# A Guidebook for ME Graduate Students

## Updated August 2025

## For the 2025–2026 Academic Year

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

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- 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-requisite or directly related to their chosen research field.* These studies prepare graduates for scientific work directed at research and development.

**Supplementary Requirements for Holders of a bachelor's degree Other than Mechanical Engineering**

In most cases, candidates will be required to complete a number of qualifying courses in the field of Mechanical Engineering. The scope of the supplementary studies and the exact composition of the required courses will be determined by the Faculty Graduate Admissions Committee, following a personal interview, and in accordance with the guidelines below:

**Supplementary Requirements for the Master of Science (MSc) Degree – "Master of Science in Mechanical Engineering" and "Master of Science"**

1. **Graduates of a four-year engineering degree (not mechanical engineering)** applying for a *Master of Science* degree without specifying the faculty name - **exempted from taking supplementary courses.**
2. **Graduates of a four-year engineering degree (not mechanical engineering)** applying for a *Master of Science in Mechanical Engineering*- **0–4 supplementary** courses will be required, depending on the applicant's academic background from the bachelor's degree and the extent of overlap with the compulsory courses in the BSc in Mechanical Engineering.
3. **Graduates of a three-year bachelor's degree** applying for a *Master of Science* degree without specifying the faculty name- **12-20 credit points** of supplementary courses will be required to ensure an appropriate academic background.

4. **Graduates of a three-year bachelor's degree** applying for a *Master of Science in Mechanical Engineering*- **at least 20 credit points** of supplementary courses will be required. Cases in which the supplementary requirement is close to 20 credit points will be those in which there is a high degree of overlap between the applicant's academic background from the three-year bachelor's degree and the compulsory courses in the BSc in Mechanical Engineering.

**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.

**Supplementary Requirements for Holders of a Bachelor's Degree Other than Mechanical Engineering**

In most cases, candidates will be required to complete a number of qualifying courses in the field of Mechanical Engineering. The scope and exact list of the supplementary courses will be determined by the Faculty Graduate Admissions Committee, following a personal interview, and in accordance with the guidelines below:

**Supplementary Requirements for the Master of Engineering (ME) Degree - "Master of Engineering in Mechanical Engineering" and "Master of Engineering"**

1. **Graduates of a four-year engineering degree (from another faculty)** applying for a *Master of Engineering* degree without specifying the faculty name- **no supplementary courses required**.
2. **Graduates of a four-year engineering degree (from another faculty)** applying for a *Master of Engineering in Mechanical Engineering*- **0-4 supplementary courses**, depending on the applicant's undergraduate background and the extent of overlap with the compulsory courses in the BSc in Mechanical Engineering.
3. **Graduates of a three-year bachelor's degree** - **no fewer than 20 credit points** of qualifying courses will be required.

**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.
- Completion of 30 credit points for the direct doctoral track, including an academic writing course in English for PhDs.
- 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.

**Statement of Objectives of the Faculty Committee for the Master's Curriculum**

The Faculty Committee for the Master's Degree Program has formulated the objectives of the research-based Master's degree, MSc, which combines a research thesis/project with advanced courses, as follows:

a) To expand knowledge and develop expertise in Mechanical Engineering.

b) To train the students for research and development work in industry and academia.

c) To develop and cultivate "soft" skills, including:

- Analytical and mathematical thinking.
- Identification, definition, and handling of complex problem-solving.
- Formulation of mathematical models to describe physical phenomena.
- Design, execution, and analysis of experiments.
- Integration of knowledge from diverse fields.
- Critical scientific thinking.
- Self-directed learning at a level required for independent research, such as reading scientific papers.
- Coding and design of numerical simulations.
- Additional skills such as entrepreneurship, creative thinking, and intercultural communication.

**Role and Objectives of Courses in the Research-Based Master's Degree:**

The role of the courses is to complement the thesis in achieving the objectives of the Master's degree outlined above, specifically:

a) Support the thesis, by creating a synergy with the research.

b) Expansion of knowledge and development of expertise in Mechanical Engineering.

c) Training in research and development work.

d) Assistance in the development and cultivation of "soft" skills, as detailed under the objectives of the Master's degree, section c.

### 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. The student must choose (at least) two course, approved by their advisor, from the "methods courses" list below:

**Faculty Courses:**

- 0360001 Analytical Methods in Mechanical Engineering 1
- 0360002 Analytical Methods in Mechanical Engineering 2
- 0360015 Finite Element Methods in Mechanical Engineering
- 0360063 Modeling of Experimental Systems
- 0360088 Computational Nano mechanics of Solids
- 0380782 Numerical Methods in Fluid Mechanics
- 0360106 Fundamentals of Real and Complex Analysis

**Courses Offered in other Faculties:**

- 198000 Asymptotic Methods
- 196013 Numerical Analysis
- 088104 Applied Mathematics in Aeronautical Engineering
- 086172 Numerical Methods in Aeronautics

**Notes:**

- In order to fulfill objective (b) of the course program ("expansion of knowledge and development of expertise in Mechanical Engineering"), the majority of courses taken within the Master's degree must be from the Faculty of Mechanical Engineering's course list.
- Accordingly, up to two courses offered outside the faculty may be taken subject to the advisor's approval.
- Any exception to this limit requires approval from the Graduate Studies Committee (GSC) based on a justified request from the student and a detailed recommendation from the advisor.

**Registration for Courses During Temporary Supervision:**
As a consequence of the above, registration for courses offered outside the faculty during the period of temporary supervision (prior to approval of the research topic) is not allowed.

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

**Requirements for Students to Complete a Minimum of 42 Credit Points:**

- **Compulsory foundational course:** Analytical Methods 1- 0360001
- **Compulsory foundational course:** One of the two computational courses- Finite Element Methods 1- 0360015 or Numerical Methods in Mechanical Engineering- 0380727. (If one of these courses is taken as a foundational course, it cannot also be counted as a core course.)
- Additional courses must be taken within one of the specialization tracks specified in Section 8, with at least two core courses and three elective courses in each track.
- **5 credits:** Seminar / Project- 0380789
- **2 credits:** Extended English course
- 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 |

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|---|---|---|---|
| | | 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<br>or<br>097324 | Process Optimization<br>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.