

Technion – Israel Institute of Technology

Faculty of Mechanical Engineering

A Guidebook for Graduate Students

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For the 2022–2023 Academic Year

Technion – Israel Institute of Technology
Faculty of Mechanical Engineering
Haifa, 3200003 Israel

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- Faculty graduate studies coordinator, Dana Alush: Tel. 04–8293189
- Faculty website: <http://meeng.technion.ac.il/>
- Graduate School website: <https://graduate.technion.ac.il/en/home/>

1. Research Fields

Energy and Thermal Sciences

Thermodynamics, solar energy, desalination, energy technologies, refrigeration and air conditioning, heat pumps, cryogenic cooling, internal combustion engines, thermal properties of materials, flow batteries.

Fluid mechanics and Transient Phenomena

Environment engineering, multi-phase flows, filtration and aerosol technology, computational fluid mechanics, heat and mass transfer, hydrodynamic stability, flow control, micro/nano flow, electro-hydrodynamics, waves in fluids, fluid-structure interaction.

Mechanics of Materials

Mechanics of composite materials, fracture mechanics, failure mechanisms, dynamic loading, fatigue, plasticity, continuum mechanics, thermo-elasticity, microstructure of materials, finite element methods, dynamic buckling, non-destructive testing, analysis of marine structures, electro-mechanics, magneto-mechanics, stress waves, micro/nano electro-mechanical systems, smart materials.

Control

Linear control, nonlinear control, process control, sampling methods, robust control, missile guidance, control of flexible structures, control of time-delay systems, physical signal processing, and automatic diagnosis of malfunctions.

Dynamical Systems

Analytical dynamics, nonlinear vibration, dynamics of rotating bodies, stress waves, vibrations in structures, dynamic measurement and identification, energy harvesting, non-linear chaotic dynamic systems, nonlinear waves.

Design and Manufacturing

Mechanical and engineering design, analysis of production processes, intelligent activators and sensors and actuators, reliability evaluations and integration in design, decision making under uncertain conditions, development of new products, rapid prototype production, risk evaluation and control.

CAD

Computational geometry, geometrical modeling, reconstruction methods of engineering structures, reverse engineering, product lifecycle engineering, configuration of manufacturing systems.

Robotics

Humanoid systems, medical robots, robot navigation, multi-fingered robotic hands, unique robotic structures, swimming robots.

Biomechanics

Mechanics and dynamics of skeletal tissues, biological tissues, muscle mechanics, heat transfer in tissues, cell mechanics, thermal comfort, human health, bio-robotics, robotic applications in medicine, brain-machine interfaces, body joints, imaging and geometric processing of medical models.

Optical Engineering

Micro/nano optical elements on various wave scales, pluralization activation, polarization operation, laser resonators, vector optics, rotating optics, surface phonons/polaritons, excitonics, frequency conversion methods, opto-mechanics, nonlinear optics.

- A list of faculty members who serve as advisors, along with their fields of interest and contact information, are available on the faculty's website. Click on the corresponding links to the [faculty member's personal pages](#).

2. Degree Types and Features

2.1 Master's Degree Programs

The faculty offers several master's programs that lead to the following degrees:

M.Sc. – Master of Science in Mechanical Engineering

Candidates include those with a B.Sc. in Mechanical Engineering with adequate grades, or those with other bachelor's degrees in engineering who may be required by the faculty graduate studies committee to complete specific undergraduate courses in mechanical engineering. These studies prepare graduates for scientific work directed at research and development.

M.Sc. – Master of Science

Candidates include those with a bachelor's degree from other engineering or scientific faculties, such as the Faculties of Mathematics, Physics, or Computer Science, who have adequate grades. Students admitted to this study track will be required to complete specific undergraduate courses in mechanical engineering that are pre-requisites or directly related to their chosen research field.* These studies prepare graduates for scientific work directed at research and development.

M.E. – Master of Engineering in Mechanical Engineering

This degree is based purely on accumulated credits and does not include the submission of a thesis. The program is intended for external students with a B.Sc. in Mechanical Engineering who have practical experience in engineering work. These studies prepare students for advanced work in applied engineering or development.

