UNIVERSITY OF WEST ATTICA

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

M.Sc. by Research in Electrical - Electronics Engineering

STUDY GUIDE

Academic Year 2025-26

Athens-Egaleo, January 2025

M.Sc. by Research in Electrical - Electronics Engineering

Department of Electrical & Electronics Engineering

Faculty of Engineering

University of West Attica (UNIWA)

Secretariat of the Department:

250, Thivon str., Athens-Egaleo, GR-12241, Greece

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E-mail: eee@uniwa.gr & mres@uniwa.gr

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M.Sc. Program Study Guide

The present Study Guide of the M.Sc. by Research in Electrical - Electronics Engineering (MRES), offered by the Department of Electrical & Electronics Engineering (DEEE), Faculty of Engineering, University of West Attica (UNIWA), is aimed at aiding and guiding enrolled graduate students throughout their study in this program.

In the Study Guide, overarching principles of operation and the internal structure of UNIWA, DEEE and the particular graduate program are described in detail. Useful information is provided on academic procedures, on administrative and technical staff and the services they support within the M.Sc. Program, on the rules and regulations enrolled students should abide by, on the various provisions and services available to graduate students and, generally, on the rights and responsibilities of all parties involved in this M.Sc. Program – students, teachers and staff. The guide is especially useful regarding all procedures relevant to student enrollment, study, assessment and graduation.

The present Study Guide refers to academic year 2025-26. The guide is regularly updated by DEEE and the M.Sc. Program administration so as to reflect annual changes, and it is made available to all interested parties online in the M.Sc. Program website (mres.eee.uniwa.gr).

Foreword

M.Sc. by Research in Electrical - Electronics Engineering (MRES) is a departmental graduate study program offered by the Department of Electrical & Electronics Engineering (DEEE), Faculty of Engineering, University of West Attica (UNIWA) in the Ancient Olive Grove Campus, in Athens-Egaleo, Greece. Starting in academic year 2025-2026, the program is offered exclusively in English.

UNIWA was instituted in March 2018, when the Greek Ministry of Education proceeded to merge the two major Universities of Applied Sciences operating in Athens and in Piraeus into a new University, as per national law 4521/2018. DEEE is one of the 8 departments of the Faculty of Engineering, which in turn is one of the six faculties in UNIWA. DEEE activities are all hosted in one of the three UNIWA campuses, namely, Ancient Olive Grove campus which is located in 250, Thivon str., GR-12241 Athens-Egaleo, Greece. DEEE is spread across Buildings A, B and Z where all teaching and research activities take place. Operating in a single location is advantageous as it facilitates collaborations among academic staff members and minimizes student transportation.

Today, DEEE is the largest and better staffed UNIWA department and, in fact, one of the better staffed engineering departments nationwide, boasting 61 academic staff members, 10 Laboratory Teaching Staff members, 6 Technical Laboratory Staff members and 6 Administrative Staff members in the Secretariat of DEEE. This level of staffing ensures the sustainability both of DEEE and of the study programs it offers, which is a critical advantage for all graduates, current and future. Currently, DEEE serves approximately 6,500 undergraduate students (3,000 out of them are active), around 150 master degree students, more than 100 PhD candidates and 6 PostDoctoral researchers.

1. UNIVERSITY OF WEST ATTICA

1.1 A brief presentation of the University of West Attica

UNIWA foundation and organization

The University of West Attica (UNIWA) was founded in March 2018 as per the Greek Law 4521/2018. The new University was in fact a merger of two long-standing Universities of Applied Sciences, one in Athens and one in Piraeus. The Greek National School of Public Health joined the newly established university in 2019. UNIWA is a public law legal entity reporting to the Greek Ministry of Education. Academic staff are public officials who enjoy freedom and independence in their office. All other staff categories enjoy status and rights as per the provisions of national legislation.

UNIWA operates with high educational and research standards and strives to respond to the ever-increasing demands of modern society for the formation of competitive graduates, equipped with a solid scientific and technological background.

UNIWA is the third largest university in the country in terms of student numbers. It has approximately 57,800 undergraduate, 5,500 postgraduate and 780 doctoral students. UNIWA operates in three campuses within the metropolitan region of Athens:

- *Egaleo Park Campus*, Agiou Spyridonos str., GR-12243 Athens-Egaleo, Greece, tel. +30 210 538-5100. Egaleo Park Campus lays in the administrative boundaries of the Municipality of Egaleo, surrounded by the streets Milou, Agiou Spyridonos, Dimitsanis, and Edessis.
- *Ancient Olive Grove Campus*, 250, Thivon & P. Ralli str., GR-12241 Athens-Egaleo, Greece, tel. +30 210 538-1100. Ancient Olive Grove Campus is also located in the Municipality of Egaleo, on Petrou Ralli and Thivon Streets, on the border of the historic Athens Olive Grove, where Ancient Athenian Philosophers gave academic lectures.
- *Athens Campus*, 196, Alexandras Ave., GR-11521 Athens, Greece, tel. +30 213 2010100. Athens Campus is located in the Municipality of Athens, and is housed in the premises of the former National School of Public Health. This is a building of particular historical value that underwent restoration works a few years ago.

Today, UNIWA is comprised of 27 departments, organized into 6 Faculties that cover a wide range of disciplines:

1. Faculty of Applied Arts and Culture,
2. Faculty of Engineering.
3. Faculty of Food Sciences,
4. Faculty of Health and Welfare Sciences,
5. Faculty of Management, Economics and Social Sciences, and
6. Faculty of Public Health.

Collectively, UNIWA Faculties and Departments cover a broad spectrum of modern sciences, including social, administrative and economic sciences, engineering, health and welfare, food science and art studies.

Figure 1. UNIWA Egaleo Park Campus, Library building, interior view.

Figure 2. UNIWA Ancient Olive Grove Campus, main entrance on 250, Thivon str.

UNIWA employs over 600 members of academic staff, 140 members of Laboratory Teaching/Technical Staff and 350 members of administrative staff, who carry out the various teaching, research and administration tasks. The vast majority of the staff is tenured, highly qualified and experienced. These features along with modern infrastructure, premises and equipment, ensure the sustainability and further academic development of UNIWA.

Undergraduate studies are organized in

- 4-year study programs, leading to degrees at Level 6 of the EQF/NQF, and
- 5-year study programs, leading to degrees at Level 7 of the EQF/NQF ('Integrated Masters').

UNIWA also offers graduate study programs (Master Degrees at Level 7 of the EQF/NQF) PhD Studies and PostDoctoral Research positions.

UNIWA Mission

The mission of UNIWA is to excel in education across all fields of study of its Faculties and Departments, to excel in research for the generation of new knowledge with strong societal impact and thus gain global recognition, as well as to promote culture, art and civilization.

UNIWA Vision

The vision of the UNIWA is to attain the status of a nationally and globally recognized dynamic public academic institution and to offer its staff and students a modern, progressive and inclusive environment for work and study.

UNIWA Strategy

The main strategic directions of UNIWA, defined within the institutional strategic plan, are expressed through the implementation of specific goals aimed at accomplishing the mission of the university. To this end, a set of efficiency indices are adopted, monitored and evaluated by UNIWA administration.

In brief, UNIWA strategic directions are:

- Excellence in Educational,
- Research Development,
- Digital Transformation,
- Improvement of the Academic Environment,
- Accountability and Transparency,
- Extroversion – Internationalization,
- Sustainability and Sustainable Management of Resources, and
- Quality Assurance.

UNIWA Quality Policy

UNIWA has established a policy and relevant procedures for quality assurance, as a part of its Strategic Planning, as approved in the 9th meeting of the internal UNIWA Quality Assurance Unit (05.05.2020) and endorsed in the 4th meeting of UNIWA Senate (08.06.2020).

The UNIWA Quality Policy Statement details the rules and procedures of the Internal Quality Management System (IQM System) aimed at bringing UNIWA to the status of an example of innovation and excellency and thus placing it among the top-ranked academic institutions at the national and international scale.

For more details on UNIWA Quality Policy, the interested reader is referred to https://modip.uniwa.gr/en/diasfalisi-poiotitas/politiki-poiotitas/

Lines of Action

Following the core philosophy of both its mission and vision, UNIWA focuses on creating added value along the following lines of actions:

- provision of high quality educational services,
- conduction of original scientific research,
- dissemination of "know-how" and best practices,
- production and dissemination of scientific knowledge,
- development of active synergies among society, labor market and academia.

UNIWA basic regulations

Besides national legislation (Greek Law 4957/2022 and subsequent legislation, as they stand) a set of internal regulations and procedures are adopted and put forth in UNIWA in order to ensure the smooth and effective educational and administrative operation of the university as well as the cooperation of all members of the academic community:

- UNIWA Internal Regulation (Greek Gov. Gazette 4621/B/21-10-2020),
- UNIWA Organization – provisional (Greek Gov. Gazette 4607/B/18-07-2023),
- UNIWA Graduate Studies Regulation (Greek Gov. Gazette 4861/B/03-08-2023),
- UNIWA PhD Studies Regulation (Greek Gov. Gazette 2233/B/15-04-2024).

Furthermore, UNIWA has adopted a set of more specific regulations, including Dissertation/Diploma Thesis Regulation, Student Internship Regulation (https://www.uniwa.gr/en/studies/internship-opportunities/), etc.

1.2 Academic Calendar

The academic year starts on September 1st and ends on August 31st of the next calendar year. The educational activities of each academic year are arranged in two academic semesters, the Winter one and the Spring one. Each academic semester comprises 13 weeks of teaching followed by an examination period of 3 weeks. The academic calendar gives all dates of interest to students and staff, including:

- Teaching of classes,
- Examination periods for Winter Semester courses, Spring Semester courses, and September period for re-sit in winter term or spring term courses,
- Christmas, Easter and national holidays.

The academic calendar is set up and endorsed by UNIWA Senate and is announced before the commencement of each academic year. The dates for academic year 2024-25 follow:

- ***Winter Semester***

  Start date: 30/09/2024

  End date: 14/02/2025 (Winter Semester Exam period included – 3 weeks)

  Winter Semester Holidays (no classes are held during Holidays):

  14 September 2024 (Religious holiday)

  28 October 2024 (National holiday)

17 November 2024 (National holiday)

23 December 2024 – 6 January 2025: Christmas and New Year Holidays

30 January 2025 (Religious holiday)

- ***Spring Semester***

  Start date: 24/02/2025

  End date: 11/07/2025 (Spring Semester Exam period included – 3 weeks)

  Spring Semester Holidays (no classes are held during Holidays):

  3 March 2025 (Religious holiday – Clean Monday)

  25 March 2025 (National holiday)

  14 – 27 April 2025: Easter Holidays

  1 May 2025 (Social holiday – Labour Day)

  9 June 2025 (Religious holiday)

- ***September Examination Period (re-sit period for winter and spring courses)***

  Start date: 01/09/2025

  End date: 19/09/2025 (Spring Semester Exam period included – 3 weeks)

The academic calendar is updated when needed. Its current version may be found online at: https://erasmus.uniwa.gr/en/erasmus/academic-calendar/

2. The Department of Electrical and Electronics Engineering

2.1 The Department in brief

2.1.1 Historical Data

The Department of Electrical and Electronics Engineering was established in March 2018, as per Greek Law 4521/2018, as a merger of four departments that operated within the former Universities of Applied Sciences of Athens and of Piraeus:

- the Department of Electrical Engineering in the Piraeus University of Applied Sciences,
- the Department of Electronics Engineering in the Piraeus University of Applied Sciences,
- the Department of Electronics Engineering in the Athens University of Applied Sciences, and
- the Department of Energy Technology Engineering in the Athens University of Applied Sciences (Division of Energy).

2.1.2 Premises and access

DEEE operates in the Ancient Olive Grove UNIWA campus, located in the municipality of Egaleo, on 250, Thivon and P. Ralli str., within the area covered by the Olive Grove of the ancient city of Athens.

Figure 3. Aerial photo of the Ancient Olive Grove UNIWA campus – P. Ralli street view.

All DEEE activities are hosted in Buildings A, B and Z of the campus. Access to the premises is either through the Central Gate on 250, Thivon str., or the two side gates on 78, P. Ralli str.

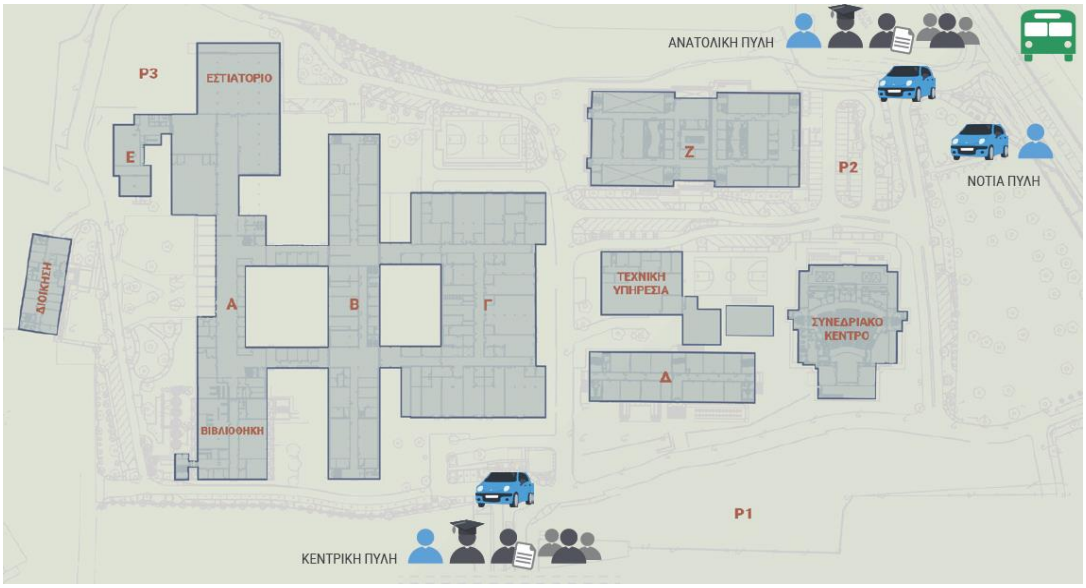

Figure 4. Ancient Olive Grove UNIWA campus plan.

