Curriculum, B.Sc. in Electrical and Electronic Engineering

Semester 1

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0509.1117	Mathematical supplement for physics	2	2		4	3.5	-
0509.1118	Classical Mechanics for Electrical Engineering (CMEE)	4	2	-	6	5.5	Mathematical Supplement for physics
0509.1724	Linear Algebra	5	2	-	7	6.5	-
0509.1746	Calculus 1B (Calc 1B)	4	2	-	6	5.5	-
0509.1820	Programming-Python (Python)	2	2	-	4	3.5	-
Total Semester		**17**	**10**	**-**	**27**	**24.5**	

Semester 2

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0509.1745	Ordinary Differential Equations (ODE)	3	1	-	4	4	Calc. 1B; Linear Algebra
0509.1747	Calculus 2B (Calc 2B)	4	2	-	6	5.5	Calc. 1B
0509.1829	Physics 2	4	2	-	6	5.5	CMEE
0512.3561	Digital Logic Systems (DLS)	3	1	-	4	4	Linear Algebra
	Humanities course				2	2	
Total Semester		**14**	**6**	**0**	**22**	**21**	

Cr. = Credits ; Lec. = Lectures ; Rec. = Recitations; Lab. = Laboratory

Semester 3

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0509.1834	Physics Lab	-	-	2	2	2	
0509.2801	Introduction to Probability and Statistics (P&S)	3	1	-	4	4	Calc 2B
0509.2843	Harmonic Analysis	2	1	-	3	3	Calc. 2B; ODE; Complex Functions (in parallel)
0509.2844	Complex Functions	2	1	-	3	3	Linear Algebra ; Calc. 2B
0512.2830	Quantum and Solid state Physics (Quantum)	3	1	-	4	4	Phys. 2, Physics lab, Probability & Stats (in parallel)
0512.2832	Circuits and Linear Systems	4	2	-	6	5.5	ODE; Phys. 2
Total Semester		**14**	**6**	**2**	**22**	**21.5**	

Semester 4

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0512.3632	Random Signals and Noise (RS&N)	3	1	-	4	4	Prob. And Stat. ; Signals and Systems
0509.2846	Partial Differential Equations (PDE)	2	1	-	3	3	ODE; Complex Functions; Harmonic Analysis
0512.2508	Electronic Devices (Devices)	3	1	-	46	4	Quantum
0512.2510	Data Structures and Algorithms (DS&A)	3	1	-	4	4	Programming C or python; DLS
0512.2525	Electromagnetic Fields (EMF)	3	1	-	4	4	Harmonic Analysis ; Phys. 2; PDE
0512.2835	Signals and Systems	3	1	-	4	4	Harmonic Analysis; Circuits and Linear Systems
Total Semester		**17**	**6**	**0**	**23**	**23**	

Cr. = Credits ; Lec. = Lectures ; Rec. = Recitations; Lab. = Laboratory

Semester 5

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0512.3513	Analog Electronic Circuits (AEC)	3	1	-	4	4	Elect. Devices ; Circuits and Linear Systems
0512.3526	Wave Transmission and distributed systems (Waves)	3	1	-	4	4	Electromagnetic Fields
0512.3543	Introduction to Control Theory	2	1	-	3	3	Linear Circuits and Systems
	2 specialization courses				8	8	
	Humanities course				2	2	
Total Semester		**8**	**3**		**21**	**21**	

Semester 6

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0512.3514	Digital Electronic Circuits	3	1	-	4	4	DLS; AEC
0512.3591	Electronics Laboratory (1) (Elab1)	-	-	4	4	2	Elec. Devices ; AEC + Waves (in parallel)
	4 specialization courses	-	-	-	16	16	
Total Semester		**3**	**1**	**4**	**24**	**22**	

Cr. = Credits ; Lec. = Lectures ; Rec. = Recitations; Lab. = Laboratory

Semester 7

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0512.3593	Electronics – Laboratory (2) (Elab 2)	-	-	4	4	2	E. Lab 2 ; Digital Electronic Circuits
0512.4001	Project (Phase A)	-	-	-	-	-	130 hours
	3 specialization courses	-	-	-	12	12	
Total Semester				**4**	**16**	**14**	

Semester 8

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites
0512.4000	*Project (Phase B)	-	-	-	4	6	Satisfactory completion of Phase A
	3 specialization courses	-	-	-	12	12	
	2 advanced laboratories	-	-	-	6	3	
Total Semester		**-**	**-**	**-**	**22**	**21**	

Cr. = Credits ; Lec. = Lectures ; Rec. = Recitations; Lab. = Laboratory

Research project for Excellent student:

Purpose: For excellent students to incorporate high-level research during the B.Sc. This research project can replace their regular project for B.Sc.