M.E. – Master of Engineering

The curriculum for this degree is identical to that of the M.E. in Mechanical Engineering program. It is open to those with a bachelor's degree in engineering, but not in mechanical engineering, subject to the approval of the faculty graduate studies committee.

Candidates who wish to apply for non-thesis M.E. programs should explicitly note this on their application forms.

Admission Criteria

Admission to all master's programs is subject to the rules of the Graduate School and the Faculty of Mechanical Engineering, which may be changed occasionally. In thesis programs, the minimum requirements are a relevant bachelor's degree with a GPA of at least 82 and two letters of recommendation. Non-thesis programs require a relevant bachelor's degree with a GPA of at least 80.

Candidates who have graduated from universities and colleges will be admitted based on their GPA, ranking, and a personal interview.

Those with a bachelor's degree from a three-year program will be required to complete undergraduate courses (no less than 20 credits) prior to beginning their master's studies, according to the rules of the Graduate School. The list of required undergraduate courses will be decided by the faculty graduate studies committee following the personal interview.

2.2 Doctoral Studies

The Ph.D. program offered by the faculty is open to those with a master's degree from a recognized academic institution with outstanding prior academic achievements and research, which will be checked by the faculty graduate studies committee.

3. Academic Requirements

3.1 Academic Requirements for Master's Programs

Students admitted to master's programs that include a thesis submission will be appointed a temporary advisor to assist them in finding a permanent advisor from the faculty members. The permanent advisor will define the research topic and determine the required graduate courses. In light of their vital role in determining the student's curriculum, a permanent advisor should be selected as early as possible. Graduate students without a permanent advisor will not be able to choose courses that do not appear on the list of compulsory courses relevant to their intended specialization.

The curriculum includes the following:

For students in M.Sc. programs with a thesis:

- At least 20 advanced course credits + 2 credits for English course (or 28 credits + 2 credits English course, for students in the final paper track).
- Language exams in Hebrew and English according to the Graduate School requirements noted in the admission letter.
- An ethics exam.
- Giving a seminar lecture at a time published on the Technion's website.
- Submission of a research thesis or a comprehensive engineering project – 20 credits.
- Thesis defense before an examining committee.

For students in non-thesis M.E. programs:

- Graduate courses according to the curriculum requirements at a scope of no less than 35 credits (including courses taken as part of advanced studies that are recognized by the Graduate School) + 2 credits for English course.
- Language tests in Hebrew and English based on the Graduate School requirements noted in the admission letter.
- Project or seminar of 5 credits under the supervision of a Technion faculty member or one who is recognized by the Technion.

The list of compulsory (core) and elective courses in the major research fields is updated annually and appears on the website:

<https://graduate.technion.ac.il/en/syllabus-department-en-3/>.

3.2 Academic Requirements for Doctoral Studies

Students admitted to the doctoral program are required to take several advanced courses, as approved by their permanent advisor, and submit a research proposal on which they will be tested at their candidacy exam. Upon completing their research, students will present their work in a seminar lecture and defend their dissertation before an examining committee.

Direct Ph.D. Track

Students with particularly high academic achievements who have begun their M.Sc. studies and demonstrated outstanding academic and research work will be able to transfer to the direct Ph.D. track based on the recommendation of the faculty graduate studies committee. In such cases students will not be required to fulfill all the requirements of a master's degree.

Admission Criteria

In addition to prior adequate academic achievements (above 90% in their bachelor's degree), candidates must demonstrate a proven ability to conduct independent research. The faculty admissions committee will review the candidate's achievements and decide whether they need to take an admission test. The test results will help the committee determine whether and under which terms to admit the candidate.

Academic Requirements

- Meeting the special terms required by the admissions committee (if any have been set).
- For doctoral students with a master's degree - at least 8 advanced credits.
- For students in the direct Ph.D. track - 28 credits (during their master's studies).
- Submitting a research proposal toward a candidacy exam and defending it before an examining committee, no later than 11 months into regular track studies and no later than five months into direct track studies.
- Giving a seminar lecture at a time that will be published on the Technion's website.
- Submitting a research dissertation and defending it before an examining committee.
- Meeting the language and ethics requirements based on the Graduate School Regulations.