Bus lines that service the Ancient Olive Grove campus and closer bus stops are:

- FIX bus stop (on P. Ralli str., direction from Athens to Nikea):
  - Bus line 829 incoming from Egaleo Metro Station (Cyclic line: UNIWA-Ancient Olive Grove campus – Egaleo Metro Station – UNIWA-Egaleo Park campus – Egaleo Metro Station)
  - Bus line 21 incoming from Athens-Omonia Sq. (Cyclic line: Nikea – P. Ralli str. – Athens-Omonia Sq. – P. Ralli str. – Nikea)

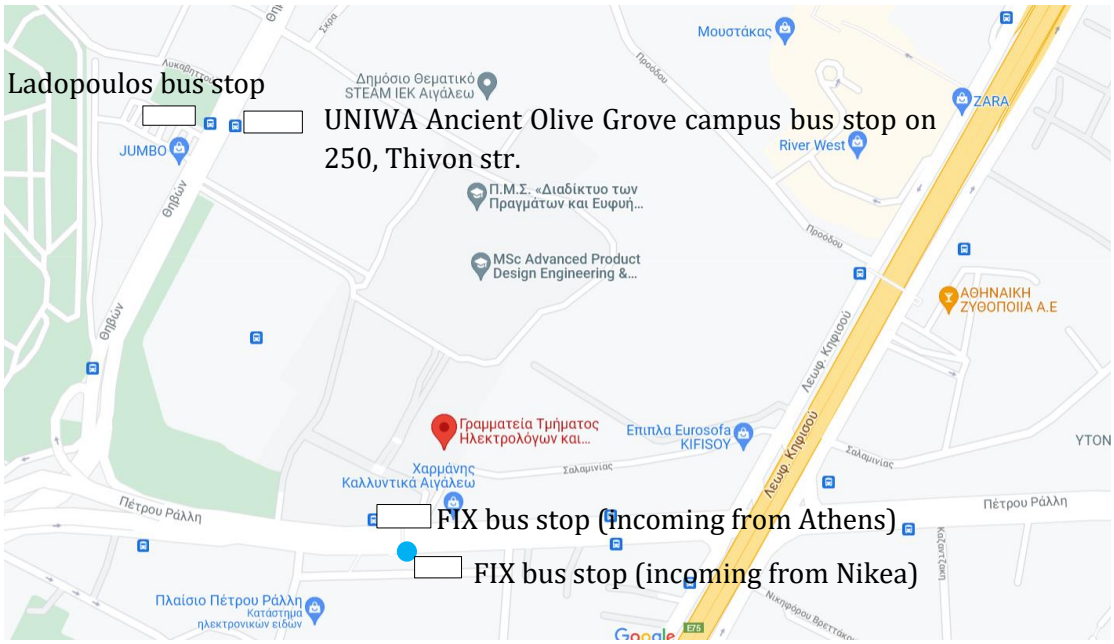

Figure 5. Bus stops that service Ancient Olive Grove.

- FIX bus stop (on P. Ralli str., direction from Nikea to Athens):
  - Bus line 21 incoming from Nikea (Cyclic line: Nikea – P. Ralli str. – Athens-Omonia Sq. – P. Ralli str. – Nikea)

- UNIWA-Ancient Olive Grove bus stop (in campus):
  - Bus line 829 incoming from Egaleo Metro Station (Cyclic line: UNIWA-Ancient Olive Grove campus – Egaleo Metro Station – UNIWA-Egaleo Park campus – Egaleo Metro Station)
- UNIWA-Ancient Olive Grove bus stop (on 250, Thivon str., direction Piraeus to Egaleo):
  - Bus line 829 to Egaleo Metro Station (Cyclic line: UNIWA-Ancient Olive Grove campus – Egaleo Metro Station – UNIWA-Egaleo Park campus – Egaleo Metro Station)
  - Bus line 703 to St. Eleftherios (Piraeus – St. Eleftherios – St. Anargyroi)
  - Bus Line 803 to Haidari Forest (Piraeus – Haidari)
  - Bus Line 845 to Elefsis (Piraeus – Elefsis via Thivon str.)
  - Bus Line 852 to Egaleo Metro Station (Cyclic line: Neapolis – Egaleo Metro Station)
- Ladopoulos bus stop (on 250, Thivon str., direction Egaleo to Piraeus):
  - Bus line 703 incoming from St. Eleftherios (Piraeus – St. Eleftherios – St. Anargyroi)
  - Bus Line 803 incoming from Haidari Forest (Piraeus – Haidari)
  - Bus Line 845 incoming from Elefsis (Piraeus – Elefsis via Thivon str.)
  - Bus Line 852 incoming from Egaleo Metro Station (Cyclic line: Neapolis – Egaleo Metro Station)

Alternatively, UNIWA Ancient Olive Grove campus is accessible on foot, by a 30-minute walk from Egaleo Metro Station, via Iera Odos and Thivon street to the campus Central Gate and vise-versa.

2.1.3 Contact DEEE

DEEE contact point is the Secretariat of the Department with the following contact details:

Department of Electrical and Electronics Engineering – Secretary Office
Building Z, 2nd floor, Room ZB-213
Ancient Olive Grove campus
University of West Attica
250, Thivon str. & P. Ralli, GR-12241 Athens-Egaleo, Greece

Tel: +30 210 538-1225
E-mail: eee@uniwa.gr

Office hours for the students and the general public are held on Tuesday – Wednesday – Thursday, 12:00-14:00, official holidays as per the UNIWA academic calendar excluded. Students and the general public may contact the Secretariat by e-mail while online access to certain services is allowed for enrolled students who can use their institutional credentials to log in the UNIWA Student Registry.

2.2 DEEE Objectives

DEEE offers a 5-year undergraduate engineering curriculum as per Greek Gov. Gazette 2323/13-6-2019 on the discipline of Electrical and Electronics Engineering which includes the fields of Electric Energy Systems for the production, transport, distribution and control of electric energy from conventional or renewable sources, urban and

industrial building energy systems, sustainable energy systems and technologies, wire- and wireless communications and communication networks, data networks and internets, computer systems, microcomputers, embedded systems hardware and software, electronic devices and micro- / nano-electronic technologies. Upon successful completion of the study program, DEEE confers to the graduate the Diploma in Electrical and Electronics Engineering which is a 5-year Integrated Master Degree in Level 7 of the EQF/NQF (Greek Law 4957/2022, article 78).

The undergraduate curriculum of DEEE aims at equipping graduates with knowledge, skills and competences that cover in depth and breadth all aspects of their discipline and the respective profession, as the latter is regulated by national legislation (Greek Law 4254/Gov. Gazette 85/A/2014, subsection IC.12, paragraphs 1 and 2, as substituted by Greek Law 4439/Gov. Gazette 222/A/30-11-2016, article 29, and the Presidential Decree 99/Gov. Gazette 87/A/5-11-2018). The undergraduate curriculum of DEEE aspires to offer students modern, high-quality and specialized knowledge, skills and competences in the respective discipline as well as in cross-disciplinary application areas. It is designed to produce graduates who combine sound theoretic knowledge with practical, hands-on laboratory skills and experience in state-of-the-art technologies. This is expected to aid them in keeping up with the ever-evolving environment of their discipline and profession.

2.3 DEEE Identity

2.3.1 DEEE Vision

- The vision of DEEE is the formation of graduates who, thanks to the high-quality programs of study DEEE offers in the respective discipline, will have constructed a solid foundation of both general background and specialized knowledge, skills and competences. In particular, DEEE believes that theoretic knowledge complemented with valuable practical experience obtained during extensive student practice in DEEE's hands-on laboratories, either within undergraduate or graduate curricula, is a major asset for life for graduates who will exercise the engineering profession or will choose researcher/scientist careers.
- The vision of DEEE is to create and sustain a truly academic community, i.e., an environment of freedom, independence, inclusion and mutual respect for students and staff that will motivate and inspire them in setting, pursuing and accomplishing high quality goals.
- Finally, the vision of DEEE is to acquire national and international reputation and renown as a high-ranking education and research entity with substantial societal impact and public accountability.

In order to see these visions materialize, DEEE focuses on the design, implementation and monitoring of the offered study programs with an eye towards keeping them aligned with international developments, competitive and open to innovation and novel practices. Students are encouraged and supported to fully develop their personality and their professional and social ethics, along with a systematic and innovative way of thinking and problem solving within engineering.

Furthermore, DEEE seeks to inspire students towards research by triggering their interests and gradually introducing them into research groups and practices in DEEE

Research Laboratories. These procedures are expected to develop a critical mass of graduates that will be interested in enrolling in 2nd and 3rd cycle study programs. Finally, DEEE systematically pursues networking, interacting and collaborating with companies and enterprises, such as industrial production units or service providers as well as with professional bodies and organizations, in order to maintain an open communication channel for the constant update and improvement of the programs of study as well as to support the smooth introduction of students into professional life and to safeguard the value of their degree in job market.

In conclusion, DEEE offers studies in a well-defined, broad and internationally recognized discipline where research and innovation keep bringing up novel results that directly impact production, economy and everyday life. DEEE envisages gaining and holding a place among contributors to the state-of-the-art of the discipline. Through competitive study programs and innovative research, DEEE envisages to prepare graduates who will be fully capable of meeting current requirements and future challenges in the field of Electrical and Electronics Engineering.

2.3.2 DEEE Mission

The mission of the Department of Electrical and Electronics Engineering is

- to offer academic engineering studies in the discipline of Electrical and Electronics through undergraduate and graduate curricula and a PhD program;
- to generate novel knowledge and to advance science and technology in the relevant fields, both independently and within national and international/European research collaborations;
- to contribute to the development of regional and national production, economy and society through initiatives and outreach activities towards public and private institutions.

Today, DEEE offers one undergraduate, 5-year engineering curriculum, three Master Degree programs and one PhD program. These cover all aspects of the respective discipline, such as the production, transportation, distribution, control and use of electric energy, (tele-)communications and (tele-)communication networks, data networks and internets, computer and microcomputer systems, embedded systems hardware and software, electronic and micro-/nano-electronic materials and devices, automatic control, intelligent systems and computational intelligence, artificial intelligence and deep learning. Thanks to the high qualifications of the staff, DEEE holds the active role of a contributor rather than a user/consumer of the respective science and technologies. Thanks to this status, DEEE is capable of offering study programs that ensure graduates will be able to meet in full job market and society requirements as qualified engineers. To this end, DEEE study programs comprise modules that build a good understanding of major concept and theories underlying new technologies, modules that offer specialized knowledge and skills as well as learning activities that develop critical thinking that will allow future engineers successfully address complex contemporary problems in their field. Finally, a strategic direction within DEEE mission is networking and the building of ties and collaborations with peer educational, research or social institutions, private or public, who are active in Electrical and Electronics Engineering worldwide.

2.3.3 DEEE Principles

In order to fulfill its mission, DEEE organizes study and research programs as well as all other academic activities based on the principles of mutual respect among all members of the academic community, fairness and merit, transparency, democracy, collaboration in an environment of full academic freedom, and certainly extroversion that will ensure DEEE mission is communicated and made known to the broad academic community and the society. Innovation and excellence in teaching and research are indispensable components along this path.

2.3.4 DEEE Research Policy

Excellence in research is the major aim of the research policy in the Department of Electrical and Electronics Engineering. Academic staff members are highly qualified and maintain an intensive involvement in research and development activities, both at the national and the European/international scale, either as prime researchers or project leaders or coordinators. These research and development activities are aimed at state-of-the-art science and technology in the field, expand to cover the whole field of electrical and electronics engineering and have produced a long record of publications in refereed international scientific journals and conference proceedings. The Department is systematically pursuing the strengthening of the departmental research structures (Research Laboratories) so that each one of them has the 'critical mass' to further advance research, to increase qualitative and quantitative research indices and to secure funding for future activities. The vision of the Department regarding research is to establish itself as a productive and recognizable agent and partner in the international research environment and the contemporary science and technology landscape.

Research is supported by academic and other staff, by under- and post-graduate students and PhD candidates and by an extended network of national and international research collaborations and exchanges that is being built based on personnel initiatives.

The research policy of the Department extends along three major axes, aiming to cover:

(a) the major and "classic" areas of electrical and electronics engineering such as energy and power, communications and networks/internets, computer systems, embedded systems, micro- and nano-electronic technologies, etc.,

(b) emerging areas of contemporary engineering research, which constitute fields of cross-disciplinary cooperation, such as smart grids, organic electronics, wearable electronics, multifunctional materials, green / environmentally-friendly technologies, renewables, etc., as well as

(c) 'horizontal', across-disciplines research areas such as Information and Communication Technologies for Education, Total Quality Management, Operational Research, Science and Technology history issues and scientific / professional Ethics issues.

Undergraduate and graduate students are strongly encouraged to participate in research activities through a close interaction with the departmental MSc and PhD programs.

Research is organized into eleven (11) Research Laboratories that have been formally instituted within the Department and whose infrastructure and equipment supports all

related activities. Fund securing and fund raising for the update and upgrade of the Laboratories equipment is an expressed policy and priority of the Department. A further plan is the quality assurance certification of selected Laboratories in order to offer quality services to external entities / organizations. All research and research-related activities are supported by UniWA through the institutional Special Account for Research Funds.

2.3.5 DEEE Research Collaborations

DEEE is intensively active in research and innovation and is strongly involved in collaborations at the national (NCSR "Demokritos", Hellenic Emerging Technologies Industry Association (HETiA), Centre for Renewable Energy Sources and Saving (CRES), Hellas Public Power Corporation, etc.) and at the international level (Horizon-2020, CERN, Columbia University, Carnegie-Mellon University, etc.)

This is the first Greek University Department to be accepted as an Associated Technical Institute by the international ATLAS Collaboration at CERN.

Today research and development activities are hosted in the eleven (11) departmental Research Laboratories; our undergraduate and graduate students are encouraged to early participate in all relevant activities.ΕΚΕΦΕ «Δημόκριτος»,

2.4 DEEE Administration and Staff

DEEE is internally organized into seven Divisions, for administrative purposes.

DEEE administration comprises the head and deputy head of the department, the directors of the seven divisions of DEEE and the head of the secretariat. Currently, these are:

- Head of the Department: Prof. Antonios Moronis
- Deputy Head: Prof. Maria Rangoussi
- Head of the Secretariat: Mrs. Kalliopi Triantafyllou
- Directors of the Divisions of DEEE, as follows:

1. Electric Power Systems. Director: Prof. Sofia Kalogeropoulou
2. Industrial Electric Devices and Automation. Director: Prof. Georgios Vokas
3. Materials and Electronics. Director: Prof. Ilias Stavrakas
4. Computer Systems and Control. Director: Prof. Ioannis Famelis
5. Digital and Embedded Systems. Director: Prof. Nicolas-Alexander Tatlas
6. Telecommunications, Informatics and Signal Processing. Director: Assoc. Prof. Sotirios Karabetsos
7. Information Transmission-Processing and Networks. Director: Prof. Charalampos Patrikakis

DEEE is the largest department within UNIWA and one of the better staffed engineering departments nationwide. Currently, DEEE employs:

- 61 academic staff members of all grades (full / associate / assistant professors, lecturers)

- 10 Laboratory Teaching Staff members,
- 6 Technical Laboratory Staff members, and
- 6 Administration Staff members in DEEE Secretariat.

