



TEL AVIV אוניברסיטת
UNIVERSITY תל אביב

Master's Degree in Environmental Engineering (Research Track)

Degree in

M.Sc. Environmental Engineering

Years:

2023-2024

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1. Overview

1.1. General Overview

Academic year 2023-2024 תשפ"ד

Research Track Master's Degree in Theoretical Environmental Engineering

The program's purpose is to train professionals in the field of Environmental Engineering who will integrate into industry, engineering, and consulting firms, and governmental or municipal organizations in engineering-executive and engineering-managerial roles.

The contribution of an environmental engineer in these frameworks includes: identifying and defining (qualitatively and quantitatively) environmental problems, setting goals and objectives for programs to address hazards, proposing, examining, selecting, and sometimes even developing technological solutions to environmental pollution problems. The knowledge required to meet these tasks comes from various and diverse disciplines and should ideally be based on an existing engineering background.

Therefore, the master's degree program is designed to build upon the undergraduate engineering studies with an additional layer of knowledge and appropriate tools the fields necessary for an environmental engineer.

Research and study areas in the program:

- Renewable energy (solar, wind, biofuels), energy storage
- Air pollution and control of emissions of organic pollutants, inorganic pollutants, and particulates into the air
- Carbon dioxide capture
- Treatment of municipal and industrial wastewater
- Water recycling, and desalination of brackish and seawater
- Solid waste treatment and control
- Remediation of contaminated soils
- Separation processes based on mass transfer
- Risk assessment in industrial processes
- Ionizing and non-ionizing radiation risks

- Wave and current dynamics in the sea
- Turbulent flow in the atmosphere
- Transport of pollutants in porous media, groundwater, and surface water, and dispersion of pollutants in the atmosphere
- Fuel transportation (gaseous and liquid) and environmental implications
- Desalination of brackish and seawater
- Transport of granular solids in suspension
- Rapid granular flow

Requirements for the Degree in the Research Track:

- Average final score of at least 75 and 24 academic credits.
- Seminar participation – totaling 14 hours.
- Authoring a thesis, totaling 12 hours, in accordance with the faculty's graduate regulations.

Admission requirements:

- Average final score of at least 75 and 36 academic credits.
- Seminar participation – 8 hours in total.
- Project- 3 academic credits.

Graduates will be granted:

M.Sc. in Environmental Engineering.

1.2. Curriculum Structure

3 credit hours

Mandatory - faculty classes

3 credit hours

Mandatory – department classes

9 credit hours

Program core classes

0-9 credit hours

Elective - environmental sciences

0-9 credit hours

Elective - engineering sciences

0-9 credit hours

Elective - flow and convection

0-9 credit hours

Elective - calculation and analysis methodology

0-9 credit hours

Elective - experimentation and measurement methodology

12 credit hours

Thesis

-

Thesis defense

12 credit hours

Departmental seminars

Degree hour cap: 24

- The text regarding registration and admission requirements, in addition to the general university conditions, is published by the Registration Center.

1.3. Regulations

[Master's degree regulation \(Hebrew\)](#)

2. Curriculum

Study Stages

Generally, master's degree studies at the Faculty of Engineering include two stages:

1. Accumulation
2. Regular Studies

Full-time students will be admitted directly to the "Regular Studies" stage. Candidates for the master's degree who require preparatory studies will be admitted to the preparatory studies.

Accumulation Stage

- The accumulation stage must be completed within a maximum of three academic years.
- At least 3 courses must be taken each year during the accumulation stage.
- A student in the accumulation stage must successfully complete the school's mandatory courses (including re-enrollment after failure, if required) no later than the end of the fourth semester of their studies. It is therefore recommended to enroll in all mandatory courses during the first year of studies, so that any failure can be corrected by the end of the second year of studies.
- The accumulated courses must have an average grade of at least 70, and all mandatory school courses must be successfully completed.
- **A student in the accumulation stage who transitions to full-time studies will move to the "Regular Studies" status.**
- **In any study path, the student must take at least 25% of the courses in the "Regular Studies" status.**

Preparatory Studies

Candidates lacking the required academic background for Environmental Engineering studies will be assigned to an appropriate preparatory program. Usually, the required preparatory courses are:

- 0542.3620 Heat Transfer
- 0542.2500 Fluid Mechanics 1

- 0542.2600 Thermodynamics 1
- 0509.2846 Partial Differential Equations

Transition Conditions

To transition to the Master's degree in the "Regular Studies" status, students must complete all preparatory courses with a grade of at least 70 and an average grade of at least 80 in the preparatory courses. Additionally, they must meet any other conditions set by the faculty.