4. International Students

Master's degree requirements:

- B.Sc. in Mechanical Engineering degree from a highly ranked university.
- High academic achievements (grades and ranking).
- Letters of recommendation from three faculty members who have reviewed the candidate's achievements. The faculty members must send the letters of recommendation to the Graduate School directly, at: IntGrad@technion.ac.il.
- GRE results: Scores of at least 85 in quantitative reasoning and 3.5 in analytical writing. The Technion exam code is 0343.
- Personal interview conducted by the faculty graduate studies sub-committee via Skype or in person, during which the candidate's English skills and academic achievements will be reviewed.
- Application forms must be submitted to the Graduate School according to the instructions appearing on the Graduate School's website.
- The faculty graduate studies committee will advise whether the candidate should be admitted or rejected and specify pre-requisite courses if needed.
- The faculty graduate studies committee will advise whether a scholarship should be granted.
- A candidate who has not completed a four-year science or engineering undergraduate program will be required to complete at least 20 credits as defined by the faculty graduate studies committee.

PhD degree requirements:

- M.Sc. in Mechanical Engineering degree from a highly ranked university.
- High academic achievements (grades and ranking).
- Letters of recommendation from three faculty members who have reviewed the candidate's achievements. These faculty members must include the candidate's advisor and at least one of the examiners from the candidate's master's degree. The faculty members must send the letters of recommendation to the Graduate School directly, at: IntGrad@technion.ac.il.
- GRE results: Scores of at least 85 in quantitative reasoning and 3.5 in analytical writing. The Technion exam code is 0343.

- Personal interview conducted by the faculty graduate studies sub-committee via Skype or in person, during which the candidate's English skills and academic achievements will be reviewed.
- Candidates must complete their master's degree before the committee will deliberate on their case.
- Candidates must send their thesis (in English) in PDF format to the Graduate School, to: IntGrad@technion.ac.il.

- International candidates are required to submit their candidacy forms to the Graduate School according to the instructions appearing on the Graduate School's website.
- Candidates must secure an advisor.
- The faculty graduate studies committee will advise whether the candidate should be admitted or rejected and specify pre-requisite courses if needed.
- The faculty graduate studies committee will advise whether a scholarship should be granted.

5. M.Sc. Degree Procedures

The purpose of this information is to guide students through the various stages of their studies and clarify the faculty's special requirements. This guidebook is an addendum to the Graduate School's catalogue and is not intended to replace it.

5.1 Curricula

- a. Students must take 20 credits + 2 credits for an English course and achieve a grade of at least 65 in each course to earn the course credits. Their GPA must be at least 75. Students who have failed a test or wish to improve their grade in courses that are also undergraduate courses (036...) will be given an opportunity to retake the test only in the same semester.
- b. Students must meet the Hebrew and English language requirements (see Section 26.06 of the Graduate School Regulations).
- c. Students must submit a research thesis or comprehensive engineering project and successfully defend it before an examining committee.
- d. Additional academic and administrative requirements are specified in the catalogue (see the Graduate School Regulations).
- e. Students are required to choose a core analytical course and two mechanical engineering science courses from the following tables and have them approved by their advisor.

1. Analytical methods courses (choose one from the list)

Course no.	Course name	Credits
036001	Analytical Methods in Mechanical Eng.1	4
036002	Analytical Methods in Mechanical Eng. 2	3
106393	Matrix Theory	3

2. Mechanical engineering sciences courses (choose two from the list)

Course no.	Course name	Credits
036003	Introduction to Continuum Mechanics	3
036005	Analytical Dynamics 1	3
036012	Linear Control Systems	3