Rules:

1. To be accepted, you must be in the top 5% of the EE class at the end of your 3rd semester.
2. You can start at the 4th semester and the length of the project can be between 1-4 semesters.
3. The communication between the instructors and students will be personalized and one-on-one and student must initiate the communication.
4. After 6 months from the time of the start of the project, the instructor must declare whether the student ill receive a grade for the research work by the end of the allotted time.
5. Student can replace a project or instructor if they still have one year to finish
6. Project can be done as a pair (who is also in the top 5% of the class of EE).

Project Presentation: Students must have an article ready for publication in a science magazine. An initial publication in ArXiv will be considered as well. In this case, students will not be required to present an

additional summary of his work. If no article is submitted for publication, the student will submit a final paper signed by the supervisor.

Humanities and Core Courses Requirements

All students must complete 4 hours of Humanity courses and 6 hours of core University courses (Kelim Shluvim) throughout their degree. It can be completed at any time during the degree. The Humanity courses are listed HERE and need to be approved by the BA in Liberal Arts & the International office in the Faculty. The core University courses (Kelim Shluvim) in English are subject to change every semester and need to be confirmed by the International office in the Faculty prior to the registration. The list of the core University courses taught in the academic year 2020-2021 is available HERE

Specialization Courses

Students must accumulate a total of 9 courses (not including laboratories) and out of those 9 courses, students must choose at least 3 courses that are "core/introductory" courses and they should be in three different tracks.

Students must complete 2 advanced laboratories in 2 different tracks/specializations and students must have the necessary prerequisites to complete this.

In order to complete the total number of hours for the degree (177), the students may choose courses from the list of specializations and tracks listed below. Not all courses will be given yearly in English, so students must be aware of when courses are being taught in English. Students are allowed to take courses from other schools/departments in the Faculty of Engineering, provided that the course is taught in English. If a student would like to do this, they must receive prior approval from the International Office in the Faculty. If a student would like to take a Master's level course, he/she must receive approval of the lecturer and the Head of the Department or School. To do this, the student must be in touch with the International Office of the Faculty

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COMMUNICATIONS TRACK

(In this track, students can take more than 3 courses)

The field of communications comprises a wide range of topics, some of which are of a fundamental scientific nature while others are innovative and rapidly evolving. The knowledge base taught in this track is vital for those involved in research and development of modern communications systems as well as for dealing with problems related to other fields such as signal processing, control and computers.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0510.6101	Information Theory [1]	3	-	-	3	3	RS&N	7
0510.6102	Principles of Coding and detection in communication theory [1]	3	-	-	3	3	Digital Comm.	8
0512.4264	Introduction to Machine learning [2]	3	1	-	4	4	RS&N	7/8
0512.4100	Communication Systems [2] (Comm. systems)	3	1	-	4	4	RS&N	6
0512.4161	Digital Communications (Digital Comm.)	3	1	-	4	4	RS&N	7
0512.4162	Digital Transmission of Signals	3	1	-	4	4	Digital Comm.	8
0512.4163	Introduction to Error correction codes	3	1	-	4	4	RS&N	7
0512.4164	Communication Circuits	3	1	-	4	4	AEC, Digital Comm.	7
0512.4190	Advanced Laboratory for Communications [2]	-	-	3	3	1.5	Digital Comm.	7/8
0512.4462	Introduction to computer communications	3	1	-	4	4	Digital Comm.	8
0512.4602	Introduction to Optical Communications	3	1	-	4	4	Waves, RS&N	8

[1] M.Sc. course
[2] courses taught in English

SIGNAL PROCESSING TRACK

(In this track, students can take more than 3 courses)

This field is of extreme importance in a wide variety of areas and applications including but not limited to: digital communications, speech processing, image processing, biomedical engineering, military systems and more. The rapid progress of computer technology facilitates the use of powerful signal processing techniques for solving problems and developing sophisticated modern products. The goal of the track is to give basic concepts and knowledge in signal processing. Both theoretical and practical aspects of signal processing are covered. The track advanced lab classes involve implementation of the studied methods in a dedicated Digital Signal Processing (DSP) processor.

