Ordinary Differential Equations for Electrical Engineering										1
0510.7315	Time-Delay Systems	2	Introduction to Modern Linear Control	+	+	+			+				1
0510.7320	Stability of Linear Systems and Related Topics in Signal Processing	2	--			+							2
0510.7325	New Directions in Systems and Control Theory Inspired by Systems Biology	2	Introduction to Control Theory			+							*

0510.7330	Control Under Communication Constraints	2	Introduction to Probability and Statistics; Linear Algebra # See course syllabus	+	+	+							*
0510.7401	Cryptography and Computer Security	2	Discrete Mathematics				+						*
0510.7403	Advanced Topics in Computer Communications	2	Introduction to Computer Communications	+			+						*
0510.7404	Computational Learning Theory	2	Data Structures and Algorithms; Introduction to Probability and Statistics	+	+		+						2
0510.7405	Advanced Computer Architecture	2	Computer Architecture and Organization	+	+		+						*
0510.7406	Topics in Multiprocessing	2	Design and Analysis of Algorithms; Introduction to Computer Communications	+			+						2
0510.7409	Topics in Information Security	2	Principles of Communication Networks; Cryptography and Computer Security				+						*
0510.7410	Topics in Algorithms	2	Design and Analysis of Algorithms				+						*
0510.7413	Network-On-Chip Architectures	2	Computer Structure	+	+		+						*
0510.7415	Processing and Analysis of Geometric Shapes	2	Knowledge in Calculus		+		+					+	*
0510.7420	Multi-Core Processors and Embedded Processor Systems	2	Advanced Computer Architecture or similar course				+						1
0510.7421	Analysis of Large Graphs	2	Design and Analysis of Algorithms or Efficiency of Computations				+						*
0510.7425	Introduction to Network Algorithms	3	Design and Analysis of Algorithms				+						*
0510.7427	Advanced Topics in Routing	2	Introduction to Computer Communications	+			+						1
0510.7430	Network-On-Chip	2	Introduction to Computer Communications				+						*

0510.7440	Topics in Online Learning	2	Introduction to Probability and Statistics; Linear Algebra #See course syllabus	+			+						+	2
0510.7503	Lighting Protection Systems	3	Techno-Economical Problems in Power Systems; Power Systems Operation at Abnormal Conditions					+						*
0510.7507	Low Voltage Installations	2	Techno-Economical Problems in Power Systems					+						*
0510.7508	High-Voltage Installations	2	Techno-Economical Problems in Power Systems; Low Voltage Devices					+						2
0510.7510	Renewable Energy 1: Photovoltaic and Wind Energy Systems	2	High Frequency Switched Mode Converters					+						1
0510.7602	Electro-Optical Systems for Signal Processing	2	Optical Data Processing (simultaneously) **or** lecturer's consent		+				+				+	*
0510.7603	Semiconductor Lasers	2	Quantum Electronics; Introduction to Lasers; Classical Optics (recommended)						+					*
0510.7604	Diffractive Optical Elements	2	Classical Optics **or** lecturer's consent						+					1
0510.7608	Laser Resonators and Coherent Beam Optics	2	Classical Optics or equivalent						+					*
0510.7609	Fiber Optic Sensors	3	Classical Optics; Introduction to Optical Communications						+					*
0510.7610	Optical Solitons	2	Partial Differential Equations; Electromagnetic Fields						+					2
0510.7614	Optical Measurement Techniques	2	Classical Optics; Statistical and Coherent Optics						+	+	+	+		1