036050	Nonlinear Control Systems	3
086312	Nonlinear Control	3
036013	Process Optimization	3
036015 or 038727	Finite Element Methods in Mech.eng. 1 or Numerical Methods in Mech. Engineering 1	3 3
036020	Computational Geometry 1	2.5
036026	Kinematics Dynamics & Control of Robots	2.5
036032 or 038504	Analytical Fluid Mechanics or Viscous Flow	3 2
036055	Linear Optics and Applications 2.	2.5
036091	Micro Optomechanics	3
038715	Advanced Thermodynamics 1	2.5
038712 or 038717	Conduction Heat Transfer or Convective Heat Transfer	3 2
038731	Radiation Heat Transfer	3
036009	Heat & Mass Transfer	3
038746	Mech. Behavior of Engineering Materials	2
036027	Dynamics of Marine Structures	3
036063	Experimental Modeling of Systems	3

Please note: Students who have completed a core course with a grade of at least 75 during their undergraduate studies can submit a request for it to be recognized as part of their master's studies. In any event, the credits for the course will not be considered part of the minimal M.Sc. requirement of 20 credits.

Students who have completed these core course requirements will complete the M.Sc. curriculum by taking at least another 20 credits, as approved by their research advisor.

The additional courses are to be chosen from the list of elective mechanical engineering courses or the list of alternative courses offered by the Technion's Graduate School.

5.2 Enrolling in Courses

Students admitted to a master's program must enroll at the start of each semester in the courses they will take and have their advisor sign a curriculum proposal form.

The curriculum proposal form can be found on the Graduate School's website under the "Forms" link. Students who do not enroll in courses on time will not be awarded credits for them, even if

they complete these courses successfully. The school will not permit retroactive enrolment other than in cases of rare exception. For their own benefit, students must make sure to enroll on time. (Students are required to submit a copy of the curriculum proposal form to the faculty graduate studies secretariat and keep a copy for themselves).

Courses can be canceled, changed, or added to the curriculum with the approval of the advisor during the first semester (approximately). If a course is added or canceled, this must be reported on the relevant form, accessible on the Graduate School's website under the "Forms" link.

If a student has not taken a test for a course in which they are enrolled, for no justifiable reason and without informing their teacher in advance, their grade for the course will be 0. Courses cannot be canceled retroactively once the date set by the Graduate School for making changes has passed.

Updated grade sheets (including courses, grades, scholarships, etc.) can be found on the Graduate School's website at <https://graduate.technion.ac.il> by clicking on the "Personal information" link.

- For a detailed list of graduate courses, click on the following link:
<https://graduate.technion.ac.il/syllabus-department-3/>

5.3 Research

The faculty offers two research frameworks:

- a. Research in which students investigate a new phenomenon, demonstrate independent thinking, and intelligently combine research methods in a manner that leads to innovations.
- b. An engineering project focused primarily on design innovation.

The scope of work is similar in both, as is the master's degree awarded once they are completed.

Students should proactively approach faculty members for advice on whether to pursue the research or project route. Students can proactively propose a research topic, however, they must secure an advisor who is a mechanical engineering faculty member. A list of faculty members who can serve as advisors and their fields of interest is specified below.

Once a student has chosen to do research or a project and has obtained the approval of their advisor, they are required to submit a research proposal along with a brief description and timeline, signed by their advisor, to the faculty graduate studies committee. The student and their advisor will receive formal notices regarding the approval of the topic and advisor. Once the permanent advisor has been approved, they will take on the role previously performed by

the temporary advisor. Prior to submitting the research proposal for approval, students must meet the research ethics requirements set by the Graduate School.

At the end of each semester, the advisor report to the dean on the student's activity and progress in their research or project. When a student has completed most of their research or project and is nearing the stage of writing their thesis or paper, they need to proactively approach the faculty secretariat (with advisor approval) and schedule a date for their seminar lecture. The lecture date will be published in the Technion's newsletter and needs to be coordinated accordingly.

The faculty graduate secretariat will send an announcement, signed by the advisor, informing the Graduate School that the lecture has been given. The lecture date will appear on the student's grade sheet.