The track provides basic knowledge necessary for an engineer who wishes to engage in signal processing research and development in the hi-tech industry or in the academia.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0510.6202	Estimation Theory[1]	3	-	-	3	3	RS&N	6/8
0510.7255	Deep Learning[1]	2	-	-	2	2	By prof approval	7
0512.4264	Introduction to Machine learning [2]	3	1	-	4	4	RS&N	7/8
0512.4200	Intro to Digital Signal Processing (DSP) [2]	3	1	-	4	4	Signals & Systems	6
0512.4261	Intro to Statistical Signal Processing	3	1	-	4	4	RS&N; DSP	7
0512.4162	Digital Transmission of signals	3	1	-	4	4	Comm systems	8
0512.4290	Advanced Lab for DSP [2]	-	-	3	3	1.5	Intro to Stat Signal Proc.	7
0512.4262	Digital Image Processing-Principles (DIP)	3	-	1	4	4	RS&N, DSP	7
0512.4263	Video Processing	3	-	1	4	4	DIP	8
0512.4291	Advanced Lab in Image Processing [2]	-	-	3	3	1.5	DIP	8
0512.4603	Imaging Systems and Optical Signal processing	3	1	-	4	4	Classical Optics	7

[1] M.Sc. course
[2] courses taught in English

CONTROL TRACK

The field of control covers a broad range of areas and in particular areas where real-time decisions are needed. For example: autonomous vehicles, drone control, robotics, aeronautics, production systems, systems integrating mechanics and electronics and most of the dynamical and chemical systems. The courses structure and material studied provide the students with an analytical and systematic view of analysis and design of control systems using some of the most advanced software tools available.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0512.4264	Introduction to Machine learning [2]	3	1	-	4	4	RS&N	7/8
0512.3542	Control Lab [2]	-	-	2	2	1	Intro to Control Theory	6/7
0512.4300	Intro to Digital Control [2]	3	1	-	4	4	Intro to Control Theory	6/8
0512.4360	Intro to modern Linear Control Theory (MLCT)	3	1	-	4	4	Intro to Control Theory; RS&N	6/8
0512.4362	Practical Feedback Systems (PFS)	3	1	-	4	4	Intro to Control Theory	7
0512.4390	Advanced Lab for Control[2]	-	-	3	3	1.5	Control Lab; Intro to MLCT; PFS	7/8
0542.4621	Intro to robotics	3	-	-	3	2.5	Physics 1; Intro to Control Theory	7

[1] M.Sc. course
[2] courses taught in English

COMPUTERS TRACK

(In this track, students can take more than 3 courses)

This specialization track provides advanced knowledge in hardware and software. The two courses "Computer Organization" and "Computer Architecture" deal with hardware, digital components and parallel computing. The course of "Introduction to programming systems" deals with the principles of operating systems and compilers.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0368.3065	Introduction to Information Security	3	1	-	4	4	Prof approval; Intro to Comp structures; Intro to Prog systems	6/8
0510.6401	Algorithms design & Analysis [1]	3	-	-	3	3	DS&A	7
0512.4264	Introduction to Machine learning [2]	3	1	-	4	4	RS&N	7/8
0510.7255	Deep learning [2]	2	-	-	2	2	Prof Approval	7
0512.4163	Intro. to Error Correction codes	3	1	-	4	4	RS&N	7
0512.4262	Image Processing	3	-	1	4	3.5	RS&N; DSP	7
0512.4400	Computer Organization [2]	2	2	-	4	3.5	DS&A; DSP lab	5
0512.4402	Intro. to Programming Systems [2]	3	1	-	4	4	DSP; Comp. Organization	7
0512.4461	Computer architecture	3	1	-	4	4	Comp. Organization	7
0512.4462	Intro to computer Communication	3	1	-	4	4	Comp. Organization	8
0512.4490	Advanced Comp Architecture Lab [2]	-	-	3	3	1.5	Comp. Organization	7
0512.4491	Advanced computer communication lab	-	1	2	3	1.5	Comp. Comm; lab instructor approval	7/8
0512.4492	Advanced Lab-Comp. Organization [2]	-	1	3	4	2	Comp. Organization	7/8
0512.4493	A C Language Workshop		1	3	4	2	C; DS&A	7/8
0512.4703	Intro to VLSI circuit Design [1]	3	1	-	4	4	DLS; E. Devices; DEC	6/8
0512.1820	Programming in C language	2	2	-	4	3	Programming-Python	7/8

[1] M.Sc. course

[2] courses taught in English

ENERGY AND POWER ELECTRONICS TRACK

(In this track students should take more than 3 courses)