0510.7615	Advanced Optical System Design	2	Classical Optics; Imaging Systems and Optical Signal Processing						+					*
0510.7616	Introduction to Optical Design Using Zemax	2	Classical Optics (see syllabus)						+		+			2
0510.7617	Integrated Quantum Photonics: Fundamentals and Applications	2	Quantum and Solid-State Physics; Wave Transmission and Distributed Systems **or** lecturer's consent						+	+	+			*
0510.7619	Photons in Structured Media: Fundamentals and Applications	2	Classical Electrodynamics **or** similar + Quantum Electronics **or** Quantum 2 (0321.3101)						+		+			*
0510.7620	Noise and Propagation Phenomena in Fiber-Optic Communication Systems	2	Introduction to Optical Communications	+					+					*
0510.7622	Ultrafast Optics	2	Classical Optics						+					*
0510.7623	Coherent Atom-Field Phenomena	2	Electromagnetic Fields; Quantum Electronics **or** Equivalent						+		+			*
0510.7625	Statistical and Coherent Optics	2	Classical Optics; Random Signals and Noise						+		+			2
0510.7630	Selected Topics in Laser Theory and Applications	2	Introduction to Lasers; Quantum Electronics						+		+			*
0510.7635	Infra-Red - Physical Processes and Applications	2	Classical Optics						+					*
0510.7701	Photovoltaic Solar Energy Conversion	2	Advanced Semiconductor Physics					+	+	+				*
0510.7702	Nonlinear Materials in Optics and Electronics	2	Introduction to Semiconductor Physics						+	+				*
0510.7703	Nanometric Devices - Properties and Applications	2	---						+	+				*
0510.7704	Nanomotion: Principles, Materials and Devices	2	Physics 1,2,3; Introduction to Semiconductor Physics						+	+				*
0510.7705	Nanoscale Characterization of	2	---						+	+				*

	Electronic Materials and Devices												
0510.7706	Advanced Design of Analog Circuits	2	Analog Electronic Circuits; Random Signals and Noise	+		+		+	+	+	+			*
0510.7709	Characterization of Electronic Materials	2	Introduction to Semiconductor Physics							+		+		*
0510.7715	Concepts and Applications of Dispersion Control and Engineering	2	Classical Optics; Quantum Electronics; Nano-Photonics (recommended)						+	+				*
0510.7718	Mixed Signal Circuit Design	2	Analog Electronic Circuits; Introduction to VLSI Design								+			*
0510.7721	Introduction to Design of Digital Cameras Based on CMOS Imager	2	---		+				+	+				*
0510.7725	Computational Models in Solid State and Finite Systems	2	Advanced Semiconductor Physics							+				*
0510.7804	Integral Numerical Methods in Electromagnetics	3	Electromagnetic Fields								+			*
0510.7805	Differential Numerical Methods in Electromagnetics	2	Electromagnetic Fields								+	+		*
0510.7806	Phased Array Antennas	2	Antennas and Radiation								+			*
0510.7807	Selected Topics in Antenna Theory	3	Antennas and Radiation								+			1
0510.7808	Electromagnetic Radiation Devices Based on Electron Beams	3	Wave Transmission and Distributed Systems								+	+		*
0510.7811	Microwave Interactions with Materials	2	Electromagnetic Fields; Wave Transmission and Distributed Systems								+			*
0510.7815	Introduction to Nano-Electromagnetism	2	Quantum Electronics								+			1
0510.7816	Optics of Nanostructured Materials	2	Quantum Electronics **or** Classical Electrodynamics							+	+			*
0510.7820	Artificial Materials – Analytical Modeling in Complex Media	2	Electromagnetic Fields; Wave Transmission and Distributed Systems						+		+			2

0510.7905	Electrophysical and Electromechanical Materials Processing	2	Electrical Discharges and Plasma Processing of Materials **or** Experimental Techniques in Electrical Discharge and Plasma Research								+		*
0510.9995	Project	3											
0510.9996	Final Examination												
0510.9999	Thesis	12											

* Not offered in 2018/19

[1] The course is taught in English

[2] Not open to students who have taken course 0510.7209

Recommended Courses from other Units

Legend:

1 – Communication 2 – Signal Processing 3 – Control 4 – Computers 5 – Energy
6 – Electro-Optics 7 – Devices 8 – Electromagnetism 90 – Plasma
95 – Image Processing and Computer Vision