A full list per category of staff follows, in alphabetic order:

DEEE academic staff			
nr.	**Full name**	**Grade**	**E-mail**
1	Alexandridis, Alexandros	Professor	alexx@uniwa.gr
2	Angeli, Chrysanthi	Professor	angeli@uniwa.gr
3	Bogris, Minas	Lecturer	m.bogris@uniwa.gr
4	Chorianopoulos, Christos	Assistant Professor	cchorian@uniwa.gr
5	Famelis, Ioannis	Professor	ifamelis@uniwa.gr
6	Galata, Sotiria	Assistant Professor	sgalata@uniwa.gr
7	Goustouridis, Dimitrios	Associate Professor	dgousto@uniwa.gr
8	Ioannidis, George	Professor	gioan@uniwa.gr
9	Kachris, Christoforos	Assistant Professor	kachris@uniwa.gr
10	Kalkanis, Konstantinos	Assistant Professor	k.kalkanis@uniwa.gr
11	Kalogeropoulou, Sofia	Professor	skalog@uniwa.gr
12	Kaltsas, Grigoris	Professor	gkaltsas@uniwa.gr
13	Kalyvas, Dimitrios	Professor	dikal@uniwa.gr
14	Kaminaris, Stavros	Professor	skamin@uniwa.gr
15	Kandris, Xenofon-Dionisis	Professor	dkandris@uniwa.gr
16	Karabetsos, Sotiris	Associate Professor	sotoskar@uniwa.gr
17	Karagiannopoulos, Panagiotis	Lecturer	p.karagian@uniwa.gr
18	Karaisas, Petros	Associate Professor	karaisas@uniwa.gr
19	Kontargyri, Vassiliki	Assistant Professor	vkont@uniwa.gr
20	Kontaxis, Panagiotis	Lecturer	pkont@uniwa.gr
21	Koukouvinos, Konstantinos	Lecturer	kkoukouvinos@uniwa.gr
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23	Kripotou, Sofia	Assistant Professor	skrypotou@uniwa.gr
24	Kyriakis-Bitzaros, Efstathios	Professor	mpitz@uniwa.gr
25	Leonidopoulos, Georgios	Associate Professor	gleon@uniwa.gr
26	Magana, Fotoula	Lecturer	fmagana@uniwa.gr
27	Malatestas, Pantelis	Professor	pmal@uniwa.gr
28	Manousakis, Nikolaos	Associate Professor	manousakis_n@uniwa.gr
29	Metafas, Dimitris	Assistant Professor	dmetafas@uniwa.gr
30	Mitilineos, Stelios	Professor	smitil@uniwa.gr
31	Moronis, Antonios	Professor	amoronis@uniwa.gr
32	Moutzouris, Konstantinos	Professor	moutzouris@uniwa.gr
33	Pachos, Pavlos	Lecturer	ppachos@uniwa.gr

34	Papadopoulos, Pericles	Professor	ppapadop@uniwa.gr
35	Papageorgas, Panagiotis	Professor	ppapag@uniwa.gr
36	Patrikakis, Charalampos	Professor	bpatr@uniwa.gr
37	Patsis, George	Professor	patsisg@uniwa.gr
38	Piromalis, Dimitrios	Associate Professor	piromali@uniwa.gr
39	Potirakis, Stelios	Professor	spoti@uniwa.gr
40	Psomopoulos, Constantinos	Professor	cpsomop@uniwa.gr
41	Rangoussi, Maria	Professor	mariar@uniwa.gr
42	Sarri, Elena	Lecturer	elena_s@uniwa.gr
43	Savaidis, Stylianos	Professor	ssavaid@uniwa.gr
44	Simos, Iraklis	Associate Professor	simos@uniwa.gr
45	Stathopoulos, Nikolaos	Professor	nstath@uniwa.gr
46	Stavrakas, Ilias	Professor	ilias@uniwa.gr
47	Syggeridou, Olympiada	Lecturer	osygger@uniwa.gr
48	Tatlas, Nicolas-Alexander	Professor	ntatlas@uniwa.gr
49	Tsakiridis, Odysseus	Assistant Professor	odytsak@uniwa.gr
50	Tsatsaros, Panagiotis	Lecturer	pt@uniwa.gr
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2.5 1st Cycle Study Program

2.5.1 Undergraduate Curriculum

DEEE offers a 5-years (10 semesters) program of undergraduate studies that corresponds to 300 credits of the European Credit Transfer System (ECTS). The curriculum covers levels 6 and 7 of the European Qualification Framework (EQF) as well as the National Qualification Framework (NQF).

Upon successful completion of the curriculum, DEEE confers the "Diploma in Electrical and Electronics Engineering" which is recognized as Integrated Master Degree that jointly covers Levels 6 and 7 of the EQF/NQF in the specialization field mentioned above, as per Greek Law 4485/2017, article 46.

The curriculum has been drawn up in compliance with (a) the Greek national legislation in effect, (b) the guidelines of the Hellenic Quality Assurance and Accreditation Agency (HQA), (c) the ECTS system, (d) the Greek and international experience as manifested in equivalent study programs at Universities / Schools / Departments of Electrical and Electronics Engineering, both nationally (Greek Technical Universities) and internationally (mainly United Kingdom and USA), (e) the standards set by national (Technical Chamber of Greece) and international (Institute of Electrical and Electronics Engineers, IEEE) scientific associations and organizations.

The curriculum is regularly updated in order to reflect the scientific and technological advances in the field of Electrical and Electronics Engineering, as well as to cover the current needs and requirements of industry, job market and society.

2.5.2 Aim and objectives of DEEE undergraduate curriculum

The curriculum aims to cover the body of knowledge that currently constitutes the discipline of Electrical and Electronics Engineering, the technologies that stem from it as well as its various application fields, either monothematic or interdisciplinary. In short, the curriculum covers the study, analysis, design and construction of systems for the transmission, distribution, storage, processing, control and use of energy and information.

The objective of the program is, firstly, to provide graduates with contemporary, high quality and highly specialized knowledge, competence and skills that cover the field of Electrical and Electronics Engineering, the corresponding profession, and its interdisciplinary fields of application, as regulated by Greek legislation (Law 4254/Gov. Gazette 85/A/2014, paragraph M.12, paragraphs 1 and 2, as substituted by Law 4439/Gov. Gazette 222/A/30-11-2016, article 29, as well as by the Presidential Decree 99/Gov. Gazette 87/A/5-11-2018).

Another objective of the curriculum is to shape graduates who will combine sound theoretical knowledge with significant laboratory experience and skills, so as to keep up with a constantly evolving scientific and professional field. Besides providing a solid background in the subject and fostering a systematic and innovative way of thinking and problem solving, the curriculum aims to integrally develop the students' personalities and raise their professional and social awareness.

Additionally, the curriculum aims to bring students in contact with the cutting edge of the science and technology in the field of Electrical and Electronics Engineering as well as the interdisciplinary fields it partakes of. The program cultivates students' interest in scientific research and gradually introduces them into the research procedures of the Department and encourages them to become members of active research teams and laboratories, so as to ensure the graduates' readiness for post-graduate studies.

Finally, an objective of the program is the systematic and organized networking and interaction of the Department with institutions and organizations in the domains of Industry and/or Services, and with related professional institutions, as well as the involvement of students and graduates in the curriculum update procedures and in lifelong learning / training programs, so as to strengthen the graduates' position in the jobs market and their employability. In this context, emphasis is placed on the preparation of the European and international professional perspective of graduates through active participation of the Department in exchange programs for learning or training and in international scientific and professional collaboration consortia..

2.5.3 Learning Outcomes of DEEE undergraduate curriculum

Upon completion of the curriculum, the graduate has acquired advanced and highly specialized theoretical and practical ***knowledge*** in the field of Electrical and Electronics Engineering, some of which is cutting-edge, and which involves a critical understanding

of its theories, principles and applications while serving as the basis for original thought. More specifically, he/she:

- knows, understands, and can apply his/her knowledge to subjects that constitute the General Background Courses, such as Mathematics, Physics, Computer programming, Electric circuits, Electrical Measurements, Materials, Computer-Aided Design, Quality Management and Construction Management;
- utilizes this knowledge as a basis to build up new knowledge, skills and competence in subjects that make up the Special Background Courses, such as Theory of (linear) Systems, Electromagnetic Fields, Power Elements and Systems, Analog and Digital Electronics, (Micro) Computing Systems, Algorithms and Data Structures, Telecommunications and Data Networks, Power Electronics, and Automatic Control Systems;
- achieves, through the In-depth Discipline Mastery and Consolidated Knowledge Courses in the discipline of Electrical and Electronics Engineering, the connection and critical assimilation of the specific knowledge, skills and competence of the General and Special Background Courses in a cohesive body, oriented toward the cutting edge of the field. Also, he/she has developed critical awareness of knowledge issues in the field and its interrelation with other fields. This level is organized into three streams of thematically relevant courses, that form the three Study Cycles of the diploma ("Energy", "Communications and Networks", "Electronics and Computer Systems"):
  (a) The "Energy" Study Cycle offers courses that cover Power Systems, High Voltage, Power Generation/Transmission/Distribution, Renewable Energy Sources, Electrical Installations, Electric Motion, and Power Protection Systems;
  (b) The "Communications and Networks" Study Cycle offers courses that cover Communications (Wired, Wireless, Optical, Mobile), Microwaves, Antennas, Radio, Radars, Data Networks and Internet of Things, Digital Signal Processing (audio, video, multimedia), Signal Transmission/Broadcasting, and Network/Web Applications Development;
  (c) The "Electronics and Computer Systems" Study Cycle offers courses that cover Computer Hardware, Design and Programming of Microcontrollers and Integrated Systems, Operating Systems, Data Bases, Cloud Computing and Internet of Things, Computer Intelligence, Robotics and Intelligent Control, Mechatronics, Micro- and Nano-electronics, Photonics, VLSI and Integrated Circuits Design.

Besides the topics mentioned above, the graduates are initiated in Humanities ("Science, Technology and Society", "History of Technology"), Economics and Business ("Business Administration", "Operational Research") and achieve functional use of a foreign language (English) specific to their field.

The graduate has also acquired advanced and specialized intellectual and practical ***skills*** and is able to demonstrate the necessary expertise and innovative approach to solving complex and unpredictable problems in the specific fields of Energy, Communications and Networks, Electronics and Computer Systems. He/she analyzes these problems and

works out solutions complying to the specifications and/or constraints set, by selecting the best method or tool, utilizing new information and communication technologies, and combining methods, tools, and approaches from all courses taught. In addition, he/she is able to check the proper function and evaluate the performance of solutions he/she has implemented. Thanks to these essential skills for research and innovation, the graduate is able to develop new knowledge in the field of Electrical and Electronics Engineering and to integrate knowledge from different fields.

The graduate has acquired high level ***competences***, both within the discipline of Electrical and Electronics Engineering and across related fields. Specifically, he/she:

- is able to customize the selected solution to the needs, priorities and specifications set by the operating environment;
- has the autonomy required to work individually but also the ability to function in a multidisciplinary team, manage complex technical or professional activities or work plans, and assume responsibility to make decisions in unpredictable work or study contexts;
- can manage and transform complex or unpredictable work or study environments and develop the new strategic approaches required;
- identifies and manages his/her personal and professional learning needs while at the same time he/she assumes responsibility to manage the professional development of individuals and teams of partners, thus demonstrating his/her commitment to the target of lifelong learning;
- is mature enough to critically view the specific discipline and the corresponding profession within the current socio-economic context and is aware of the professional and moral responsibility of the engineer towards the society and the environment.

DEEE Undergraduate Study Program is offered according to the provisions of the DEEE Internal Study Regulation:

- https://eee.uniwa.gr/spoudes/pps/%CE%9220%20%CE%9A%CE%B1%CE%BD%CE%BF%CE%BD%CE%B9%CF%83%CE%BC%CF%8C%CF%82%20%CE%A0%CE%A0%CE%A3.pdf)

and the detailed Curriculum, as endorsed by UNIWA Senate and described in the undergraduate Study Guide which is updated annually:

- https://eee.uniwa.gr/el/spoudes/pps/ps/programma-spoudon-ilektrologou-kai-ilektronikoy-mixanikoy-5etes/17-spoudes/1463-odigos-spoudon.

2.6 2nd Cycle Study Programs – Master Degrees

DEEE organizes and offers graduate study programs leading to a Master Degree in various fields within the discipline of DEEE as well as in cross-disciplinary application areas. Graduate degrees open to their holders new perspectives into science and new opportunities in the job market. Thanks to its carefully designed and well-supported

graduate programs, DEEE supplies industry and service provision companies and organizations with highly qualified staff.

Currently DEEE offers

1. the departmental MSc by Research in Electrical and Electronics Engineering (https://mscres.eee.uniwa.gr) offered in Greek during 2018-19 to 2023-24, for Greek nationality students without fees,
2. the Interdepartmental MSc in Artificial Intelligence and Deep Learning (https://aidl.uniwa.gr), and
3. the Interinstitutional MA in ICT for Education (https://icte.ecd.uoa.gr),

and is launching the present MSc by Research in Electrical and Electronics Engineering in English, to attract foreign as well as Greek students, prepared under funding by NSRF 2014-2020, UNIWA-SARG project "Support of actions for the internationalization of UNIWA Study Programs" (MIS 6004803).

2.6.1 MSc by Research in Electrical and Electronics Engineering

MSc by Research in Electrical and Electronics Engineering was a departmental graduate study program offered by DEEE in the Ancient Olive Grove UNIWA campus and during academic years 2018-19 to 2023-24. This program was offered in Greek, for students of Greek nationality, without fees and was also research-oriented. Today the program is operating with already enrolled students, and up to their graduation. The experience gained from that research-oriented MSc program was exploited in the design of the present MSc offered in English.

2.6.2 Joint MSc in Artificial Intelligence and Deep Learning (AIDL)

Since 2020, DEEE and the UNIWA Department of Industrial Design & Production Engineering have joined forces to offer the MSc in AIDL, which is designed to give students both the theoretic backbone and the practical, hands-on experience in the fields of Artificial Intelligence and Deep Learning.

The MSc in AIDL aims at addressing the market demand for professionals capable of designing, developing and applying artificial intelligence and deep learning algorithms in various sectors of the economy including health, industry, education (e.g., emotional intelligence and affect cognition), engineering (e.g., unmanned vehicles) and culture.

Graduates will be able to combine artificial intelligence and deep learning techniques with other technologies like big data and analytics, for decision making.

Emphasis of the curriculum is placed on providing the students with hands-on experience: educational material, projects and tools from the Deep Learning Institute of NVIDIA are integrated in the curriculum, while students are given direct access to GPU infrastructure and hardware throughout their studies.