- Final failure in two consecutive enrollments in any of the preparatory courses will result in termination of studies.
- Outstanding undergraduate students may be admitted to full-time studies and receive a living stipend.

2.1. Faculty Mandatory Classes

It is mandatory to study one of the courses in coordination with the instructor.

3 total semestral hours | 3 total weighted semestral hours

<u>0510-5001</u>	Class method	Total Hours	Weighted Score
Differential and Integral Equations	3 credit hours	3	3

<u>0510-5002</u>	Class method	Total Hours	Weighted Score
Functional Analysis	3 credit hours	3	3

<u>0540-5001</u>	Class method	Total Hours	Weighted Score
Mathematical Methods in Engineering	3 credit hours	3	3

2.2. Departmental Mandatory Classes

3 total semestral hours | 3 total weighted semestral hours

<u>0540-5300</u>	Class method	Total Hours	Weighted Score
Advanced Fluids Mechanics	3 credit hours	3	3

Prerequisites

Fluid Mechanics (1) (0542-2500) and

Mathematical Methods in Engineering (0540-5001)

2.3. Program Core Classes

It is mandatory to take 6 core classes in coordination with the instructor.

18 total semestral hours | 18 total weighted semestral hours

<u>0542-4122</u>	Class method	Total Hours	Weighted Score
Pollutants Transfer	Class and practice - 3 credit hours	3	3

Prerequisites

Fluid Mechanics (1) (0542-2500)

<u>0545-5101</u>	Class method	Total Hours	Weighted Score
Air Pollution	3 credit hours	3	3
<ul style="list-style-type: none"> • Will not open in 2023-2024 			

Prerequisites

Fluid Mechanics (1) (0542-2500)

<u>0545-5110</u>	Class method	Total Hours	Weighted Score
Solar Energy	3 credit hours	3	3
<ul style="list-style-type: none"> • Will not open in 2023-2024 			

Prerequisites

Basic engineering chemistry (0509-1815)

Heat Transfer (0542-3620) and

Thermodynamics (1) (0542-2600)

<u>0545-5201</u>	Class method	Total Hours	Weighted Score
Municipal and industrial wastewater treatment (1)	3 credit hours	3	3

Prerequisites

Fluid Mechanics (1) (0542-2500)

<u>0545-5203</u>	Class method	Total Hours	Weighted Score
Water Treatment Technologies • Will not open in 2023-2024 Prerequisites Basic engineering chemistry (0509-1815)	3 credit hours	3	3
<u>0545-5301</u>	Class method	Total Hours	Weighted Score
Hazardous Materials Handling Risk Assessment • Will not open in 2023-2024 Introduction to mechanical and material engineering statistics (0509-2805)	3 credit hours	3	3
<u>0545-5401</u>	Class method	Total Hours	Weighted Score
Solid Waste Treatment	3 credit hours	3	3
<u>0545-5501</u>	Class method	Total Hours	Weighted Score
Salty and brackish water desalination • Will not open in 2023-2024	Class and practice - 3 credit hours	3	3

2.4. Elective Classes – Environmental Sciences

Elective Courses:

- A total of 9 credits must be accumulated from all elective courses in the program, in coordination with the instructor.
- Non-departmental Elective Courses: Up to 9 credits can be taken outside the Environmental Engineering curriculum. Courses outside the faculty will be approved by a permanent advisor or a representative of the study unit in the unit committee. The courses have to be related to the student's curriculum or research program.

- A course outside the curriculum will receive credit and weighting according to the parent department and can grant up to 3 credits.
- In addition to the courses offered by the department, students in the track will be offered, considering their previous background and in coordination with the instructor, courses on environmental topics from other departments in the university.