This specialization track deals with electronic circuits for power regulation and switched power converters (ac-dc, dc-dc and dc-ac) where both control and topological aspects are considered. In the topic of electric drive the track focuses on system aspects of electric motors, loads and power amplifiers for electric motors operation. The track also comprises topics related to the production, transmission and distribution of electric power, techno-economic considerations, power systems for high and low voltages, normal operating conditions and malfunctioning conditions.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0512.3571	Energy Conversion	3	1	-	4	4	Circuits and Linear Systems; Electromagnetic Fields	
0512.4362	Practical Feedback Systems	3	1	-	4	4	Control theory	7
0512.4502	Electric Motor Drives	3	1	-	4	4	Energy conversion	7
0512.4503	High Frequency Switched Mode Converters [2]	3	1	-	4	4	Linear systems; Energy conversion	6/8
0512.4504	Power Systems Operation at Abnormal Conditions	3	1	-	4	4	Techno-Eco. Problems	7
0512.4505	Techno-Economical Problems in Power Systems	3	1	-	4	4	Energy conversion	6/8
0512.4506	Power Electronics	3	1	-	4	4	Energy Conversion	7
0512.4590	Advanced Lab for Energy conversion [2]	-	-	3	3	1.5	Energy conversion; Energy conversion lab	7/8

[1] M.Sc. course

[2] courses taught in English

The following is a list of courses required to register in this specialization. It is also required that the final project should be in the field of strong current:

0512.2525- Electromagnetic fields
0512.3571- Energy conversion
0512.3572- Energy conversion lab
0512.3673- Electric Drive
0512.3674- Techno-economical problems in power systems
0512.4504- Power Systems Operation at Abnormal Conditions
0512.4503- High Frequency Switched Mode Converters
0512.7507- Low voltage devices
0512.7508- high voltage devices

Please note that the conditions for obtaining a license are not determined by the university but by the person in charge of licenses in the Ministry of Labor, therefore conditions can be changed at any given moment by the Ministry of labor.

ELECTRO-OPTICS TRACK

Electro-optic systems now play key roles in sensing, data storage and communications, and many additional applications are expected in the future. The goal of the track is to expose the student to basic concepts and knowledge in electro-optical devices and systems. The advanced laboratory allows hands-on experience with some of these systems.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0512.4601	Introduction to lasers [3]	3	1	-	4	4	Waves; Quantum	7
0512.4602	Introduction to optical communications [3]	3	1	-	4	4	Waves, RS&N	8
0512.4603	Imaging Systems and Optical Signal Processing	3	1	-	4	4	Classical optics	7
0512.4660	Classical Optics [2]	3	1	-	4	4	Waves; or EMF	6
0512.4690	Advanced Lab in Electro-Optics [2]	-	-	3	3	1.5	Classical Optics	7/8
0512.4704	Solid State Devices	3	1	-	4	4	Electronics Devices	8
0512.4862	Propagation and Scattering of Waves	3	1	-	4	4	Waves	7
0512.4690	Numerical Analysis	3	1	-	4	4	Python; PDE	7/8

[1] M.Sc. course
[2] courses taught in English
[3] mandatory at least one of the two

ELECTRONIC DEVICES TRACK

(In this track students should take more than 3 courses)

This specialization track is intended for students who consider taking part in the micro-electronics industry in manufacturing, designing, inspecting and R&D roles. The track provides broad background on electronic devices and materials, production and design methods.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0512.4601	Introduction to lasers	3	1	-	4	4	Waves; Quantum	7
0512.4700	Microelectronics and Nano-electronics Technologies [1]	3	1	-	4	4	Electronic Devices	7
0512.4702	Intro to micro-electro-mechanical systems	3	1	-	4	4	Quantum	6/8
0512.4703	Intro to VLSI circuit Design [2]	3	1	-	4	4	DLS, Electronic Devices; DEC	6/8
0512.4704	Solid State Devices	3	1	-	4	4	Electronic devices	8
0512.4705	Advanced electronic devices [2]	3	1	-	4	4	Electronic Devices	6
0512.4706	Integrated Analog Circuit Design	3	1	-	4	4	AEC	7
0512.4790	Advanced Lab in semiconductor devices [2]	-	-	3	3	1.5	Advanced Electronic Devices ; waves	7/8
0512.4803	Active microwave devices	3	-	-	3	3	Waves, Electronic devices	8