No.	Course name	Cr. pts.	W hrs.		1	2	3	4	5	6	7	8	90	95	Sem
0553.5510	Advanced Optical Microscopy and Its Applications in Biomedicine	3	3	See Biomedical Engineering						+					2
0553.7000	Practical Ethics for STEM Students	3	3	See Biomedical Engineering											2
0555.4570	Introduction to Magnetic Resonance Imaging (MRI)	3	4	Equivalent level course See Biomedical Engineering										+	2
0572.5120	Data Privacy			See Industrial Engineering											*
0581.4231	Transmission Electron Microscopy in Material Science			Equivalent level course See Materials Science and Engineering							+				1
0581.5332 (0582.5110)	Scanning Electron Microscopy (SEM)	2	2	See Materials Science and Engineering							+				*
0581.5232	Laboratory in Scanning Electron Microscopy (SEM)[1]	1	2	See Materials Science and Engineering											*
0581.5233	TEM for Characterization of Materials	2	2	See Materials Science and Engineering							+				2
0581.5234	Laboratory in TEM for Characterization of Materials[1]	1	1	See Materials Science and Engineering											2
0581.5235	Analyzing Materials with Innovative Spectroscopic Techniques XPS/AES	2	2a	See Materials Science and Engineering							+				*
0581.5236	Laboratory in Analyzing Materials with	1	1b	See Materials Science and Engineering											*

	Innovative Spectroscopic Techniques XPS/AES[1]														
0581.5255	Nanomotion: Principles, Materials and Devices	2	2	See Materials Science and Engineering						+	+				*

[1] To participate in the lab course a student must first pass the theoretical course. The number of participants is limited, and admission will be approved by the lecturer based on considerations such as the student's study program, whether he/she is a fulltime student, whether the equipment is essential for his/her thesis research (permanent supervisor's confirmation required), available vacancies etc.

(a) 2 semester hours – 3 hours – 2/3 semester

(b) 1 semester hour – 3 hours – 1/3 semester

* Not offered in 2018-2019

Elective Courses at the Faculty of Exact Sciences*

In addition to courses offered at the Faculty, MSc students may take courses at TAU's Faculty of Exact Sciences.

Course contents are available on the website of the Faculty of Exact Sciences.

Please check in the TAU curriculum whether the course is offered in the 2018-2019 academic year:
https://www20.tau.ac.il/yedion/yedion.html (In Hebrew only)

No.	Course name	Cr. pts.	W hrs.	Comments	1	2	3	4	5	6	7	8	90	95
0321.4450	Signal Processing and Information Analysis from Experimental Physics	3	3			+								
0365.4133	Advanced Statistical Theory	2	3		+	+	+	+						
0365.4142	Information, Probability and Games	2	3		+	+	+	+						
0365.4212	Advanced Probability	2	3		+	+	+	+						
0365.4230	Ergodic Theory	2	3		+	+	+	+						
0365.4409	Convex Analysis and Optimization (1)	2	3		+	+	+							
0365.4432	Dynamic Programming	2	3		+	+	+							
0365.4436	Queuing Theory	2	3		+	+	+	+						
0365.4542	Integer Programming	2	3		+	+	+							
0366.4660	Advanced Mathematical Techniques for Processing and Analyzing Images		3											+
0368.3014	Computer Graphics		3	Equivalent level										+
0368.3049	Introduction to Modern Cryptography		3	Equivalent level			+							
0368.3063	Computational Learning: Probabilistic Graphic Models		3	Equivalent level										+
0368.4211	Computational Geometry		3											+
0368.4429	Distributed Computation	2	3					+						

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* 0321 – Physics
  0365 – Statistics
  0366 – Mathematics
  0368 – Computer Science

School of Electrical Engineering

Recommended MSc programs

Course layers

4000 Layer – Specialized undergraduate courses, for 3 credit points each. MSc students may not take the Computer Structure course or labs from the 4000 layer.
5000 Layer – Foundations in Mathematics and Science
6000 Layer – Core Engineering courses
7000 Layer – Specialization courses

Course requirements[1]

Research Track: At least 2 courses from the **5000 layer** (including at least one in Mathematics); and at least 2 courses from the **6000 layer** are required. A student may take up to 3 courses from the **4000 layer**, and a 4th if approved by the supervisor and the School's MSc Committee.