Instructions for writing the thesis can be found on the Graduate School's website at:

<https://graduate.technion.ac.il/> - Graduation

5.4 Duration of Studies

Studies will last no more than eight semesters. The faculty committee will deliberate on any request to extend this period or take a leave of absence, with the approval of the advisor. In the event that a student cannot participate in their studies on a regular basis, they should request approval for specific dates of a leave of absence. The Graduate School does not approve leave retroactively.

The Graduate School's Regulation 25.03 ("Statute of Limitations") stipulates that "to maintain an adequate academic level and keep up with the rapidly changing fields of science and technology, a student whose duration of studies exceeds six years will be required, at the recommendation of the faculty committee, to accumulate 2 additional credits per each semester of studies. The six-year period (equal to 12 semesters) includes leaves, cessations of studies, and the duration of graduate studies activity."

6. M.E. Degree Procedures

The purpose of this information is to guide students through the various stages of their studies toward an M.E. degree and clarify the faculty's special requirements. This guidebook is an addendum to the Graduate School's catalogue and is not intended to replace it.

6.1 Admission

Students who wish to be admitted to a graduate program should submit applications to the Graduate School's Registration Department (online registration). Applications will be deliberated by the faculty committee. Admission criteria change occasionally; the most recent requirements are those that apply (see pp. 1–2). On their application, students with an associate's degree should ask for the courses they have taken to be recognized (if their grades are over 75). The committee will then advise the Graduate School whether or not to admit them and award credits for those courses, based on the program guidelines.

6.2 Courses

Students are required to accumulate at least 40 credits according to the following specification:

- A compulsory foundational course – XXXX – 036001
- A compulsory foundational course – one of the two computational courses: XXXX 036015 or XXXX 038727 (if one of these courses is taken as a foundational course, it will not be considered a core course).
- The other courses must be taken in one of the specialization tracks specified in Section 8, with at least two core courses and three elective courses in every track.
- 5 credits from a seminar/project – 038789
- Up to five managerial courses, from List B, Section 9.2.

Please note:

- a. Students will be awarded a degree if they have passed all their courses, achieved a GPA of over 75, and have met all the Graduate School requirements.
- b. Courses appearing on the curriculum that were taken by students during their undergraduate studies will not be recognized for the purpose of meeting the requirements for a master's degree.
- c. Graduate courses taken at other faculties that are not part of the program must be approved by the graduate committee. This does not apply to courses that are essentially identical.

6.3 Project or Seminar Paper

Students are required to register for graduate studies for at least one semester. During this semester students must complete their language studies according to the Graduate School guidelines (see Section 26.06 of the Graduate School Regulations) and do a project or seminar paper (038789) of five study units, under the supervision of a mechanical engineering faculty member.

Students choose their advisor and must obtain the latter's consent. If a student has difficulty finding an advisor they should approach the graduate committee coordinator who will try to assist them. A list of faculty members and their fields of interest can be found in Chapter 10 of the faculty's catalogue. Students can choose the topic of their project or paper, provided their advisor has approved it. Once an advisor and topic have been chosen, students are required to submit a project or seminar paper topic proposal form to the faculty graduate studies committee secretariat, stating the topic along with a brief description and signed by the advisor. The paper should be approximately 30 pages. Students are required to defend it before their advisor and the final weighted grade for the paper and exam will be sent to the Graduate School.

6.4 Duration of Studies

As stipulated in Regulation 25 of the Graduate School Regulations for master's studies:

[Technion Graduate School regulations.pdf#page=13](#)

7. Ph.D. Degree Procedures

Students seeking to enroll in a doctoral program should talk to faculty members and secure a dedicated advisor prior to submitting their application.

Students who have been admitted to the program are required to:

- Meet the special requirements set by the admissions committee (if any have been set).
- Take 8 graduate-level credits or at least 25 master's credits in the special doctoral track.
- Know Hebrew, English, and another language (Section 34.03).
- Submit a research proposal toward their candidacy exam and defend it before an examining committee.
- Submit a seminar paper and give a lecture on it at a time that will be published in the Technion's newsletter.
- Submit a research thesis and defend it before an examining committee.