2.6.3 Joint MA in ICT for Education

Since 2005, DEEE is part of an interinstitutional collaboration that offers the MA program in ICT for Education. This program was launched in the academic year 2005-2006 by the Department of Early Childhood Education and the Faculty of Communication and Mass

Media Studies of the National and Kapodistrian University of Athens, Greece, in collaboration with the Department of Architecture of the University of Thessaly and DEEE. The program grants a joint degree by the four collaborating Faculties.

The MA in ICT for Education is a two-year (4 academic semester) program, which includes a dissertation. It aims at developing a critical stance towards the role of technology in education as well as providing professional training, at enhancing knowledge on applications of information and communication technologies and at bringing students in contact with experts on the use of such technologies in various sectors of education. The ideal candidates would hold a first degree which qualifies for employment in primary, secondary and further education, or a degree in any education-related field. This MA program has been running for almost 20 years and has produced more than 500 graduates.

2.7 3rd Cycle Study Program – PhD degree

DEEE is the leading department within UNIWA in the organization and offer of 3rd cycle program of study towards a PhD. More than 100 PhD students are already enrolled and carry out research towards their PhD, under the supervision of DEEE faculty. DEEE PhD program is the breeding ground expected to yield a new generation of scientists and researchers; as such, they are encourage to get actively involved in all education and research activities of DEEE to gain valuable experience in research and teaching.

DEEE PhD program is offered free of tuition or fees. Upon successful completion of the relevant requirements, DEEE confers the PhD title which certifies that the holder has carried out innovative research and has contributed to the generation of novel knowledge in any of the areas of DEEE discipline or in cross-disciplinary application areas. Intake is twice per academic year (September and February), through open calls and evaluation. Follow this link for more details on DEEE PhD Studies Regulation (Gov. Gazette 4658/B/18-10-2018):

https://eee.uniwa.gr/el/spoudes/didaktorikes-spoudes/kanonismos-didaktorikon-spoudon

2.8 PostDoctoral Research

DEEE encourages young scientists to take up postdoctoral research in one of the DEEE Research Laboratories, in topics that are of interest to DEEE academic staff and research partners. Six (6) postdoctoral researchers are currently involved in DEEE research activities and projects, while two (2) more have already successfully completed their projects. Through the setup and opening of postdoctoral research positions, DEEE aims at:

- supporting young scientists able to contribute to science and technology in their field through the development of innovative science and technology, especially in state-of-the-art directions,
- highlighting the role of UNIWA as a young scientist-friendly and supportive institution,
- supporting the continuation of doctoral research and the extension of doctoral research results into new directions of interest to UNIWA and to DEEE staff,

- upgrading the quality of scientific research, and increasing its impact by dissemination of results and by technology transfer.

3. MSc by Research in Electrical - Electronics Engineering

MSc by Research in Electrical - Electronics Engineering is a departmental graduate study program offered by the Department of Electrical & Electronics Engineering (DEEE), Faculty of Engineering, University of West Attica (UNIWA) in the Ancient Olive Grove Campus, in Athens-Egaleo, Greece. Starting in academic year 2025-2026, the program is offered exclusively in English.

3.1 Aim – Objectives – Learning Outcomes – Degree Conferred

The aim of this MSc program is to offer graduate-level studies leading to the Master of Science By Research in Electrical - Electronics Engineering. The major objectives of the program are to produce graduates that

(i) are specialized in an area of their choice within the field of Electrical and Electronics Engineering,

(ii) have acquired adequate research skills and experience in order to staff research teams in research institutions and laboratories,

(iii) are able to make an informed decision as to whether they should engage in PhD studies in the field of Electrical and Electronics Engineering.

Under the supervision and guidance of experienced DEEE academic staff, students are encouraged and led to delve into a specific area of interest within the field of Electrical and Electronics Engineering and to engage in innovative research in this area. Research areas are strongly connected to the research carried out in the Laboratories of the Department. Students become members of the laboratory teams right from the beginning of the study program; they are thus smoothly introduced to the research atmosphere, procedures and ethics. Laboratories host, encourage and scaffold young researchers in their first steps towards independent research. Moreover, through this program, students that aspire to PhD studies can get a lived experience of research and make an informed decision as to whether they will engage in a long-term project, such as PhD studies are – and this at minimum risk of dropout; a benefit for both the involved parties, student and supervisor/department.

These objectives dictate the character of the program that features a limited number of places opened annually, strict selection criteria, close academic supervision throughout the study program and the obligation for a scientific publication for graduation. Taught courses are kept to a minimum (24 ECTS, 4 course modules) in order to maximize the part dedicated to research (66 ECTS, 4 course modules). Research work towards the MSc thesis starts from day one, proceeds along all 3 academic semesters of the program and is culminated by the (required) publication of the results in relevant, internationally renowned journals or conference proceedings, as deemed suitable by the supervisor.

Upon successful completion of the MSc program, students are expected to be able to:

1. Demonstrate their expertise in the chosen area of specialization within the field of Electrical and Electronics Engineering. To do so, they are expected to understand, describe and classify the underlying theories, knowledge

representation models, methods and tools employed to address existing as well as emerging problems / challenges and open research questions in this area.

2. Analyze problems, construct solutions and comparatively evaluate alternative solutions or approaches within their chosen area of research.
3. Design and implement (initially, under supervision and later on, independently) research plans based on specific research methodologies and protocols, in order to pose, test and accept or reject scientific hypotheses, through theoretic or experimental approaches.
4. Describe, present and defend in an accurate, detailed and complete manner the results of their work, either individual or teamwork, in speech, text or other multimedia form.
5. Collaborate with peer scientists and engineers on cross-disciplinary fields and apply their specialized skills in the development of innovative knowledge and technology.
6. Cultivate and demonstrate their awareness on the rules and ethics of research regarding personal, social, economic and environmental dimensions and the impact of research results on all these axes and discern new / open issues or challenges when and where they arise.
7. Develop their personal research interests in order to proceed to the next grade of PhD studies in more focused / specialized areas within the field of Electrical and Electronics Engineering.

A call for applications is issued annually, after endorsement by the Assembly of the DEEE. The call opens a number of places grouped under research areas of specialization within the field of Electrical and Electronics Engineering as these are proposed by the academic staff members willing to supervise research in the respective area. In addition to the area of specialization, each place is accompanied by a proposed research title, brief description, prerequisite knowledge and skills and expected research outcomes. Areas of specialization, as listed below, are mentioned on the MSc title conferred:

1. Energy
2. Telecommunications
3. Electronics
4. Computing Systems
5. Cross-disciplinary Specialization in (*one of the following: Defense / Education / Biomedical / Marine / Industrial Automation*) Technologies

The above list is not exclusive; new specialization areas may be proposed by academic staff members to be included in future calls, upon approval by the Assembly of the DEEE.

Upon successful completion of all requirements of the program, the DEEE confers the “Master of Science By Research in Electrical - Electronics Engineering” degree. The specialization area, as defined in the respective call and selected by the graduate, is mentioned on the degree. Furthermore, the specific title of research is mentioned in the Diploma Supplement issued upon graduation.

3.2 Program Administration

As designated by national legislation (Greek Law 4957/2022, article 82), the MSc program is administered by

- the Senate of the University of West Attica,
- the Assembly of the Department of Electrical and Electronics Engineering,
- the MSc Program Coordinating Committee,
- the MSc Program Director, and
- UNIWA Committee for Graduate Studies.

Responsibilities are detailed below.

The MSc Program Coordinating Committee (CC) is comprised of the MSc Program Director and 4 more DEEE academic staff members whose areas of specializations are relevant to the MSc program subject and who are involved in the program as module instructors or MSc thesis supervisors. All 5 CC members are appointed by the Assembly of DEEE. Professors Emeriti may be appointed as CC members, on the condition that they undertake instruction or supervision in the program.

One of the CC members is appointed by the Assembly of DEEE as the MSc Program Director, for a 2-year term of office. The Director is chosen preferably among Professors or Associate Professors. Term of office may be renewed for any number of times.

The Director and other CC members are not entitled to renumeration or reimbursement of any type against their administrative responsibilities and office duties.

The MSc program administrative and secretarial support is handled by the Secretariat of the DEEE. Duties include the support for the issue of annual calls for applications and candidate selection processes, the financial administration and record keeping, the secretarial support of the CC members and Director, the keeping and updating of the Student Registry, the inauguration of graduates, the issue of MSc degree titles, Diploma Supplements and all relevant certificates, as well as the preparation of graduation ceremonies.

3.3 Teaching and MSc Thesis supervision

Teaching duties in the MSc program are assigned yearly to academic staff members by the Assembly of the DEEE. The following classes of academic staff members can get a teaching assignment:

1. Professors of the DEEE or of other Departments of the same or other Greek University,
2. Professors Emeriti or retired professors of the DEEE or of other Departments of the same or other Greek University,
3. Adjunct professors,
4. On-contract professors,
5. Visiting professors or Visiting researchers,

6. Researchers and other scientists tenured in the research and technology institutions described in Greek Law 4310 (Gov. Gazette 258/A/2014), or in any other Research Center or Institute, in Greece or abroad,
7. Renowned scientists with specialized knowledge and experience in the MSc program subject.

MSc thesis supervision duties may be assigned to any academic staff member of the first 6 classes enumerated above, provided they hold a PhD in a relevant field. MSc thesis supervision duties are assigned yearly by the Assembly of DEEE. The same body may assign such duties to academic staff members that do not teach in the MSc program but hold a PhD in a relevant field.

All academic staff members involved in teaching or supervision are entitled to renumeration against the program budget, according to the provision of Greek Law 4957/2022, article 83, as it stands.

The Assembly of the DEEE may assign Teaching Assistantship (TA) duties to PhD candidates enrolled in the Departmental PhD program of studies. In these cases, PhD candidates offer ancillary work in the MSc program courses and laboratories under the supervision of an academic staff member.

Regarding teaching assignment, MSc course modules fall under the 'taught course modules' and the 'research supervision course modules' categories.

A. Teaching assignments for the 4 'taught course modules' category:

Full Name	**Position / Grade / Department**	**Course Module teaching assignment (hours/week)**	**Contact**
Rangoussi, Maria	Professor, DEEE	0.5 (MRES.B.02.08)	mariar@uniwa.gr +30 210 538-1224 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=331
Potirakis, Stelios	Professor, DEEE	3.0 (MRES.A.01)	spoti@uniwa.gr +30 210 538-1550 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=283
Famelis, Ioannis	Professor, DEEE	1.5 (MRES.A.02)	ifamelis@uniwa.gr +30 210 538-1245 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=304
Papadopoulos, Pericles	Professor, DEEE	0.5 (MRES.A.02)	ppapadop@uniwa.gr +30 210 538-1243

Full Name	Position / Grade / Department	Course Module teaching assignment (hours/week)	Contact
			https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=544
Stathopoulos, Nikolaos	Professor, DEEE	1.0 (MRES.B.02.03) 1.0 (MRES.B.02.04)	nstath@uniwa.gr +30 210 538-1486 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=558
Vassiliadis, Savvas	Professor, DEEE	0.5 (MRES.B.02.02)	svas@uniwa.gr +30 210 538-1489 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1378
Voudouris, Konstantinos	Professor, DEEE	1.0 (MRES.B.02.05)	kvoud@uniwa.gr +30 210 538-1313 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1299
Zachariadou, Aikaterini-Styliani	Professor, DEEE	0.5 (MRES.B.02.08)	zacharia@uniwa.gr +30 210 538-1766 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1346
Kandris, Dionysios-Xenofon	Professor, DEEE	1.0 (MRES.B.02.06)	dkandris@uniwa.gr +30 210 538-1545 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=539
Zois, Elias	Assoc. Professor, DEEE	1.0 (MRES.B.02.01)	ezois@uniwa.gr +30 210 538-1559 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1834
Galata, Sotiria	Assoc. Professor, DEEE	0.5 (MRES.B.02.02)	sgalata@uniwa.gr +30 210 538-1643

Full Name	Position / Grade / Department	Course Module teaching assignment (hours/week)	Contact
			https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1343
Tsekouras, George	Assoc. Professor, DEEE	1.0 (MRES.B.02.07)	gtsekouras@uniwa.gr +30 210 538-1750 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=839
Chorianopoulos, Christos	Assist. Professor, DEEE	1.0 (MRES.A.02)	cchorian@uniwa.gr +30 210 538-1047 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1304
Karampatsos, Christos	Adjunct Professor, DEEE	3.0 (MRES.B.02.01)	c.karabatsos@uniwa.gr +30 210 538-1225 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=1747
Charitopoulos, Angelos	Laboratory Staff Member, DEEE	0 (MSc Technical Support – MSc Website)	acharito@uniwa.gr +30 210 538-1240 https://eee.uniwa.gr/en/index.php?option=com_content&view=article&id=615

B. Teaching assignments for the 4 'research supervision course modules':

All DEEE academic staff members as well as Laboratory Teaching Staff members who hold a PhD in a relevant field may propose a research topic in the program annual call and undertake the supervision of students who will apply and enroll to carry out research on that topic. This means that they get teaching assignment in the following 4 'research supervision course modules':

- MRES.A.03 «Supervised Research I» (Compulsory, 18 ECTS, graded)
- MRES.B.03 «Supervised Research II» (Compulsory, 18 ECTS, graded)
- MRES.C.01 «MSc Thesis» (Compulsory, 30 ECTS, graded)
- MRES.C.02 «Publication of Research Results» (Compulsory, 0 ECTS, ON/OFF)

Curricula Vitae, research interests and research indices of all DEEE academic staff members as well as Laboratory Teaching Staff members who hold a PhD and are therefore eligible to

supervise students in this MSc program are available online in the DEEE website https://eee.uniwa.gr/el/personnel-el/dep-el along with contact information. An alphabetic list follows:

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nr.	**Full name**	**Grade**	**E-mail**
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4	Famelis, Ioannis	Professor	ifamelis@uniwa.gr
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6	Goustouridis, Dimitrios	Associate Professor	dgousto@uniwa.gr
7	Ioannidis, George	Professor	gioan@uniwa.gr
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11	Kaltsas, Grigoris	Professor	gkaltsas@uniwa.gr
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13	Kaminaris, Stavros	Professor	skamin@uniwa.gr
14	Kandris, Xenofon-Dionisis	Professor	dkandris@uniwa.gr
15	Karabetsos, Sotiris	Associate Professor	sotoskar@uniwa.gr
16	Karaisas, Petros	Associate Professor	karaisas@uniwa.gr
17	Kontargyri, Vassiliki	Assistant Professor	vkont@uniwa.gr
18	Koulouras, Grigorios	Associate Professor	gregkoul@uniwa.gr
19	Kripotou, Sofia	Assistant Professor	skrypotou@uniwa.gr
20	Kyriakis-Bitzaros, Efstathios	Professor	mpitz@uniwa.gr
21	Leonidopoulos, Georgios	Associate Professor	gleon@uniwa.gr
22	Malatestas, Pantelis	Professor	pmal@uniwa.gr
23	Manousakis, Nikolaos	Associate Professor	manousakis_n@uniwa.gr
24	Metafas, Dimitris	Assistant Professor	dmetafas@uniwa.gr
25	Mitilineos, Stelios	Professor	smitil@uniwa.gr
26	Moronis, Antonios	Professor	amoronis@uniwa.gr
27	Moutzouris, Konstantinos	Professor	moutzouris@uniwa.gr
28	Papadopoulos, Pericles	Professor	ppapadop@uniwa.gr
29	Papageorgas, Panagiotis	Professor	ppapag@uniwa.gr
30	Patrikakis, Charalampos	Professor	bpatr@uniwa.gr
31	Patsis, George	Professor	patsisg@uniwa.gr
32	Photopoulos, Panagiotis	Associate Professor	pphotopoulos@uniwa.gr
33	Piromalis, Dimitrios	Associate Professor	piromali@uniwa.gr
34	Potirakis, Stelios	Professor	spoti@uniwa.gr