Final Project Track: At least 2 courses from the **5000 layer** (including at least one in Mathematics); and at least 4 courses from the **6000 layer** are required. Students may take up to 4 courses from the **4000 layer**.

In both tracks - all other courses may be chosen from **layers 5000, 6000 & 7000**.

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[1] Course requirements in both the research track and the final project track are specified in the Study Regulations of the School of Electrical Engineering.

Communications – Research Track (1)

The Communications program encompasses the full range of electronic methods used for transmitting information, as well as principles for analyzing their performance. The program focuses on building mathematical models for the signals and mediums used for transmitting information, such as entropy of data and signals, maximum rate of transmission over a channel, and the probability of detection errors for digital signals and error correction codes. The tools for analysis are mainly statistical and combinatorial, but also based on classical principles of signal processing.

The applications of the field of Communications a numerous, starting with the transmission of data through copper wires; compressing files, sound and images; modulation, coding and detection in multiuser and wireless systems; all the way to information networks. The student's mathematical foundation consists of Random Processes, Functional Analysis and Discrete Mathematics.

Within the framework of core courses, Information Theory provides a broad understanding, while the Principles of Modulation, Coding and Detection provide applicable tools. Specialization courses enable further expansion, or alternately acquaintance with systems from adjacent fields: Computers, Radiation and Optics.

4000 courses

It is advisable to enrich the study program with courses from Layer 4000 addressing various aspects of Communication in adjacent tracks: signal processing, computers, electromagnetism, radiation and optics. For example: Introduction to Statistical Signal Processing, Introduction to Computer Communication, Optical Communication, Antennas and Radiation, and Propagation and Scattering of Waves.

0512.4161 Digital Communications
0512.4162 Digital Transmission of Signals
0512.4163 Introduction to Error Correction Codes
0512.4164 Communication Circuits
0512.4261 Introduction to Statistical Signal Processing

5000 courses[1]

0510.5002 Functional Analysis
0510.5003 Discrete Mathematics
0510.5005 Random Processes

6000 courses[2]

0510.6101 Information Theory
0510.6102 Principles of Coding and Detection in Communication
0510.6201 Digital Processing of Single and Multi-Dimensional Signals
0510.6202 Estimation Theory
0510.6402 Principles of Communication Networks

7000 courses[3]

It is advisable to enrich the study program with courses from Layer 7000 addressing various aspects of communication in adjacent tracks: signal processing, computers, electromagnetism, radiation and optics.

0510.7101 Advanced Topics in Information Theory
0510.7103 Selected Chapters in Digital Communication OFDM-MIMO
0510.7104 Data and Signal Compression
0510.7105 Wireless Communication Systems
0510.7107 Informational Approach to Linear Gaussian Channels
0510.7108 Iterative Methods in Coding
0510.7112 Codes and Strings
0510.7114 RFIC Amplifier Design
0510.7115 RFIC Communication Circuit Design
0510.7117 Introduction to 5th Generation Cellular Communication
0510.7130 Interactive compression and Communication
0510.7140 High-Dimensional Probability and Applications
0510.7255 Deep Learning
0510.7315 Time-Delay Systems
0510.7330 Control Under Communication Constraints
0510.7413 Network-On-Chip Architectures
0510.7427 Advanced Topics in Routing
0510.7440 Topics in Online Learning

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[1] Students must take at least two courses