Following the first stage of studies and after conducting a survey study on their research topic, students are required to submit a research proposal and take a candidacy exam (Section 37 of the Academic Graduate Studies Regulations). At the end of the exam, the examining committee may require the candidate to take certain courses as part of the quota mentioned above (at least 8 credits) or in addition to it. If the candidate passes the exam, they are required to conduct the research and meet all other requirements, including writing a research thesis and passing the final exam (Section 38).

8. Recommended Core and Elective Courses for M.Sc. and M.E in the Various Research Areas

8.1 Energy and Fluid Mechanics

a. Core courses	036002	Analytical Methods in Mechanical Eng. 2
	036032	Analytical Fluid Mechanics
	038504	Viscous Flow
	038712	Conduction Heat Transfer
	038715	Advanced Thermodynamics 1
	038717	Convective Heat Transfer
	038731	Radiation Heat Transfer
	036009	Heat & Mass Transfer
b. Elective courses	036003	Introduction to Continuum Mechanics
	036008	Compressible Flow
	036009	Heat & Mass Transfer
	036015	Finite Element Methods in Mech.eng. 1
	036038	Interfacial Transport Processes
	036052	Mechanics and Transport of Aerosols
	036061	Fluid-Particle Systems
	036074	Active and Passive Flow Control
	036076	Electrokinetics in Nano Micro-Fluidics
	036082	Internal Combustion Engine Fundamentals
	036086	Flow and Transport in Microdevices
	036096	Electrochemical Flow Systems
	038727	Numerical Methods in Mech. Engineering 1
	038782	Computational Fluid Dynamics
	038802	Experimental Methods in Micro Flows
	038807	Turbulence# Theory and Practice
	038810	Analytical Methods in Fluid Mechanics
	036010	Theory of Hydrodynamic Lubrication
	*****	Any core course not taken as a compulsory course.

8.2 Control and Dynamical Systems

a. Core courses	036002	Analytical Methods in Mechanical Eng. 2
	036005	Analytical Dynamics 1
	036012	Linear Control Systems
	036050	Nonlinear Control Systems
	106393	Matrix Theory
b. Elective courses	036007	Vibrations of Structures
	036026	Kinematics Dynamics & Control of Robots
	036027	Dynamics of Marine Structures
	036039	Control of Structures and Mechanical
	036042	Dynamics of Rotating Systems
	036047	Estimation of Stochastic Processes
	036048	Analysis of Nonlinear Vibrations.
	036049	Neural Networks for Control/diagnostic
	036050	Nonlinear Control Systems
	036063	Experimental Modeling of Systems
	036087	Hybrid Dynamics in Mechanical Systems
	036092	Biological Movement Control
	036709	Sampled Data Control Systems
	038781	Robust Guidance and Control Via Min-Max
	038786	Introduction to Chaotic Dynamical System
	038801	Models of Nonlinear Dynamics
	038806	Time-Delays in Control and Estimation
	108324	Elements of Modern Analysis for Electri.
	036013	Process Optimization
	108327	Functional Analysis for E.e.
	*****	Any core course not taken as a compulsory course.

8.3 Design, Production, CAD, and Robotics

a. Core courses	036002	Analytical Methods in Mechanical Eng. 2
	036005	Analytical Dynamics 1
	036015	Finite Element Methods in Mech.eng. 1
	036020	Computational Geometry 1
	036026	Kinematics Dynamics & Control of Robots
b. Elective courses	036004	Fracture Mechanics
	036014	Metal Forming Processes
	036041	Advanced Engineering Design 1
	036044	Robot Path-Planning and Sensor Based Nav
	036045	Computational Geometry and Cad Models 2
	036048	Analysis of Nonlinear Vibrations.
	036057	Info-Gap Anlaysis of Risk and Reliabilit
	036063	Experimental Modeling of Systems
	036072	Kinematics in Biomechanics and Robotics
	036081	Principles of Mems Design and Production
	036083	Decisions# Challenges and Implications
	038703	Design and Analysis of Experiments
	038785	Advanced Topics in Robotics
	*****	Any core course not taken as a compulsory course.