35	Psomopoulos, Constantinos	Professor	cpsomop@uniwa.gr
36	Rangoussi, Maria	Professor	mariar@uniwa.gr
37	Sarri, Elena	Lecturer	elena_s@uniwa.gr
38	Savaidis, Stylianos	Professor	ssavaid@uniwa.gr
39	Simos, Iraklis	Associate Professor	simos@uniwa.gr
40	Stathopoulos, Nikolaos	Professor	nstath@uniwa.gr
41	Stavrakas, Ilias	Professor	ilias@uniwa.gr
42	Syggeridou, Olympiada	Lecturer	osygger@uniwa.gr
43	Tatlas, Nicolas-Alexander	Professor	ntatlas@uniwa.gr
44	Tsakiridis, Odysseus	Assistant Professor	odytsak@uniwa.gr
45	Tsekouras, George	Associate Professor	gtsekouras@uniwa.gr
46	Tsiakas, Panagiotis	Lecturer	ptsiakas@uniwa.gr
47	Valamontes, Evangelos	Professor	vala@uniwa.gr
48	Varsamis, Christos-Platon	Professor	cvars@uniwa.gr
49	Vassiliadis, Savvas	Professor	svas@uniwa.gr
50	Vokas, Georgios	Professor	gvokas@uniwa.gr
51	Voudouris, Konstantinos	Professor	kvoud@uniwa.gr
52	Zachariadou, Aikaterini-Styliani	Professor	zacharia@uniwa.gr
53	Zervas, Evangelos	Professor	ezervas@uniwa.gr
54	Zois, Elias	Associate Professor	ezois@uniwa.gr

DEEE Laboratory Teaching Staff members with a PhD			
nr.	**Full name**	**Grade**	**E-mail**
1	Christakis, Ioannis	Laboratory Teaching Staff	jchr@uniwa.gr
2	Feidakis, Michail	Laboratory Teaching Staff	m.feidakis@uniwa.gr
3	Ferles, Christos	Laboratory Teaching Staff	xferles@uniwa.gr

3.4 Applications and Candidate Selection Procedure

Application and candidate selection procedures follow Greek Law 4957/2022 as it stands and the provisions of the MSc Program Internal Regulation. Intake is once per year, initiated by an open call for applications that advertises 25 places maximum and 10 places minimum, each under a specific research topic. The call for applications for studies starting in the fall semester of a given academic year (typically, in October) is issued by the end of the spring semester of the previous academic year (typically, in June). The call is prepared by the MSc program CC, is endorsed by the Assembly of DEEE and is published online in the website of the MSc program, the website of DEEE and the central website of UNIWA for graduate study programs. The MSc program Director takes care to advertise the annual call as widely as possible, at the national and international level.

Applications are accepted from candidates who hold an academic title of the 1st cycle, at Level 6 of the EQF or equivalent, from an academic institution accredited by Greek NARIC. Candidates may check the status of their degrees online in https://www.doatap.gr/national-registry-of-foreign-recognized-higher-education-institutes/. The ideal candidate should hold a degree in Electrical and/or Electronics and/or Computer Engineering. Degrees in other Engineering Faculties or degrees in Sciences are also welcome. Applications from candidates who hold degrees in other disciplines are judged per case by the Selection Committee.

Applications are filed with the Secretariat of DEEE, as detailed in the annual call and within the deadline set therein. If necessary, an extension may be granted, which is announced wherever the initial call was announced. Selection is based on the evaluation of applicant portfolio (50%) and a personal interview held with the Candidate Evaluation Committee (50%). The MSc Program Internal Regulation includes all details on the application and selection process and criteria.

3.5 Enrollment of successful candidates

Successful candidates are invited to enroll in the program within ten (10) days of the announcement of the final results. In doing so, they must file with the Secretariat all necessary registration documents.

If one or more successful candidates do not enroll, the runners-up, if any, are invited to enroll, in the order of their ranking on the approved merit list.

Following enrollment, the list of enrolled students is forwarded by the Secretariat to the Assembly of the DEEE, the CC and the Research Laboratories or individual academic staff members that had contributed Research Proposals. CC appoints a tripartite examination committee for each new graduate student. The academic staff member who had contributed the specific Research Proposal is by default one of the 3 members. Furthermore, at least one of the 3 members comes from a Research Laboratory different than that of the supervisor. Replacement of an appointed examination committee member is possible in cases of leave of absence, paid or not, sick leave, resignation or major force reasons.

Depending on the annual budget availability of each Research Laboratory and/or of the Department, Teaching Assistantships may be offered to MSc students, in order to aid faculty members of the Department in their undergraduate teaching duties. In this case, the student signs a contract with the Department, for up to 10 hours per week work, paid per hour.

3.6 Enrollment renewals and course registration

In the beginning of every academic semester of study, the graduate student has to renew enrollment and also to register to those course modules he/she plans to attend and graded in that semester. This is an online procedure carried out in the UNIWA Student Registry, within dates that are announced in the website of the program. The procedure has to be repeated in the beginning of both winter and spring semester.

Within 10 days of the renewal and registration deadline, students who missed it may file with DEEE secretariat an application for delayed renewal, where they state the cause for

this delay and list the course modules they intend to attend. Delayed renewals are granted by the Assembly of DEEE on the basis of the (serious) cause claimed. Students who enroll in the 1st semester of study are allowed to register exclusively in all the 1st semester course modules.

3.7 Student status – Full-time study mode

Graduate student status is obtained upon enrollment to the program and retained up to graduation, provided that the student regularly renews enrollment in the beginning of each semester and with the exception of suspension of study semesters possibly granted.

The program is offered only in full-time study mode. Classes start in the Winter Semester of every academic year. The typical length of studies to graduation is three (3) academic semesters; the 3rd one is dedicated to the preparation and defense of a MSc thesis.

Students may need to prolong their studies due to unforeseen reasons; in that case, they have to apply for an extension of studies. The application has to be filed with DEEE secretariat within the 1st week of the extension semester. In their application, they have to state and document the need for an extension. Extensions are granted by the CC for whole academic semesters only. The maximum duration of studies, including any extensions, is five (5) academic semesters. This means that a student may get up to a maximum of two (2) extension semesters. If program requirements are not all completed at the end of the 2nd extension semester, the Assembly of DEEE expels the student from the program following a relevant proposition by the CC. In that case, instead of the Master Degree, the student receives a Certificate of Attendance which states all course modules successfully completed by the student, along with their grades and ECTS.

3.8 Suspension of study

Students may apply for a suspension of studies. In their application, they have to state and document the need for a suspension. Suspensions of study are granted by the CC for whole academic semesters only. Regardless of the time of application, a suspension of study starts in the beginning of the following academic semester. A student is not entitled to more than two (2) suspensions overall, either sequential or not. Semesters of suspension are not counted in the maximum duration of studies. During suspension, student status and student privileges are also suspended; they are automatically reactivated upon expiration of the suspension period.

3.9 Curriculum

3.9.1 Structure of the curriculum

The MSc program curriculum corresponds to 90 ECTS units. The curriculum is structured in academic semesters. All modules and educational activities correspond to a number of ECTS units gained within the semester they are offered. In order to graduate, a student must have successfully completed the following:

1. Attend and get a passing grade in the 6 compulsory course modules (MRES.A.01, MRES.A.02, MRES.A.03, MRES.B.01, MRES.B.02.01-08, MRES.B.03),
2. Carry out, submit and successfully defend a MSc thesis (MRES.C.01),

3. Publish the results of their research in a scientific journal or conference, as deemed suitable by the supervisor (MRES.C.02).

The list of course modules and other academic activities is given in the following Table per semester:

THE MSC PROGRAM CURRICULUM

(*) M/E: Mandatory / Elective

Module Code	Module Title	M/E*	ECTS	STUDENT EFFORT in HOURS
MANDATORY MODULES				
MRES.A.01	Research Methodology – Scientific Writing	M	6	180
MRES.A.02	Scientific Computing and Mathematical Modeling	M	6	180
MRES.A.03	Supervised Research I *Students carry out research in their specific research topic, supervised by an academic staff member. Technical Report I, including intermediate research results obtained in the 1st semester, is prepared and turned in by the student at the end of the semester. Technical Reports are presented by the students to their respective examination committees and are graded. They can be used as parts (chapters) of the final MSc thesis.*	M	18	540
MRES.B.01	Science, Technology, Society: From History to Policy	M	6	180
MRES.B.02	A series of 3 out of 8 Mini Modules	E	2X3 =6	180
MRES.B.03	Supervised Research II *Students carry out research in their specific research topic, supervised by an academic staff member. Technical report II, including intermediate research results obtained in the 2nd semester, is prepared and turned in by the student at the end of the semester. Technical Reports are presented by the students to their respective examination committees and are graded. They can be used as parts (chapters) of the final MSc thesis.*	M	18	540
MRES.C.01	MSc Thesis *Completion of supervised research and preparation of the MSc thesis that includes intermediate and final results. The MSc thesis is written, turned in and defended by the student to the respective examination committee. Presentation is in public. The MSc thesis is graded.*	M	30	900
MRES.C.02	Publication of research results *Research results have to be published in an international refereed scientific journal or international refereed scientific conference with*	M	0	0

	proceedings, as deemed suitable by the supervisor. A copy of the publication or an acceptance letter has to be filed for graduation. At least one such publication is required.			
ELECTIVES (MINI-MODULES: students select a series of 3 out of 8)				
MRES.B.02.01	Selected Topics in image Processing and Computer Vision	E	2	60
MRES.B.02.02	Multifunctional materials and Wearable Devices	E	2	60
MRES.B.02.03	Multilayer structures in Organic Optoelectronic Devices	E	2	60
MRES.B.02.04	Fiber Bragg Gratings in optical fiber communications and sensing applications	E	2	60
MRES.B.02.05	Advanced topics in Antennas and 5G Communications	E	2	60
MRES.B.02.06	Special Control Schemes in Wireless Sensor Networks	E	2	60
MRES.B.02.07	Selected topics in Small Hydroelectric Power Plants	E	2	60
MRES.B.02.08	E-learning: Mining, Analytics and Visualization of Educational Data	E	2	60

The Syllabus of the MSc program, organized in three (3) academic semesters, is given in the following Table:

THE MSC PROGRAM SYLLABUS

Module Code	Module Title	Contact Hours per Week	ECTS	Student Effort in hours
SEMESTER A (30 ECTS)				
MRES.A.01	Research Methodology – Scientific Writing	3	6	180
MRES.A.02	Scientific Computing and Mathematical Modeling	3	6	180
MRES.A.03	Supervised Research I	N/A	18	540
SEMESTER B (30 ECTS)				
MRES.B.01	Science, Technology, Society: From History to Policy	3	6	180
MRES.B.02.a	Elective A (out of 8 modules B.02.01 – 08)	1	2	60
MRES.B.02.b	Elective B (out of 8 modules B.02.01 – 08)	1	2	60
MRES.B.02.c	Elective C (out of 8 modules B.02.01 – 08)	1	2	60
MRES.B.03	Supervised Research II	N/A	18	540
SEMESTER C (30 ECTS)				
MRES.C.01	MSc Thesis	N/A	30	900
MRES.C.02	Publication of Research Results	N/A	(-)	(-)
	TOTAL		**90**	**2,700**

Course module descriptions, as detailed in **Appendix I**, are an integral part of this Study Guide.

Upon approval from the Assembly of DEEE, course modules MRES.A.01, MRES.A.02, MRES.B.01 and MRES.B.02.01-08 may be taught intensively in a one- or two-week period. In that case, the class schedule is announced in the beginning of the semester, before student enrollment. Intensive mode of instruction may not apply to more than one module in any given semester

The graduate student must satisfy the following requirements to qualify for the Master Degree: (a) accumulate 90 ECTS units earned as per the curriculum and (b) publish research results in at least one publication.

3.9.2 Supervised Research Modules and Technical Reports

In order to earn the 18 ECTS units of course module MRES.A.03 "Supervised Research I" and the 18 ECTS units of course module MRES.B.03 "Supervised Research II", the student has to carry out research in his/her specific research topic, supervised by an academic staff member. A Technical Report including intermediate research results obtained in the respective semester, is prepared and turned in by the student at the end of the semester (Technical Report I or II, respectively). Technical Reports are prepared by the student according to the template available online. They are presented to the examination committee and graded. The final grade is the average of the grades given individually by the 3 committee members. Technical Report contents are intended to be used as parts (chapters) of the final MSc thesis.

Supervised research in the selected research area and topic is carried out by the students either in the hosting Research Laboratory or in an external institution, industry, company or Research Center that collaborates with the hosting Research Laboratory, under joint supervision. In that case, the supervisor from the side of UNIWA is held responsible by the MSc program regarding student progress.

3.9.3 MSc Thesis

In order to earn the 30 ECTS corresponding to the course module MRES.C.01 "MSc thesis", the student has to complete and conclude his/her supervised research and prepare a MSc thesis that collectively presents all obtained results, intermediate and final. The MSc thesis is written by the student according to the template of the program available online. MSc thesis is turned in and orally defended by the student to the examination committee. The procedure is held in public. The examination committee may (i) accept the MSc thesis as it is, (ii) return the thesis to the student along with comments for improvement and set a new deadline for defense, or (iii) reject the thesis. An accepted MSc thesis is graded by the examination committee on the basis of the set of defined evaluation criteria and grade breakdown, as detailed in the MSc Program Study Regulation. The final grade is the average of the grades given individually by the 3 committee members. After the committee files the MSc thesis grading form with DEEE Secretariat, the student has to upload the thesis in full text in the UNIWA repository POLYNOE, under the MSc program partition, for the grade to become final.