[2] Core – Students must take Information Theory and/or Principles of Coding and Detection in Communication plus one more course

[3] Specialization

Signal Processing – Research Track (2)

4000 courses

0512.4161 Digital Communications
0512.4162 Digital Transmission of Signals
0512.4261 Introduction to Statistical Signal Processing
0512.4262 Image Processing

5000 courses[1]

0510.5001 Differential and Integral Equations
0510.5002 Functional Analysis
0510.5003 Discrete Mathematics
0510.5005 Random Processes

6000 courses[2]

0510.6101 Information Theory
0510.6201 Digital Processing of Single and Multi-Dimensional Signals
0510.6202 Estimation Theory
0510.6205 Statistical Machine Learning
0510.6301 Optimal Control

7000 courses[3]

0510.7002 Optimization
0510.7104 Data and Signal Compression
0510.7140 High-Dimensional Probability and Applications
0510.7201 Spatial Signal Processing
0510.7202 Artificial Neural Networks
0510.7204 Radar Principles – Extended
0510.7206 Digital Processing of Speech Signals
0510.7207 Signal Processing in Sensory Systems
0510.7230 Applications of Coding in Big Data and Networks
0510.7250 Sparse Representations and Their Applications in Signal and Image Processing
0510.7255 Deep Learning
0510.7315 Time-Delay Systems
0510.7320 Stability of Linear Systems and Related Topics in Signal Processing
0510.7330 Control Under Communication Constraints
0510.7413 Network-On-Chip Architectures

Courses from the School of Mathematics – The Department of Statistics and Operations Research[4]

0365.4001 Resilient and Stable Methods
0365.4010 Advanced Non-Parametric Statistics
0365.4133 Advanced Statistical Theory

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[1] Students must choose at least two courses – Random Processes plus one other course.

[2] Core – Students must take Estimation Theory and at least one other course.

[3] Specialization- Student must choose 4-6 courses from the list.

[4] Approval of supervisor and lecturer / School of Mathematics is required.
Students may choose 1-2 courses instead of 7000 courses

Control (3)

4000 courses
0512.4300 Introduction to Digital Control
0512.4360 Introduction to Modern Linear Control Theory
0512.4362 Practical Feedback Systems

5000 courses[1]
0510.5001 Differential and Integral Equations
0510.5002 Functional Analysis
0510.5005 Random Processes

6000 courses[2]
0510.6202 Estimation Theory
0510.6301 Optimal Control

7000 courses[3]
0510.7202 Artificial Neural Networks
0510.7301 Robust Control
0510.7303 Advanced Topics in Control
0510.7306 Switched Control Systems
0510.7307 Control Techniques in Electronics and Power Systems
0510.7310 Stochastic Control
0510.7312 Advanced Topics in Linear Algebra with Applications to dynamical Systems
0510.7315 Time-Delay Systems
0510.7320 Stability of Linear Systems and Related Topics in Signal Processing
0510.7325 New Directions in Systems and Control Theory Inspired by Systems Biology
0510.7330 Control Under Communication Constraints

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[1] Students must choose at least 2 courses.
[2] Core
[3] Specialization

Computers (4)

4000 courses
0512.4402 Introduction to Programming Systems
0512.4409 Network Algorithms
0512.4461 Computer Architecture and Structure
0512.4462 Introduction to Computer Communications

5000 courses[1]
0510.5003 Discrete Mathematics
0510.5005 Random Processes

6000 courses[2]
0510.6205 Statistical Machine Learning
0510.6251 Computer Vision
0510.6401 Design and Analysis of Algorithms
0510.6402 Principles of Communication Networks