Example Courses from the School of Environmental Studies:

- 0910.1000 Environmental Law
- 0910.3000 Topics in Environmental Quality
- 0910.4042 Environmental Nanotechnology
- 1092-4011 How to Achieve the SDGs - Evidence from the Field
- 1092-4011 Technology for Sustainable Development

Selected courses from the undergraduate program defined as “equivalent level” will be approved as graduate courses- provided, they or similar ones, were not part of the undergraduate degree, as detailed below:

- **Research Path:** Up to three courses with a total of 9 credits. Additional course can be approved by the Academic Affairs Committee (up to 4 courses and 12 credits).

Updates

(1). 05/09/2023 11:18:22

0-9 total weighted semestral hours

0542-4125	Class method	Total Hours	Weighted Score
Introduction to Environmental Engineering • equivalent level	Class & practice 3 credit hours	3	3
Prerequisites			
Basic Engineering Chemistry (0509-1815) and Fluid Mechanics (1) (0542-2500)			

<u>0540-5325</u>	Class method	Total Hours	Weighted Score
Micro Technologies and Nano-Flow for Bio-Medical and Environmental Applications	3 credit hours	3	3
Prerequisites			
Fluid Mechanics (1) (0542-2500)			

<u>0540-6330</u>	Class method	Total Hours	Weighted Score
Flow in Natural Gas and Oil Reservoirs	3 credit hours	3	3
Prerequisites			
Fluid Mechanics (1) (0542-2500) or Advanced Fluid Mechanics (0540-5300)			

2.5. Elective Classes – Engineering Sciences (general)

9 credits must be accumulated from all elective courses, in coordination with the instructor.

0-12 total weighted semestral hours

<u>0510-7003</u>	Class method	Total Hours	Weighted Score
Scientific Writing in English	Class - 2 credit hours Personal guidance – 2 credit hours	4	0
<ul style="list-style-type: none"> • Personal guidance – no credits 			

<u>0540-6341</u>	Class method	Total Hours	Weighted Score
Nature-Inspired Movements and Sensors	3 credit hours	3	3
Prerequisites			
Programming (Python) (0509-1820)			

<u>0540-6501</u>	Class method	Total Hours	Weighted Score
Heat Transfer - Convection	3 credit hours	3	3
Prerequisites			
Heat Transfer – Conduction (0540-5500)			

<u>0542-4123</u>	Class method	Total Hours	Weighted Score
Heat and Matter Transfer Processes	Class and practice - 3 credit hours	3	3
<ul style="list-style-type: none"> • equivalent level 			
Prerequisites			
Fluid Mechanics (1) (0542-2500) and Heat Transition (0542-3620)			

<u>0553-7000</u>	Class method	Total Hours	Weighted Score
Practical Ethics for Engineering and Science Students	3 credit hours	3	3
equivalent level			
Prerequisites			
Fluid Mechanics (1) (0542-2500) and Heat Transition (0542-3620)			

2.6. Elective Classes – Transport Processes in the Environment

9 credits must be accumulated from all elective courses, in coordination with the instructor.

0-9 total weighted semestral hours

<u>0540-6301</u>	Class method	Total Hours	Weighted Score
Viscous Flow	3 credit hours	3	3
Prerequisites			
Advanced Fluid Mechanics (0540-5300)			

<u>0540-6322</u>	Class method	Total Hours	Weighted Score
Boundary Layer Flow Control	3 credit hours	3	3
Prerequisites			
Fluid Mechanics (1) (0542-2500) or Advanced Fluid Mechanics (0540-5300)			

<u>0540-6340</u>	Class method	Total Hours	Weighted Score
Advanced Topics in Ocean Waves: From Theory to Experiment	3 credit hours	3	3
<ul style="list-style-type: none"> • equivalent level 			
Prerequisites			
Fluid Mechanics (1) (0542-2500)			

2.7. Elective Classes – Computational Methods and Analysis

9 credits must be accumulated from all elective courses, in coordination with the instructor.

0-9 total weighted semestral hours

<u>0540-5600</u>	Class method	Total Hours	Weighted Score
System Design	3 credit hours	3	3
Prerequisites			
Engineering Design: Introduction and methodology (0542-4422)			

<u>0542-4391</u>	Class method	Total Hours	Weighted Score
Laboratory in Numerical Simulations of Flow and Heat Transfer	Class - 3 credit hours Laboratory - 1 credit hours	3	3
<ul style="list-style-type: none"> • equivalent level, grants 3 credits 			

Prerequisites

Fluid Mechanics (1) (0542-2500)
and **Heat Transition** (0542-3620)

2.8. Elective Classes – Experimental Methods and Measurement

9 credits must be accumulated from all elective courses, in coordination with the instructor.