3.9.4 Publication of research results

A final requirement for graduation is the publication of research results, to cover course module MRES.C.02 "Publication of research results". The publication must be co-authored

by the student and the research supervisor at least - and possibly by other researchers that contributed to this research, as decided by the supervisor. Acceptable publications are those in international refereed scientific journals or international refereed scientific conferences with proceedings and review in the full text of the paper. Publication sources must be accessible and renowned (indexed in Web of Science – Science Citation Index and Science Citation Index Expanded, Scopus, PubMed). For the student to meet this requirement, either a copy of the full publication or a copy of the submitted manuscript in full text along with the letter of acceptance, must be filed with the Secretariat by the supervisor.

3.10 Teaching – Examination Periods – Student Evaluation

3.10.1 Teaching

Teaching is organized in two academic semesters, Winter and Spring, each extending to 13 weeks of lectures followed by 2 weeks of examinations (examination period of January for course modules taught in the Winter semester and examination period of June for course modules taught in the Spring semester). Furthermore, students are entitled to a re-sit exam in any course module of the Winter or Spring semester, in the examination period of September. Compulsory modules are taught for at least 39 hours per semester.

Students have to register in a number of modules in the beginning of each new academic semester, Winter and Spring. Attendance of classes for the chosen modules is mandatory, as is the participation in all other educational activities of the program as detailed in the Curriculum. In particular, it is important that students participate in all research-related events organized by the MSc program, the respective Research Labs or DEEE.

Classes are taught according to the announced week and semester schedule which includes class teacher(s), class days/hours, meeting room(s)/laboratories or teleconference links, depending on the mode of instruction of each module. Class attendance is mandatory. Delays beyond 15 minutes are considered as missed class; the student, however, may still attend the class. Students who have missed more than two (2) of the scheduled classes of any given course module, automatically fail the module and are not allowed to participate either in the regular exam period or the September re-sit exam period. Student attendance is recorded by each class teacher who evaluates participation and progress continuously.

If a class is cancelled for any reason, it is rescheduled by the class teacher who announces the new date and time in the website. Students have to closely follow the MSc program website, to keep updated on announcements, news and events.

In order to facilitate class attendance and evaluation of students with disabilities or special (educational) needs (SD/SN), the DEEE professor designated as SD/SN Counsellor has to be contacted by the student before the beginning of the semester (https://eee.uniwa.gr/el/spoudes/akadimaiki-ypostiriksi/symvouloi-foititon-me-anapiria-fmea). The student should also contact the teacher of each course module he/she is registered in the current semester and inform him/her on the type of special needs and other requirements.

3.10.2 Mode of instruction

Course modules are taught and examined in hybrid mode, as a blend of face-to-face teaching in class and online teaching, through synchronous distance learning (teleconferencing). In any case, teleconferencing may extend up to 75% of the whole course. The specific teaching and examination mode for each course module is announced in the beginning of every academic semester, before student enrollment.

In the case of teleconferencing, the UNIWA-endorsed teleconferencing platforms are used. Furthermore, UNIWA-endorsed e-learning platforms, such as *eclass* or *moodle*, may be used by the class teachers to upload learning content in digital form, such as material for study, class notes, presentations, videos, figures, diagrams, proposed bibliography, tests/exams, etc. Teaching is delivered according to the provisions of Greek Law 4957/2022 and the UNIWA Regulation for Graduate Studies (Gov. Gazette 4861/B/02-08-2023, article 9) as well as the Joint Ministerial Decision 18137/Z1/16-02-2023 (Gov. Gazette 1079/B/28-02-2023).

This MSc program does not offer any course module in asynchronous e-learning mode.

3.110.3 Auxiliary e-learning platforms

Class teachers may use the *Open E-class* and *moodle* e-learning platforms operated by UNIWA in order to support their students in the course modules with additional learning material, online tools, past evaluation tests, laboratory material, etc. Students may access this material using their institutional credentials (<username>@uniwa.gr). In the central UNIWA webpage https://www.uniwa.gr/e-learning/, students can find detailed user guides for these platforms and their various features and functionalities.

3.10.4 MSc Program Language

The MSc working language is English.

3.10.5 Examination Periods

Student progress and performance is evaluated solely by the teacher(s) of the corresponding course module. Teachers may decide to evaluate students by written or oral exams, by projects that have to be reported and presented, by tests or quizzes or in any other way they deem suitable. Assessment may take place in midterm, at the end of the term, at both time points or continuously, throughout the semester. In the case of course modules assigned to more than one teacher, evaluation methods may be common or differ per teacher; this has to be communicated to the students in the beginning of the semester. All possible ways of evaluation within a given course module are described in detail, along with the respective grade breakdown, in the course module description table available online.

In any case, assessment is completed within dates set by the course module teacher(s) and announced in the beginning of the semester; it may not extend beyond the beginning of next academic semester. In case a *final* exam is needed, be it a written or oral exam or a project submission and presentation, this must be scheduled within the official examination periods announced.

Examination periods take place following the completion of teaching periods of each of the two semesters, as defined in the academic calendar; they may not overlap with teaching classes. The exact dates are decided by CC and announced in the MSc website every year. In the same decision, the exact dates for the re-sit examination period of September are set. Students are allowed to take part in the examinations of all course modules they are registered in for the current semester. The learning material to be examined is announced by the course module teacher(s) in the beginning of the semester along with any details or amendments.

In the beginning of a final exam, proctors check student IDs. Students spotted to cheat in any way (e.g., copy material from books or notes or from fellow students or from online sources using a mobile device) or to secretly communicate with fellow students or to impede the smooth running of the exam in any way are expelled from this exam, the respective written documents are signed by the proctor(s) and the MSc Program Director is notified in order to initiate the relevant disciplinary procedures.

Teachers should make all necessary arrangements for the evaluation of SD/SN, according to the provisions of UNIWA Internal Regulation, article 37. SD/SN should contact the professor designated as SD/SN counsellor as well as the teacher(s) of each course module they intend to be evaluated in the current semester, so as to ensure that their special needs are taken care of.

Written exam sheets, student reports or documents of any other type of evaluation taking place within this MSc are retained by the course module teacher(s) for a period of at least 12 months following which they may be physically destroyed, except when a disciplinary procedure is ongoing or pending.

3.10.6 Student Evaluation and Grading

Grading is in the 0.0 – 10.0 scale. Grades are given with accuracy of one decimal digit. Passing grade is 5.0 for all modules. For graduation, however, a GPA of 6.0 or above is required. GPA is computed as the average of the final grades obtained by the student in the course modules, each weighted by the corresponding ECTS units. GPA is given with accuracy of two decimal digits. GPA is accompanied by performance ranking as follows:

8.50 – 10.00: Excellent

6.50 – 8.49: Very Good

6.00 – 6.49: Good

5.00 – 5.99: Unsatisfactory

0.00 – 4.99: Fail

In the case of an ‘Unsatisfactory’ or a ‘Fail’ result (GPA less than 6.00), DEEE does not confer the MSc degree and title. Instead, the student receives a Certificate of Attendance stating all successfully completed modules or other educational activities, along with their grades and ECTS units.

Teachers file examination results and grades with the UNIWA Student Registry and the DEEE Secretariat within two (2) weeks of the end of the corresponding examination period. They also file with the Secretariat all documentation for the grade(s) given, such

as written exam sheets, technical reports, project reports, presentations, etc. All these are kept in record by the Secretariat.

3.10.7 MSc thesis preparation and evaluation

The MSc thesis is written and submitted by the student under the research area and research title defined in the respective call. In the case when a modification of the research title (within the same research area) is deemed necessary, so that the new title describes more accurately the research work carried out, an application along with a brief justification has to be filed with the Secretariat by the supervisor. Applications can be filed at any time before the MSc thesis examination procedure. They are forwarded to the Assembly of DEEE for endorsement and become effective immediately afterwards.

MSc thesis is undertaken and carried out strictly on an individual basis. The MSc thesis text should extend to up to 20,000 words approximately. In case of theses that include the development of novel audiovisual or of other digital material or software application, the thesis text can be reduced to 10,000 words approximately. The thesis preparation must follow the plan, stages and schedule agreed between the student and the supervisor.

MSc theses are written in Greek. Students who wish to write their thesis in English may do so with the consent of CC following an application endorsed by the research supervisor. In any case, cover page, list of contents and an extensive abstract and keywords are given in both languages.

MSc theses are submitted for examination within the deadline announced by the Secretariat, at the end of each academic semester. Thesis preparation extensions are granted for exceptional reasons such as health issues. Thesis preparation extensions are granted by the CC for whole academic semesters only, after a written, justified and documented application of the student.

MSc theses are submitted for examination along with a form signed by the supervisor who states that the thesis is completed and ready for evaluation. The thesis is submitted in digital form, along with any supplemental digital material. A single printed and bound copy is given to the Secretariat for MSc records, after examination, acceptance and grading of the thesis. Thesis text formatting should strictly follow the instructions and template of the MSc program, which is decided by the CC and made available online in the program website. The text should be preceded by an abstract of 300-400 words approximately, along with a set of 4-6 keywords.

An MSc thesis is evaluated by the tripartite examination committee that includes the supervisor. The student presents and orally defends the thesis to the committee. The procedure is held in public and the date and place are announced in time by DEEE Secretariat. The committee may (i) accept the thesis as it is, (ii) return the thesis to the student along with written comments for improvement and set a new deadline for defense, or (iii) reject the thesis.

1. In the first case, the thesis is graded by the examination committee on the basis of the set of defined evaluation criteria and grade breakdown, as detailed in **Appendix II** of this Study Guide and the MSc Program Study Regulation. The final grade is the average of the grades given individually by the 3 committee members.

2. In the second case, the whole procedure is repeated for the defense and acceptance of the improved thesis version.
3. In the third case, the Department does not confer the Master of Science degree and title. Instead, the student receives a Certificate of Attendance stating all successfully completed modules or other educational activities, along with their grades and ECTS units.

Accepted and graded MSc theses must be uploaded in full text in the digital repository of UNIWA Library POLYNOE. After the examination committee files the MSc thesis grading form with the Secretariat, the student has to upload the thesis in full text in POLYNOE, under the MSc program partition, for the grade to take effect.

3.10.8 Anti-plagiarism rules

Students should clearly and meticulously cite any external sources of material(s) used in the text of the MSc thesis or in any other text(s) students submit during their studies to fulfill the requirements of the MSc program. They also take special care to place quoted text in quotation marks, so as to differentiate it from their own original text. Quoted text coming from external sources or text similar to already published text(s) of the same or other author(s) should not exceed 20% of the total thesis text, excluding bibliographic references and cover pages. Observation of the above limit is checked by the supervisor on the final thesis text, prior to submission of the text for examination, using the UNIWA-endorsed software tool (*turnitin*® or other). In the case of Technical Reports I and II and of the MSc thesis, the resulting percentage of similarity is forwarded by the supervisor to the other two members of the examination committee.

Plagiarism is considered a grave academic offense. The term covers all cases of

- appropriation or use of the work(s) or part of work(s) of others, either published or not, without the due reference,
- re-use of previous work(s) or parts of work(s) by the same author that have already been submitted and evaluated within a different framework, without clearly stating so,
- quotation of any documentation material without the due reference to its source.

In the unfortunate case that a student commits any of the above academic offenses and after a documented proposition by the CC, the Assembly of DEEE may decide to expel of the student. The expelled student receives a Certificate of Attendance stating all successfully completed modules or other educational activities, along with their grades and ECTS units.

3.11 Graduation

The graduation ceremony takes place during a meeting of the Assembly of DEEE, in the premises of the Department or the Faculty and in the presence of the MSc program Director, the Head or Deputy Head of DEEE, the Dean or Deputy Dean of the Faculty of Engineering and a representative of UNIWA Rectorate, as available. All other details of the ceremony are defined by the Faculty of Engineering Regulation for all the MSc programs

offered by the Faculty of Engineering Departments. In the graduation ceremony, graduates receive the original Master of Science title along with the Diploma Supplement.

A point that should be stressed is that a Master of Science degree cannot be conferred to a student who does not already hold and has submitted to the Secretariat a degree for studies of the 1st cycle (Level 6 of the EQF or equivalent) from a university or equivalent academic institution that is accredited by the Greek NARIC.

3.12 Certificates

Following a student application, DEEE Secretariat may issue any of the following types of Certificates:

1. Certificate of Student Enrollment,
2. Student Transcripts,
3. Certificate of Student Status,
4. Certification on Computer Skills,
5. Certificate of Completion of Studies,
6. A copy of the Degree, and
7. Diploma Supplement in English.

The first three certificates are issued in electronic form through the UNIWA Student Registry:

https://sso.uniwa.gr/login?service=https%3A%2F%2Fservices.uniwa.gr%2Flogin%2Fcas

The Certificate of Completion of Studies is issued following a student application for graduation, when the student has completed all requirements for the issue of the Master Degree. The certificate is valid for the short period up to the Graduation Ceremony, when the original Master Degree and Diploma Supplement is conferred.

3.13 Discontinuation of studies – Expulsion of students

The Assembly of the Department may decide to discontinue the study (i.e., to expel a student) in the following cases:

1. following an application from the student who wishes to discontinue his/her studies,
2. following a documented proposition of the CC, in case one of the following holds true:
    a) the student has exceeded the maximum length of study, as set in the MSc Program Study Regulation, either because he/she abstained from required activities or because of poor performance and failure in examinations or other evaluation activities so that it has become impossible for the student to complete all program requirements within the maximum duration allowed,
    b) the student has committed offenses that have violated the MSc Program Study Regulation, the UNIWA Internal Regulation, or other legislation, as this is verified by the competent body,
    c) while preparing an MSc thesis or other deliverable required by the MSc program, the student has violated the regulations on Intellectual Property Rights (Greek Law 2121/1993, as it holds) as this is verified by the competent body.

An expelled student receives a Certificate of Attendance stating all successfully completed modules or other educational activities, along with their grades and ECTS units.