7000 courses[3]
0510.7002 Optimization
0510.7101 Advanced Topics in Information Theory
0510.7104 Data and Signal Compression
0510.7140 High-Dimensional Probability and Applications
0510.7202 Artificial Neural Networks
0510.7250 Sparse Representations and Their Applications in Signal and Image Processing
0510.7255 Seminar in Deep Learning
0510.7401 Cryptography and Computer security
0510.7403 Advanced Topics in Computer Communications
0510.7404 Computational Learning Theory
0510.7405 Advanced Computer Architecture
0510.7406 Topics in Multiprocessing
0510.7409 Topics in Information Security
0510.7410 Topics in Algorithms
0510.7413 Network-On-Chip Architectures
0510.7421 Analysis of Big Graphs
0510.7425 Introduction to Network Algorithms
0510.7427 Advanced Topics in Routing
0510.7430 Communication Networks on Chip

Courses from the School of Mathematics – The Department of Statistics and Operations Research[4]

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[1] Student must choose at least 2 courses.
[2] Core
[3] Specialization – 2 credit points per course
Student must choose 4-6 courses from then list.
[4] Approval of supervisor and lecturer / School of Mathematics is required
Students may choose 1-2 courses instead of 7000 courses

Energy (5)

4000 courses

0512.4502 Electronic Drives in Motors
0512.4503 High-Frequency Switched Mode Converters
0512.4504 Power Systems Operation at Abnormal Conditions
0512.4505 Techno-Economical Problems in Power systems

5000 courses[1]

0510.5001 Differential and Integral Equations
0510.5002 Functional Analysis

6000 courses[2]

0510.6301 Optimal Control
0510.6501 Power Processing

7000 courses[3]

0510.7507 Low Voltage Installations
0510.7508 High Voltage Installations
0510.7510 Renewable Energy 1: Photovoltaic and Wind Energy Systems
0510.7701 Photovoltaic Solar Energy Conversion

Advanced courses from the Gordon Institute – 2 credit points

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[1] Students must choose at least 2 courses
[2] Core
[3] Specialization

Electro-Optics (6)

4000 courses

0512.4601 Introduction to Lasers
0512.4602 Introduction to Optical Communications
0512.4660 Introduction to Classical Optics
0512.4690 Advanced Laboratory in Electro-Optics[1]

5000 courses[2]

0510.5001 Differential and Integral Equations
0510.5004 Quantum Electronics

6000 courses[3]

0510.6602 Electro-Optics and Nonlinear Optics
0510.6610 Photonic Devices: Principles and Applications

7000 courses[4]

0510.7218 Vision -Mechanisms, Models and Algorithms
0510.7315 Time-Delay Systems
0510.7602 Electro-Optical Systems for Signal Processing
0510.7603 Semiconductor Lasers
0510.7604 Diffractive Optical Elements
0510.7608 Laser Resonators and Coherent Beam Optics
0510.7609 Fiber Optic Sensors
0510.7610 Optical Solitons
0510.7614 Optical Measurement Techniques
0510.7616 Introduction to Optical Design Using Zemax
0510.7619 Photons in Structured Media: Fundamentals and Applications
0510.7622 Ultrafast Optics
0510.7623 Coherent Atom-Field Phenomena
0510.7625 Statistical and Coherent Optics
0510.7630 Selected Topics in Laser Theory and Applications
0510.7635 Infra-Red - Physical Processes and Applications
0510.7702 Nonlinear Materials in Optics and Electronics
0510.7715 Concepts and Applications of Dispersion Control and Engineering
0510.7815 Introduction to Nano-Electromagnetism
0510.7816 Optics of Nanostructured Materials

Course for Further Enrichment[5]

One of the following courses:

4000 courses

0512.4161 Digital Communications
0512.4261 Introduction to Statistical Signal Processing

6000 courses[6]

0510.6701 Advanced Semiconductor Physics
0510.6801 Classical Electrodynamics

[1] To enroll in the Lab course students must obtain a recommendation from their supervisor and approval of the Chairperson of the School's MSc/PhD Committee.
[2] Students must choose at least 2 courses.
[3] Core – 6 credit points
[4] Specialization – 7 credit points
Students must choose 3 or 4 courses from the list.
[5] 3 credit points
[6] Core

Devices and Materials (7)

The field of Devices and Materials at the School of Engineering includes a range of courses and areas of research involving electronic devices, materials & processes and nanotechnology.
Students may choose an in-depth specialization in one or more areas, or a broad specialization in several areas, including enrichment in electro-optics or other courses offered at the School.
To assist our students, we present the courses in the three categories, as well as other relevant courses from other areas taught at the School.