8.4 Mechanics of Materials

a. Core courses	036002	Analytical Methods in Mechanical Eng. 2
	036003	Introduction to Continuum Mechanics
	036005	Analytical Dynamics 1
	036015	Finite Element Methods in Mech.eng. 1
	038746	Mech. Behavior of Engineering Materials
b. Elective courses	036004	Fracture Mechanics
	036006	Stress Waves in Solids
	036007	Vibrations of Structures
	036016	Finite Element Methods in Mech.eng. 2
	036027	Dynamics of Marine Structures
	036048	Analysis of Nonlinear Vibrations.

		036058	Micromechanics of Solids 1
		036062	Contact Mechanics
		036063	Experimental Modeling of Systems
		036065	Electro/magneto Mech' for Actu/sensing
		036071	Biomechanics of Cells and Molecules
		036088	Computational Nanomechanics of Solids
		036090	Cell Mechanosensing
		036093	Mechanics of Composite Materials 1
		038742	Plasticity
		038786	Introduction to Chaotic Dynamical System
		038792	Cosserat Theories# Shells Rods Points
		038800	Anal. Modeling Meth. in Micro Systms
		038801	Models of Nonlinear Dynamics
		038805	Compt. Micromech. of Composite Mat.

8.5 Biomechanics

a.	Core courses	036015	Finite Element Methods in Mech.eng. 1
b.	Elective courses	036002	Analytical Methods in Mechanical Eng. 2
		036071	Biomechanics of Cells and Molecules
		036072	Kinematics in Biomechanics and Robotics
		036076	Electrokinetics in Nano Micro-Fluidics
		036086	Flow and Transport in Microdevices
		036090	Cell Mechanosensing
		036092	Biological Movement Control
		036095	Thermomechanics of Materials

In light of the special nature of this track, mechanics courses must be chosen according to the research topic in coordination with the advisor.

8.6 Optical Engineering

1. Core courses	036002	Analytical Methods in Mechanical Eng. 2
	036055	Linear Optics and Applications 2.
	036091	Micro Optomechanics
	038731	Radiation Heat Transfer
2. Elective courses	036015	Finite Element Methods in Mech.eng. 1
	036064	Advanced Topics in Mechanical Eng' 4
	036070	Nanooptics and Periodic Structures
	036091	Micro Optomechanics
	038715	Advanced Thermodynamics 1
	038727	Numerical Methods in Mech. Engineering 1
	046050	
	046052	Quantum Optoelectronics
	046249	Electro-Optic Systems
	046851	Semicon Lasers and Integ Photonic Device
	048873	Computer Vision
	048905	Nonlinear Optics and Its Applications
	116003	
	116217	Solid State Physics
	118136	Ultrafast Optics
	648010	Quantum Mechanics in Nanoscience
	648012	Statistical Thermodynamics
	648013	Nano Metric Transport Phenomena

9. List of Courses for an M.E. Degree (Lists A, B, and C)

For information about the courses in each semester offered by the Continuing Education Unit in Tel Aviv and Haifa, call 03–6962134 or 04–8294464, respectively.

9.1 List A: Foundational Courses (For All Specialization Fields)

Compulsory	036001	Analytical Methods in Mechanical Eng.1
	038789	Advanced Seminar/project in Mech. En.
Students are required to take one of these two courses	036015	Finite Element Methods in Mech.eng. 1
	038727	Numerical Methods in Mech. Engineering 1

9.2 List B: Managerial Courses (For All Specialization Fields)

Students can take up to five of these courses	036013 or 097324	Process Optimization or
	036057	Info-Gap Anlaysis of Risk and Reliabilit
	036083	Decisions# Challenges and Implications
	038703	Design and Analysis of Experiments
	096121	Reliability Engineering
	096124	Des. for Manufacturability and Assembly
	098430	

9.3 List 3: Courses by Specialization Field

1. Students are required to take at least five courses, including two core courses and three elective courses for all specialization fields.
2. See Section 8 for a list of core and elective courses.