3.14 MSc Program Infrastructure, Equipment and Resources

3.14.1 Infrastructure – Laboratories – Libraries

Students are given access to the classrooms and laboratories of the Department as well as to the printed and online material and collections of the UNIWA Libraries. For the needs of their research, students are given access to the following Research Laboratories of the Department, as they currently stand or as they may be reconfigured by the relevant competent bodies:

nr.	Laboratory Title	Website	DEEE Academic Staff (Director and members)
1	Power Systems, Measuring Systems, Environment and Reverse Engineering Laboratory	http://ecpmlab.eee.uniwa.gr/	G. Leonidopoulos, N. Manousakis, V. Kontargyri, P. Karagiannopoulos
2	High Voltage and Energy Systems Lab	http://hvlab.eee.uniwa.gr	C. Psomopoulos, P. Pachos, P. Tsatsaros
3	Building and Industrial Energy Systems Lab	http://eiclab.eee.uniwa.gr/	G. Ioannidis, P. Malatestas, S. Kaminaris, P. Karaisas, K. Kalkanis, P. Kontaxis, K. Koukouvinos, O. Syggeridou
4	Electronics and Computer Technologies (ECTLab)	http://ectlab.eee.uniwa.gr/	S. Potirakis, S. Vassiliadis, K. Zachariadou, E. Kyriakis-Bitzaros, M. Rangoussi, N.-A. Tatlas, D. Metafas, E. Sarri, S. Galata, Ch. Kachris
5	Wireless and Optical Devices and Communication Networks (WAVECOM)	http://wavecomm.eee.uniwa.gr/	N. Stathopoulos, S. Savaidis, K. Voudouris, I. Simos
6	Smart Technologies, RES and Power Quality (STRESQ)	https://restqmlab.eee.uniwa.gr/	G. Vokas, P. Papageorgas, D. Piromalis
7	Electronic Devices and Materials (EDML)	http://edml.uniwa.gr/	K. Moutzouris, I. Stavrakas, S. Kripotou, P. Photopoulos, F. Magana
8	Telecommunications, Signal Processing and Intelligent Systems (TelSiP)	http://telsip.uniwa.gr/	D. Kalyvas, E. Zervas, A. Alexandridis, G. Koulouras, E. Zois, S. Karabetsos, P. Tsiakas

9	Microsystems, Sensors, Embedded Systems and Automations (microSENSES)	http://microsenses.eee.uniwa.gr/	G. Kaltsas, E. Valamontes, I. Famelis, G. Patsis, D. Kandris, D. Goustouridis
10	Energy Applications and Energy Saving Systems	http://eaess-lab.uniwa.gr/	A. Moronis, G. Tsekouras
11	COmputer Networks & SErvices (CONSERT)	https://consert.eee.uniwa.gr/	Ch. Patrikakis, S. Mitilineos, P. Papadopoulos

Graduate students use the premises and equipment of the hosting Laboratory under the supervision of the lab personnel and observe at all times the Laboratory Regulation and especially the safety regulations included therein.

3.15 Evaluation and Accreditation of the Program

3.15.1 Internal Evaluation

Internal evaluation of every course module as well as of every class teacher or research supervisor involved in the MSc program takes place by the end of the teaching period of each semester (13 weeks). Internal evaluation procedures and forms are defined by national legislation, UNIWA Internal Regulation, the directives of the UNIWA Quality Assurance Unit (https://modip.uniwa.gr/en/home/) and the MSc Program Internal Regulation.

Detailed evaluation results are treated as confidential and are promptly forwarded to the corresponding class teacher(s) as feedback for their personal update and improvement. Within the following semester, evaluation statistics, anonymized and free of any personal / identification data, are published on the MSc website and are forwarded to the Assembly of DEEE to support decision making.

On the basis of the evaluation results obtained in the two academic semesters of an academic year, the CC prepares the annual Internal Evaluation Report, typically following the September examination period. This Report along with the annual statistical results, carefully anonymized and free of any personal / identification data, is discussed in the CC and is made available by the CC to the Assembly of DEEE, to all academic staff members involved in the MSc program, to the students through the MSc program website and to the UNIWA Graduate Study Programs Committee.

Furthermore, the CC discusses the evaluation results and proposes a set of measures or actions to be undertaken in order to fill gaps or remedy weak points revealed by the internal evaluation, in order to improve the MSc program. The proposal is addressed to the Assembly of DEEE for decision making.

3.15.2 External Evaluation and Accreditation

External evaluation and accreditation of the MSc program is regulated by Greek Legislation, EU legislation and the procedures and forms set by the Hellenic Authority for

Higher Education (H.A.H.E., https://www.ethaae.gr/en/). Accreditation by this national body is mandatory for all academic study programs offered in Greece.

3.16 Student Rights and Obligations

MSc students have all the rights and are entitled to all support activities and means that are offered to undergraduate students in UNIWA, with the exception of the right to receive a free copies of textbooks for the MSc course modules they attend. In particular, the supervisor of a student acts as his/her academic counsellor and remains in close collaboration with the student throughout his/her study program. The counsellor for MSc students with disabilities is the same academic staff member that is appointed to this role for undergraduate students of DEEE. DEEE and UNIWA have to ensure that students with disabilities are given equitable access to the university premises, the learning material and the instruction

3.16.1 Tuition and Fees

Financial administration of the MSc program in undertaken by UNIWA Special Account for Research Grants (SARG) (https://elke.uniwa.gr/en/home/).

The tuition and fees for this MSc program may be differentiated between students from other EU countries and students from third countries (Greek Law 5094/2024). Tuition and fees for this MSc Program are set to 1,000 euros per academic semester or 3,000 euros for the total study program. These are paid per semester, in two equal installments at the beginning and in the middle of the term, upon notification from the Secretariat, except for the tuition and fees for the 1st semester which are payable in a single installment before enrollment, in order to register in the program. No tuition and fees are payable during break of study semesters.

The MSc Program offers yearly one (1) scholarship on merit, for top performing students, in the form of a tuition and fees waiver for the 3rd semester of studies, decided on the basis of performance in the 1st and 2nd semester of studies. The scholarship is proposed by the CC and granted by the Assembly of DEEE. Students who have applied for and received extension(s) of study are not eligible for this scholarship.

3.16.2 UNIWA Network Operations Center (NOC)

UNIWA offers free e-mail services to students of all study programs through the UNIWA Network Operations Center (NOC). An e-mail account of the form <username>@uniwa.gr is assigned to each graduate student upon enrollment through the Secretariat. In particular, upon enrollment students receive from the Secretariat their personal and unique UNIWA Registration Number and the password necessary to activate their institutional e-mail account. Accounts are deactivated automatically by NOC upon either graduation or expiration of the maximum duration of study. An electronic message notifies the student or graduate for deactivation. A reasonable extension may be granted, following an application of the interested student to the Secretariat.

Furthermore, all UNIWA premises have wireless Internet access (Wi-Fi protocol, ssid: uniwa).

3.16.3 Digital Secretary Services

The digital secretary services of UNIWA are available to the students at the URL https://www.uniwa.gr/services/e-services/, where students can log in the UNIWA Student Registry using their institutional credentials. In the Registry, student may

- get updated on course modules, teachers, textbooks, notes, assignments, deadlines, etc.,
- renew enrollment and register to course modules in every semester,
- get updated on the grades received in all exams or other evaluation activities,
- receive Certificates of Student Status in electronic form.

3.16.4 Academic ID

Upon enrollment, graduate students are entitled to apply to the Greek Ministry of Education for an Academic ID. Academic ID is issued by the central Greek Ministry of Education services, in the form of a smart card which ensures certain privileges to the holder. Application is filed by the student directly to the Ministry through the URL http://academicid.minedu.gov.gr/. After an online check and verification by the Secretariat of the Study Program the student is enrolled in, the personal Academic ID is issued and may be picked up in physical form by the student from one of the pick-up points selected during the application process. Academic IDs are also valid as public transportation access cards, for those students eligible for free transportation and up to the expiration date written on them.

3.16.5 UNIWA Libraries

The mission of UNIWA Library is to support and strengthen educational and research activities of all members of the UNIWA academic community by means of facilitating the retrieval and management of specialized information and data as well as their disposal and availability to the broad national and international academic community. As part of its mission, UNIWA Library holds an active role in all initiatives UNIWA takes in the fields of education, culture and civilization.

UNIWA Library and Information Center has physical presence in the 3 campuses operated by UNIWA: students and staff can make use of the facilities and services of

- the Egaleo Park Campus Library or Library 1 (https://library1.uniwa.gr/),
- the Ancient Olive Grove Campus Library or Library 2 (https://library2.uniwa.gr/),
- the Athens Campus Library or Library 3 (https://library3.uniwa.gr/).

All three Libraries have study rooms and computer rooms with Internet access made available to students at extended opening hours (9:00 – 19:00 workdays, UNIWA academic calendar holidays excluded).

Furthermore, as a member of the Hellenic Link of Academic Libraries (Heal-Link), UNIWA Library and Information Center offers students free electronic access to major bibliographic databases such as Mathscinet, as well as to the full text of thousands of digital books and scientific journals of top-rank publishers such as Elsevier, Springer, Kluwer, Academic Press, etc.

Moreover, the Online Public Access Catalogue (OPAC), accessible at the URL https://opac.seab.gr/search~S15*gre, gives to all UNIWA members free access to all departmental libraries and to the central UNIWA library contents.

3.16.6 UNIWA Study Rooms and Computer Rooms

Study rooms and computer rooms for the use of undergraduate and graduate students are available in all 3 UNIWA Libraries, each located in one of the 3 UNIWA campuses.

3.16.7 Keeping updated and participating

MSc students are welcome to participate in all research-related or other, general interest events and activities organized by the MSc program, the Department, the Faculty or other units of UNIWA, to the extent that such participation supports and positively affects their studies. In particular, they are welcome to participate in research group seminars, focus groups and discussions, bibliographic updates seminars or presentation, lab tours and visits, workshops or conferences on subjects related to the MSc, lectures or any other scientific event.

3.16.8 Student Evaluation of Teaching

Evaluation of every course module as well as of every class instructor takes place by the end of instruction period of each semester. Evaluation procedure and forms are defined by legislation, UNIWA Internal Regulation and the directives of the UNIWA Quality Assurance Unit (https://modip.uniwa.gr/en/home/). In particular, students complete an anonymous online questionnaire for each course module they are enrolled in during the current semester. The questions refer to the course module content, the instruction process and the efficiency of the instructor. Evaluation results are treated as confidential and are forwarded to the corresponding class instructor(s) as feedback for their personal update and improvement. Within the following semester, evaluation statistics, anonymized and free of any personal / identification data, are published on the MSc website and are forwarded to the Assembly of the Department to support decision making.

3.16.9 Teaching Assistantships

Depending on the annual budget availability of the MSc program, of the involved Research Laboratories and/or of DEEE, Teaching Assistantships (TA) may be offered to MSc students, in order to aid faculty members of DEEE in their undergraduate teaching duties. TAs are granted by the Assembly of DEEE, after a proposition by the CC, following an open call and a selection process. Selected students sign a contract with the DEEE, for up to 10 hours per week work, paid per hour.

3.16.10 Student Mobility through ERASMUS+

MSc students are entitled to participate in mobility programs within the ERASMUS+ framework, to a peer academic or research institution abroad. To qualify for mobility, students should have successfully completed all requirements of the 1st semester of study. Incoming students from peer institutions at the MSc level are also welcome in the

program. Graduate student mobility is regulated by the UNIWA Mobility Regulation and the MSc Mobility Regulation.

3.16.11 Support for Students with Disabilities or Special (Educational) Needs

UNIWA takes special care to support students who for various reasons (students with disabilities, students with special (educational) needs, students from vulnerable social groups, students from low-income families) face obstacles that prevent them from participating in academic activities required in their study programs and in student life in general. These students are collectively referred to as SD/SN.

According to UNIWA Internal Regulation, article 61, paragraph 2, DEEE assigns the role of SD/SN counsellor to an academic staff member for an academic year term which may be renewed. Departmental SD/SN counsellors, in collaboration with UNIWA administration staff and services, undertake the task of supporting SD/SN in order to alleviate practical obstacles that prevent them from completing their studies and from graduating (https://eee.uniwa.gr/el/spoudes/akadimaiki-ypostiriksi/symvouloi-foititon-me-anapiria-fmea). The departmental SD/SN counsellor of DEEE holds the same role for SD/SN enrolled in the MSc program. Special care is taken by DEEE and the MSc program administration so as to provide SD/SN with access to all textbooks and to facilitate their class/laboratory participation.

3.16.12 Academic Counsellor

Every academic year in May, the Assembly of DEEE designates one or more DEEE professors as student Academic Counsellors for the next academic year. The list of counsellors is announced online in DEEE website. Counsellors advice and support students, especially first-year students, in order to facilitate their transition from secondary education to university. Drawing from their educational, research and professional experience, counsellors help students address and overcome practical issues so as to successfully proceed and complete their study program and enter professional life.

For the students enrolled in the MSc program, the role of academic counsellor is held by the research supervisor of each student.

3.16.13 Student Advocate

The Student Advocate was instituted in all Greek Universities by national Law 4009/2011, article 55, in order to mediate between students and teachers or students and administrative services of the University, to prevent maladministration or illegal actions and to safe-guard the smooth and fair operation of the University. The Student Advocate has no jurisdiction on issues of student evaluation and grading in examinations.

As part of his/her responsibilities, the Advocate investigates cases of his/her own accord or upon a student request or complaint and mediates with the relevant UNIWA bodies to resolve them. The Advocate may request and obtain from the University services any information, document or other evidence relative to the case at hand, may interrogate individuals and/or may ask for an expert opinion. In the case the Advocate detects illegal actions, maladministration or malfunctioning of a certain aspect of University life, he/she

notifies the academic staff or the relevant administrative department involved, as well as the student who submitted the report or complaint, and puts special effort to resolve the issue in a mutually satisfactory way. The Advocate may decide not to investigate but to file a student report which is vague, not documented or unsubstantiated. On the other hand, if the Advocate believes there is any evidence of a disciplinary offense, he/she forwards the case to the competent disciplinary body. (https://advedu.uniwa.gr/).

3.16.14 Student welfare and other services

Graduate students of UNIWA are entitled to certain welfare provisions and services, as these are defined in the pertinent national legislation, in UNIWA Regulation for Graduate Studies and the decisions of UNIWA administration. Information on these services, student eligibility and all relevant detail are available through the UNIWA Student Welfare Department. More specifically, graduate student are entitled to:

- Free meals in the UNIWA student restaurants, depending on their personal and family income,
- Medical services (European Security Card),
- Free transportation in public transport (academic ID is also used as student bus pass, eligibility dependent on personal and family income).
- Access to UNIWA Sport Facilities,
- Access to UNIWA cultural activities (organized groups for music, dance, theater, photography and cinema).

More details on each of these services are provided in UNIWA Internal Regulation (Gov. Gazette 4621/B/21-10-2020) and online in the central UNIWA website (https://www.uniwa.gr).

APPENDIX I: Course module description tables

COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.A.01	**SEMESTER**	A
COURSE TITLE	Research Methodology - Scientific Writing		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	6
Lab	0	
Total	3	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Postgraduate skills development
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-a-01-research-methodology-scientific-writing/ & https://eclass.uniwa.gr/courses/REEE101/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of*

the European Higher Education Area

- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course module primarily aims at student skills development at the graduate level, on the issues of (a) research methodology and (b) scientific writing.

Upon successful completion of the course, students are expected to be able to:

1. Understand and explain the difference between research and development,
2. Appreciate the role of English language mastery in order to write scientific texts in Science and Engineering,
3. Understand and correctly apply basic quantitative and qualitative research methods,
4. Understand, and adopt research ethics, proper citation and plagiarism avoidance,
5. Perform bibliographic search and retrieval of pertinent information,
6. Understand and explain how is research is carried out and how it is connected to the presentation of results in the form of an article,
7. Construct and organize correctly a typical scientific article,
8. Develop correctly the parts of a scientific article,
9. Put together sound argumentation and produce accurate citation and referencing,
10. Author / compose and correctly format the content, references etc. of a scientific article,
11. Understand and correctly apply the scientific article submission process and the review process,
12. Evaluate and review scientific articles and compose / author paper review reports,
13. To compose / author responses to reviewers.