4000 courses

0512.4660 Classical Optics
0512.4601 Introduction to Lasers
0512.4700 Micro- and Nano-Electronics
0512.4702 Introduction to Micro-Electro-Mechanical Systems
0512.4703 Introduction to VLSI Design
0512.4704 Solid State Devices

5000 courses[1]

0510.5001 Differential and Integral Equations
0510.5004 Quantum Electronics

6000 courses[2]

0510.6602 Electro-Optics and Nonlinear Optics
0510.6701 Advanced Semiconductor Physics

7000 courses[3]

0510.7623 Coherent Atom-Field Phenomena
0510.7702 Nonlinear Materials in Optics and Electronics
0510.7709 Characterization of Electronic Materials
0510.7725 Computational Models in Solid State and Finite Systems

7000 courses[4]

0510.7616 Introduction to Optical Design Using Zemax
0510.7701 Photovoltaic Solar Energy Conversion
0510.7706 Advanced Design of Analog Circuits

7000 courses[5]

0510.7703 Nanometric Devices - Properties and Applications
0510.7704 Nanomotion: Principles, Materials and Devices
0510.7705 Nanoscale Characterization of Electronic Materials and Devices

Enrichment courses from adjacent areas

Optics:
0512.4602 Introduction to Optical Communications
0510.7721 Introduction to Design of Digital Cameras Based on CMOS Imager

[1] Students must choose at least 2 courses
[2] Core – in Devices and Materials
[3] Specialization – Materials and Processes
[4] Specialization – Devices
[5] Specialization – Nanotechnology

Electromagnetism (8)

The field of Electromagnetism includes 3 main areas: a. Antennas and Microwaves; b. Propagation and Scattering of Waves; c. Power Sources for Microwaves.
A student may choose an in-depth specialization in one or more areas, or a broad specialization in several areas, including enrichment in Communications and/or Optics.
To assist our students, we present the courses in their various categories. Selecting courses from the list depends on the student's field of specialization.

4000 courses

0512.4800 Microwave Engineering
0512.4802 Passive Microwave Devices
0512.4861 Antennas and Radiation
0512.4862 Propagation and Scattering of Waves

5000 courses[1]

0510.5001 Differential and Integral Equations
0510.5002 Functional Analysis

6000 courses[2]

0510.6801 Classical Electrodynamics
0510.6802 Radiation and Propagation of Electrodynamic Waves

7000 courses[3]

0510.7804 Integral Numerical Methods in Electromagnetics
0510.7805 Differential Numerical Methods in Electromagnetics

7000 courses[4]

0510.7623 Coherent Atom-Field Phenomena
0510.7630 Selected Topics in Laser Theory and Applications
0510.7803 Physical Principles in Wireless Communication Systems
0510.7806 Phased Array Antennas
0510.7807 Advanced Topics in Antenna Theory
0510.7820 Artificial Materials – Analytical Modeling in Complex Media

7000 courses[5]

0510.7808 Electromagnetic Radiation Devices Based on Electron Beams
0510.7811 Microwave Interactions with Materials

7000 courses[6]

0510.7815 Introduction to Nano-Electromagnetism
0510.7816 Optics of Nanostructured Materials

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[1] Students must choose at least 2 courses
[2] Core
[3] Specialization – Numerical Methods for Solving Radiation and Scattering Problems
[4] Specialization – Antennas and Microwaves
[5] Specialization – High-Power Sources
[6] Specialization – Nano-Electromagnetism