0-9 total weighted semestral hours

<u>0540-6314</u>	Class method	Total Hours	Weighted Score
Experimental Engineering	3 credit hours	3	3

2.9. Thesis

Total 12 credit hours | Total 0 weighted credit hours.

2.10. Thesis Defense

Students in the coursework track are not required to give an MSc defense. Those that

2.11. Departmental Seminar

It is required to participate in 14 departmental seminars during the course of the degree and to present a seminar.

3. Timetable – Academic Year 2023-2024

3.1. Faculty Mandatory Classes

Functional Analysis [0510-5002](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	2 nd	Prof. Goerge Wise		Thursday 15:00-18:00

The course is presented in English

Mathematical Methods in Engineering [0540-5001](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	1 st	Prof. Lior Madina	Social Work School building 056	Tuesday 16:00-19:00

The course is presented in English

3.2. Departmental Mandatory Classes

Advanced Fluid Mechanics [0540-5300](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	2 nd	Prof. Alexander Gelfgat		Thursday 16:00-19:00

The course is presented in English

3.3. Program Core Classes

Pollutants Transfer [0542-4122](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
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01	Lecture and practice	Weekly	1 st	Prof. Ines Zucker	Wolfson building – mechanical engineering 238	Wednesday 16:00-20:00
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Air Pollution [0545-5101](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
01	Lecture	Weekly	1 st	Prof. Amos Ullmann	Engineering classes building 207	Tuesday 16:00-19:00

Water Treatment Technologies [0545-5203](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
01	Lecture	Weekly	2 nd	Prof. Hadas Mamane Steindel		Tuesday 16:00-19:00

Risk Assessment in Handling Hazardous Materials [0545-5301](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
01	Lecture	Weekly	2 nd	Dr. Eliyahu Stern		Sunday 1500-18:00

Solid waste treatment [0545-5401](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
01	Lecture	Weekly	1 st	Mr. Ilan Nissim	Engineering classes building 207	Sunday 17:00-20:00

3.4. Elective Classes – Environmental Sciences

Introduction to Environmental Engineering [0542-4125](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	1 st	Prof. Hadas Mamane Steindel, Mr. Barak Halpren	Engineering auditorium and flow labs 020	Monday 16:00-20:00

Micro Technologies and Nano-Flow for Bio-Medical and Environmental Applications [0540-5325](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	1 st	Prof. Gilad Yossifon		??? ??:00-??:00

Flow in Natural Gas and Oil Reservoirs [0540-6330](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	2 nd	Dr. Avraham Rabinovich		Monday 15:00-18:00

3.5. Elective Classes – Engineering Sciences (general)

Scientific Writing in English [0510-7003](#)

Gr-oup	Class method	Frequ-ency	Sem-ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	1 st	Mrs. Monica Broido	Engineering classes building 103	Wednesday 14:00-16:00

Online course

<u>02</u>	Personal guidance	Weekly	1 st		Program and computer engineering building 010	Wednesday 14:00-16:00
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Online course

03 Lecture Weekly 2nd Wednesday
16:00-18:00

Online course

04 Personal Weekly 2nd Wednesday
guidance 16:00-18:00

Online course

Nature-Inspired Movements and Sensors [0540-6341](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
01	Lecture	Weekly	2 nd	Prof. Yosef Yuval		Monday 15:00-18:00

Heat Transfer - Convection [0540-6501](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
01	Lecture	Weekly	1 st	Prof. Alexander Gelfga	Program and computer engineering building 103	Thursday 16:00-19:00

Heat and Matter Transfer Processes [0542-4123](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
01	Lecture and practice	Weekly	2 nd	Dr. Roy Kushnir		Sunday 14:00-16:00 Tuesday 14:00-16:00

Practical Ethics for Engineering and Science Students [0553-7000](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
01	Lecture	Weekly	2 nd	Prof. Israel Gannot		Wednesday 15:00-18:00

3.6. Elective Classes – Transport Processes in the Environment

Viscous Flow [0540-6301](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	2 nd	Prof. Gilad Yossifon		Wednesday 16:00-19:00