[1] M.Sc. course
[2] courses taught in English

ELECTROMAGNETIC AND RADIATION TRACK

Electromagnetic waves are used to transmit information in various transmission and sensing systems. The specialization track deals with methods of analysis, design and implementation of electromagnetic systems in radio frequency, microwave and millimeter waves; from the level of sources through transmission systems and microwave circuits, components and antennas, to wave propagation. The specialization track provides basic training for engineers in microwave and antennas and is also intended for those wanting to pursue fields of communications and radar, or even electro-optics.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0512.4800	Microwave Engineering [2]	3	1	-	4	4	Waves or EMF	6
0512.4802	Microwave Components	3	1	-	4	4	Microwave systems	7
0512.4803	Active microwave devices	3	-	-	3	3	Waves; EMF	8
0512.4861	Antennas and Radiation	3	1	-	4	4	Waves	7
0512.4862	Propagation and Scattering of Waves	3	1	-	4	4	Waves	7
0512.4890	Advanced Lab for Microwaves [2]	-	-	3	3	1.5	Microwave systems	7/8
0512.4690	Numerical Analysis	3	1	-	4	4	Python; PDE	7/8

[1] M.Sc. course
[2] courses taught in English

BIO-ELECTRONICS TRACK

(Students must take the mandatory courses + 1 from the 3 groups)

This specialization track opens a window to the world of medicine and life sciences. The impressive technological development in areas of medical research, diagnosis and treatment, places engineers as integral parts of these efforts. The specialization track covers the following subjects: getting familiarity with physiological systems, medical devices, principles of medical measurements and various applications of advanced medical technology, such as medical imaging systems and laser applications in medicine. Signal and image processing methods for biomedical applications are also often used.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0555.4282	Advanced Biomedical Lab	-	-	4	4	4	Molecular biology	8
0555.4551	Molecular Biology and Genetic Engineering [2]	4	-	-	4	4		6/8
0512.4601	Introduction to Lasers	3	1	-	4	4	Quantum; Waves	7
0555.3240	Wave Propagation in biological tissue	3	1	-	4	4	Introduction to Lasers	7
0512.4262	Digital Image Processing-Principles (DIP)-Part 2	3	1	-	4	3.5	RS&N; DSP	7
0555.4520	Medical Image Processing	3	1	-	4	4	DIP part 1	8
0555.3801	Anatomy and Physiology for Engineering	3	1	-	4	4		6
0555.4550	Intro to Cellular Biophysics and bioengineering	3	1	-	4	4	Molecular bio and genetic engineering	7
0555.4560	Electrical Signals and Conduction in cells	3	1	-	4	4	Molecular bio and genetic engineering	7

[1] M.Sc. course
[2] courses taught in English

MATERIALS TRACK

Materials research is probably one of the oldest techno-scientific fields. The significance of materials and their effect on the development of humanity are reflected in the names of historical periods (the stone age, the bronze age etc.). The development of new materials, improvement of the properties of existing materials and the development of new processes for production, processing and bonding of materials have recently became a bottleneck in the development of various technologies (e.g. turbine engines for aviation, mega-energy systems, fiber optics, microelectronics components, etc.). It is expected that materials science will continue to make significant impact on the economy and on the environment. In the age of nanotechnology, development of new materials and nano-fabrication technologies plays a central role. Therefore, hi-tech companies are increasingly paying attention to the field of materials. At Tel Aviv University, this area is developing rapidly, especially in graduate studies. The objectives of the Materials track are to expose students to the fascinating world of materials science and engineering, and to provide them with a better knowledge base if they choose to pursue graduate studies in the interdisciplinary program at Tel Aviv University.

Number	Course	Lec.	Rec.	Lab.	Total hours	Credits	Prerequisites	Semester Taught
0509.1815	Basic Chemistry for Engineering	2	1	-	3	3		7
0510.6701	Advanced Physics of semiconductors	3	-	-	3	3	Electronic Devices	8
0581.1111	Intro to Material science & engineering (MSE) [2]	3	1	-	4	4	Basic Chemistry	8
0581.3121	Physics of Materials	3	1	-	4	4	Advanced Physics of Semiconductors	8
0581.3122	Intro to Computational Science in materials	3	2	-	5	4.5	MSE	7
0581.4321	Magnetic materials	3	-	-	3	3	Physics 2; Physics of Materials	
0581.5312	Smart Materials	3	-	-	3	3	MSE	8
0581.5332	Scanning Electron microscopy	2	-	-	2	2		8

[1] M.Sc. course
[2] courses taught in English