Enrichment courses from adjacent areas
5000 courses[1]
0510.5004 Quantum Electronics
0510.5005 Random Processes

Optics
4000 courses
0512.4602 Introduction to Optical Communications (equivalent level course)
0512.4660 Classical Optics (equivalent level course)
0510.7616 Introduction to Optical Design Using Zemax

7000 courses
0510.7625 Statistical and Coherent Optics

Signal Processing
6000 courses
0510.6201 Digital Processing of Single and Multi-Dimensional Signals
0510.6202 Estimation Theory

7000 courses
0510.7201 Spatial Signal Processing

Communication Systems
0510.7204 Radar Principles – Extended

[1]Mandatory

Plasma (90)

5000 courses[1]
0510.5001 Differential and Integral Equations
0510.5002 Functional Analysis OR
0510.5004 Quantum Electronics

6000 courses[2]
0510.6501 Power Processing
0510.6701 Advanced Semiconductor Physics
0510.6801 Classical Electrodynamics

7000 courses[3]
0510.7002 Optimization

7000 courses[4]
0510.7905 Electrophysical and Electromechanical Materials Processing

Recommended courses from adjacent areas
7000 courses
0510.7709 Characterization of Electronic Materials
0510.7805 Differential Numerical Methods in Electromagnetics
0510.7808 Electromagnetic Radiation Devices Based on Electron Beams
0510.7811 Microwave Interactions with Materials

Enrichment courses from adjacent areas
4000 courses
0512.4503 High-Frequency Switched Mode Converters
0512.4601 Introduction to Lasers
0512.4704 Solid State Devices

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[1] Students must choose at least 2 courses.
[2] Core
[3] Specialization
[4] Specialization – Plasma Processing of Materials

Image Processing and Computer Vision (95)

4000 courses
0512.4262 Image Processing
0512.4263 Video Processing
0512.4603 Imaging systems and Optical Signal Processing

5000 courses[1]
0510.5001 Differential and Integral Equations
0510.5002 Functional Analysis
0510.5003 Discrete Mathematics
0510.5005 Random Processes

6000 courses[2]
0510.6201 Digital Processing of Single and Multi-Dimensional Signals
0510.6205 Statistical Machine Learning
0510.6251 Computer Vision

7000 courses[3]
0510.7002 Optimization
0510.7104 Data and Signal Compression
0510.7207 Signal Processing in Sensory Systems
0510.7211 Advanced Image Processing
0510.7212 Advanced Topics in Computer Vision[4]
0510.7213 Advanced Laboratory in Digital Image Processing
0510.7218 Vision -Mechanisms, Models and Algorithms
0510.7250 Sparse Representations and Their Applications in Signal and Image Processing
0510.7255 Seminar in Deep Learning
0510.7415 Processing and Analysis of Geometric Shapes
0510.7602 Electro-Optical Systems for Signal Processing

Courses from other Schools and Faculties[5]

Biomedical Engineering
0553.5547 Image Analysis in Digital Libraries and Medical Databases (Specialization)
0555.4570 Introduction to Magnetic Resonance Imaging (MRI) (Equivalent Level Course)

Applied Mathematics
0366.4660 Advanced Mathematical Techniques for Processing and Analyzing Images

Computer Science
0368.3014 Computer Graphics (Equivalent Level Course)
0368.3063 Computational Learning: Probabilistic Graphic Models (Equivalent Level Course)
0368.4211 Computational Geometry (Specialization)

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[1] Student must choose at least 2 courses
[2] Core
[3] Specialization
[4] The course Advanced Topics in Computer Vision may be taught by a different lecturer every year. In such cases students nay take it twice and receive credit points both times.

[5] To enroll in these courses a student must obtain approval from his/her supervisor as well as the other department. At the School of Electrical Engineering some of these courses will be considered Equivalent Level courses (4000), while others will be considered specialization courses (7000).