Advanced Topics in Ocean Waves: From Theory to Experiment [0540-6340](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture and laborato- ry	Weekly	2 nd	Prof. Izhaq- Yaron Toledo		Thursday 16:00-19:00

3.7. Elective Classes – Calculation and Analysis Methodology

System Engineering [0540-5600](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	2 nd	Prof. Yoram Reich		Tuesday 16:00-19:00

Laboratory in Numerical Simulations of Flow and Heat Transfer [0542-4391](#)

Gr- oup	Class method	Frequ- ency	Sem- ester	Lecturer	Location	Date
<u>01</u>	Lecture	Weekly	1 st	Dr. Gil Marom	???	Wednesday 14:00-16:00

02	Laboratory	Weekly	1 st	Dr. Gil Marom, Mr. Alexander Yurishchev	Wednesday 16:00-19:00
03	Lecture	Weekly	2 nd	Dr. Gil Marom	Wednesday 15:00-117:00
04	Laboratory	Weekly	2 nd	Dr. Gil Marom	Wednesday 17:00-20:00

3.8. Elective Classes - Experimentation and Measurement Methodology

3.9. Project (coursework-track only)

Students in the coursework-only track are no longer required to complete a research project in fulfillment of their degree. Students in the coursework-track may either complete a research project approved by the department or complete a 3 credit hour course in lieu of the project.

4. Exams and Assignments Schedule

Course Number	Course	Sem-ester	Group	Assessment Type	Sitting	Date
0510-5002	Functional Analysis	2 nd	01	Final exam	1 st	28/06/2024 Friday 09:00
					2 nd	02/08/2024 Friday 09:00
0540-5001	Differential and Integral Equations	1 st	01	Final exam	1 st	26/01/2024 Friday 09:00
					2 nd	01/03/2024 Friday 09:00
0540-5300	Advanced Fluids Mechanics	2 nd	01	Final exam	1 st	02/07/2024 Tuesday 14:00
					2 nd	30/07/2024 Tuesday 14:00
0542-4122	Pollutants Transfer	1 st	01	Final exam	1 st	14/02/2024 Wednesday 09:00
					2 nd	22/03/2024 Friday 09:00
0545-5101	Air Pollution	1 st	01	Final exam	1 st	01/02/2024 Thursday 14:00
					2 nd	26/02/2024 Monday 14:00
0545-5203	Water Treatment Technologies	2 nd	01	Final exam	1 st	04/07/2024 Thursday 14:00
					2 nd	08/08/2024 Thursday 14:00
0545-5301	Hazardous Materials	2 nd	01	Final exam	1 st	17/07/2024 Wednesday 14:00

	Handling Risk Assessment				2 nd	20/08/2024 Tuesday 14:00
0545-5401	Solid Waste Treatment	1 st	01	Final exam	1 st 2 nd	29/01/2024 Monday 14:00 21/02/2024 Wednesday 14:00
0540-5325	Micro Technologies and Nano-Flow for Bio-Medical and Environmental Applications	1 st	01	House assignment	1 st	
0540-6330	Flow in Natural Gas and Oil Reservoirs	2 nd	01	House exam	1 st	
0510-7003	Scientific Writing in English	1 st	01 02 03	Other Other Other	1 st 1 st 1 st	
0540-6341	Nature-Inspired Movements and Sensors	2 nd	01	Project	1 st	
0540-6501	Heat Transfer - Convection	1 st	01	Final exam	1 st 2 nd	08/02/2024 Thursday 14:00 03/03/2024 Sunday 14:00
0542-4123	Heat and Matter Transfer Processes	2 nd	01	Final exam	1 st 2 nd	19/07/2024 Friday 09:00 12/08/2024 Monday 09:00

0553-7000	Practical Ethics for Engineering and Science Students	2 nd	01	House assignment	1 st	
0540-6301	Viscous Flow	2 nd	01	Final exam	1 st 2 nd	08/07/2024 Monday 14:00 05/08/2024 Monday 14:00
0540-6340	Advanced Topics in Ocean Waves: From Theory to Experiment	2 nd	01	Final exam	1 st 2 nd	11/07/2024 Thursday 14:00 18/08/2024 Sunday 14:00
0540-5600	System Design	2 nd	01	House assignment	1 st	
0542-4391	Laboratory in Numerical Simulations of Flow and Heat Transfer	1 st	02	Other	1 st	