Keywords: Research Methodology, Research Ethics, Scientific Writing, Scientific Articles, Literature Search, Scientific Journals and Conferences.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Adaptation to new situations.
- Decision making.
- Autonomous work.
- Teamwork.
- Work in an interdisciplinary environment.
- Promoting free, creative and inductive thinking.
- Conduction of research.
- Presentation of research results in the form of a scientific article.

(3) SYLLABUS

The contents of the module are outlined as follows:

1. Introduction to research terminology, basic and applied research, research design and implementation issues, support – explanatory material development, publication and dissemination of research results.
2. Quantitative and qualitative research methods overview.
3. Research ethics, intellectual property rights, avoidance of plagiarism.
4. International scope of research results publication (journals, conferences, workshops), prestige and renown of publication sources and means, access to published material (membership / open-access), publication review process and publications management.
5. Bibliographic databases, search and retrieval of information through modern web tools.
6. Formal referencing and citation styles (Chicago, Harvard, APA, etc.).
7. Scientific text authoring (reports, articles, abstracts, presentations). Structure, contents, formatting, terminology, use of language and expression. Practice on examples from the field of Electrical and Electronics Engineering.
8. Software tools (text editors, such as LaTeX, etc.) for scientific text preparation and formatting (text, tables, mathematical formulas, etc.). Collaborative editing, versioning and commenting methods and tools.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Synchronous distance learning (e-learning) (MS Teams)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>- Support of the learning process using power point presentations
- Electronic communication with students
- Support of the learning process through the Open eClass electronic platform</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.
The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lecture attendance</td><td>40</td></tr>
<tr><td>Study of theory, lectures and literature</td><td>40</td></tr>
<tr><td>Unguided literature study, solving exercises and preparing a final course examination.</td><td>36</td></tr>
<tr><td>Writing a scientific article, review a scientific article.</td><td>64</td></tr>
<tr><td>Course total</td><td>180</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure
Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public</td><td>The final grade is composed of 3 parts:
(a) sample regular paper or short review paper write-up (student is free to select paper subject; supervisor consent is required; the subject is usually related to the student's research project topic) x 60%,
(b) the presentation of this paper in class x 20%,
(c) the review of the paper written by a classmate x 20%.
Grading criteria for (a):</td></tr>
</table>

presentation, laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	• Paper structure, • Understanding and critical assessment of existing research, • Sound documentation of and argumentation on the proposed research results, • Correct formatting and referencing. Grading criteria for (b): • Presentation structure, • Content formatting, • Fluency in presentation and ability to answer questions on it. Grading criteria for (c): • Review structure, • Control points as in (a) and (b) above, used as review criteria, • Expression, language and style of the review.

(5) ATTACHED BIBLIOGRAPHY

BIBLIOGRAPHY

1. Research Methodology and Scientific Writing, C. George Thomas, Second Edition, 2021, Springer Cham, ISBN: 978-3-030-64864-0, DOI: https://doi.org/10.1007/978-3-030-64865-7.
2. Writing for Science and Engineering, Heather Silyn-Roberts, Second Edition, 2013, Elsevier, ISBN: 978-0-08-098285-4, DOI: https://doi.org/10.1016/C2011-0-07858-4.
3. Scientific Papers and Presentations, Martha Davis, Kaaron J. Davis and Marion M. Dunagan, Third Edition, 2013, Elsevier, ISBN: 978-0-12-384727-0, DOI: https://doi.org/10.1016/C2009-0-64256-2.
4. Scientific Papers and Presentations, by Martha Davis. Academic press, 1997
5. Publications Handbook and Style Manual, Chapter 5. Tables and Figures, ASA–CSSA–SSSA, 5585 Guilford Rd., Madison, WI 53711, USA.

RESEARCH ARTICLES

6. S. R. N. Reis and A. I. Reis, "How to write your first scientific paper," 2013 3rd Interdisciplinary Engineering Design Education Conference, Santa Clara, CA, USA, 2013, pp. 181-186, DOI: https://doi.org/10.1109/IEDEC.2013.6526784.
7. C. A. Linte, "Tips on Scientific Writing and Manuscript Preparation [Continuing Education]," in IEEE Pulse, vol. 5, no. 6, pp. 58-60, Nov.-Dec. 2014, DOI: https://doi.org/10.1109/10.1109/MPUL.2014.2355322.
8. J. A. Longo, Preparing a Research Paper in IEEE Format, on-line available: https://www.unlv.edu/sites/default/files/page_files/27/Engineering-PreparingPaperIEEE-Sept15.pdf (last access: 8/2/23).
9. J. Gain, Research Methods: Technical Writing, on-line available: https://slideplayer.com/slide/4401286/ (last access: 8/2/23).
10. K. Sainani, Scientific Writing, on-line available: https://web.stanford.edu/~kcobb/courses/writing/ (last access: 8/2/23).
11. Measuring Your Impact: Impact Factor, Citation Analysis, and other Metrics: Journal Impact Factor (IF), University Library, on-line available: https://researchguides.uic.edu/if/impact (last access: 8/2/23).

TOOLS

- LaTeX: https://www.latex-project.org/

WEBSITES

- https://dl.sciencesocieties.org/publications/style
- http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWtoc.html
- https://www.springer.com/gp/authors-

editors/authorandreviewertutorials/writing-a-journal-manuscript/figures-and-tables/10285530

- https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously#step1

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.A.02	**SEMESTER**	A
COURSE TITLE	Scientific Computing and Mathematical Modeling		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		3	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General Background		
PREREQUISITE COURSES:	1. Undergraduate courses on Mathematical Analysis 2. A course on Introduction to Linear Algebra 3. A course on programming (Matlab, Python, Julia, R, …) 4. A course on Numerical Analysis (optional).		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-a-02-scientific-computing-and-mathematical-modeling/ & https://eclass.uniwa.gr/courses/REEE102/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

- comprehend basic scientific programming methodologies for solving mathematical problems,
- implement solutions using the capabilities provided by modern scientific programming environments rather than programming them from scratch;
- understand the mathematical framework of the problem they want to solve,
- analyze the mathematical problem and choose the appropriate parameters to use,
- argue for the appropriate solution method,
- develop solutions by selecting and applying the appropriate tools provided by modern computing environments,
- analyze, evaluate and compare the solutions to other available,
- develop reports that present the calculations results and evaluate with arguments their correctness and quality characteristics.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *……*

- Analytical and synthetic work with complex Mathematical concepts to solve problems in basic fields of science and Engineering.
- Use of modern Mathematical Software for the implementation of solutions in scientific programming environments.
- Autonomous work.
- Teamwork.
- Ability to convert basic physical problems into corresponding mathematical-computer problems.
- Production of free, creative and inductive thinking.
- Analysis and synthesis of Mathematical processes with the use of the computer.
- Working in an interdisciplinary environment.
- Critical thinking and decision making depending on the solution of the Mathematical Problem.

3. SYLLABUS

The course syllabus consists of the following units.

Unit 1: Mathematical Modeling

Deterministic and stochastic mathematical models. Mathematical modeling with dynamic systems and differential equations.

Unit 2: Introduction to Scientific Programming (S.P.), Modern S.P. Environments. Computer Errors

Solving mathematical problems in scientific programming environments (Matlab, Mathematica, Python, Fortran). Numerical and symbolic calculations on a computer. Double, quadruple and higher precision calculations. Numerical calculation errors on the computer.

Unit 3: Numerical Linear Algebra in S.P. environments

Numerical Linear Algebra Methodologies in an S.P. environment. (solving linear systems, factorizations of matrices, calculation of eigenvalues, SVD).

Unit 4: Methodologies of approximation of functions and scientific data in S.P. environments.

Interpolation and Approximation of functions and data. Interpolatory Procedures. Least Squares Approximation. Statistical processing and data analysis methodologies.

Unit 5: Optimization Methodologies in S.P. Environments

Optimization Methodologies with or without conditions. Finding minimum of cost functions with classical or differential-evolutionary algorithms. Solving equations of non-linear systems.

Unit 6: Differentiation, Integration, Differential Equations

Numerical Integration and Differentiation. Numerical Solution of Ordinary Differential Equations. Methodologies of solving Partial Differential Equations.

Unit 7: Introduction of parallel computation in modern S.P. Environments

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Distance Learning (Synchronous, MS Teams)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• MS Teams for distance learning classes (weekly)
• E-class for course content support and teacher-student-class communication
• Mathematical software and tools (Matlab, Mathematica, Python, Fortran) for the subjects taught.</td></tr>
<tr><td>TEACHING METHODS

The manner and methods of teaching are described in detail.

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Study learning content</td><td>61</td></tr>
<tr><td>Bibliography study, solution of exercises</td><td>30</td></tr>
<tr><td>Projects preparation</td><td>30</td></tr>
<tr><td>Final Exam preparation</td><td>20</td></tr>
<tr><td>Course total</td><td>180</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation,</td><td>Student performance evaluation comes form:

• Participation in the educational process and contribution to discussions that take place (20% of the final grade)</td></tr>
</table>

laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	• Assignment average (best 3 out of a total of 4, 40% of final grade). Assignments are submitted via eclass. • Final written exam using a computer (40% of final grade).

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Numerical Analysis, Burden R., Faires J. D, Brooks\Cole.
- A First Course in Numerical Analysis, A. Ralston, Ph. Rabinowitz, Mc Graw Hill.
- Numerical Methods using Matlab, J. Mathews, K. Fink, Pearson Prentice Hall.
- Applied Numerical Analysis, C. Gerald, P. O. Wheatley, Addison Wesley.
- Applied Numerical Analysis Using Matlab, L. Fausett, Pearson Prentice Hall.
- Numerical Methods for Engineers, With Software and Programming Applications Fourth Edition, S.C. Chapra, R.P. Canale, MC Graw Hill, 2002
- Numerical Python, Scientific Programming and Data Science Applications with Numpy, Scipy and Matplotlib, R. Johansson, Apress
- Practical Numerical and Scientific Computing with MATLAB and Python, 1st edition, Eihab B. M. Bashie, CRC Press
- Learning Scientific Programming with Python, Christias Hill

Related Scientific Journals:

- SIAM Journal on Numerical Analysis
- International Journal for Numerical Methods in Engineering
- Applied Numerical Mathematics
- Journal of Computational and Applied Mathematics
- Numerical Algorithms
- Numerische Mathematik
- Scientific Programming

TOOLS

- Matlab: https://www.mathworks.com/products/matlab.html
- Mathematica: https://www.wolfram.com/
- Wolfram Alpha: https://www.wolframalpha.com/
- Python: https://www.python.org/
- scipy: https://scipy.org/
- Julia: https://julialang.org/
- R: https://www.r-project.org/

WEBSITES

- https://scipython.com/
- https://earthlab.colorado.edu/blog/what-scientific-programming-and-why-it-rocks
- https://sciprog.center/
- https://www.opensourceforu.com/2011/05/what-is-scientific-programming/

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.A.03	**SEMESTER**	A
COURSE TITLE	Supervised Research I		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Supervised Research Work		N/A	18
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge, Skills development		
PREREQUISITE COURSES:	(-)		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-a-03-supervised-research/ & https://eclass.uniwa.gr/courses/REEE103/		

2. LEARNING OUTCOMES

Learning outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. *Consult Appendix A* • *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* • *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B* • *Guidelines for writing Learning Outcomes*
Upon successful completion of this course module, the student is expected to be able to: • State, explain and categorize major research methodologies; select the appropriate one for the problem at hand,

- Perform a literature review of the selected research topic to get acquainted with the state of the art,
- Compare, contrast and critique published solutions/approaches on the selected research topic,
- Discern a gap in knowledge and/or technology that is worth addressing at the MSc level,
- Analyze the problem(s) or issue(s) related to this gap,
- Write and orally defend an extended technical report on the problem to be addressed, the literature review, the planned experimental procedure and the results sought.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

pervised Research I is the first part of research on the topic selected by the student upon enrollment.

1. Typically, this first part involves a literature review of the field, so as to get acquainted with the state of the art, and to compare, contrast and critique published solutions/approaches in an attempt to discern a gap in knowledge and/or technology that is worth addressing at the MSc level.
2. Further on, the student analyzes the problem(s) or issue(s) related to this gap, sets relevant hypotheses and plans and organizes an experimental plan to verify or reject them.
3. By the end of the semester, the student prepares a detailed Technical Report including all progress made during the semester, as well as the schedule of next semester research steps.
4. Technical Report I is written according to the respective template, is submitted by the student and is orally presented and defended in front of the supervising committee who grades it.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Laboratory work and measurements, Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for research supervision (weekly) • E-class for course content support and teacher-student communication • Pertinent mathematical / modelling / simulation software and tools (e.g., Matlab, Mathematica, Python, SPSS, etc.) depending on the specific research topic undertaken.

TEACHING METHODS

The manner and methods of teaching are described in detail.

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS

Activity	***Semester workload***
study and analysis of bibliography	260
laboratory work	130
essay writing (technical report I)	130
preparation of oral presentation of research results	20
Course total	***540***

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

The results of supervised research achieved in the 1st semester of study are evaluated on the basis of Technical Report I. This is written by the student, turned in in paper and in electronic form by the end of the semester, orally presented to the evaluation committee within the examination period, graded by the supervising committee and filled by the secretariat.

The supervising committee may

(i) Accept Technical Report I as it is.

(ii) Return Technical Report I to the student along with written comments for improvement. In that case, the student advances to the 2nd semester and continues his/her research, with the obligation to submit and present the improved Technical Report I along with Technical Report II by the end of the 2nd semester of study.

(iii) Reject Technical Report I. In that case, the student fails in MRES.A.03 and has to repeat it.

An accepted Technical Report I is graded by the examination committee on the basis of the set of defined evaluation criteria and grade breakdown, as detailed in the MSc Program Study Regulation. The final grade is the average of the grades given individually by each committee member. The committee submits the signed Technical Report I evaluation form to the Secretariat.

The Technical Report I evaluation form along with the detailed criteria and grade breakdown per criterion can be found in the "BIBLIOGRAPHY" tab, within the course module webpage https://mres.eee.uniwa.gr/mres-a-03-supervised-research/ .

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- As designated by the supervisor, according to the specific research topic undertaken.

Related Scientific Journals:

- As designated by the supervisor, according to the specific research topic undertaken.

TOOLS

- As designated by the supervisor, according to the specific research topic undertaken.
- Matlab: https://www.mathworks.com/products/matlab.html
- Mathematica: https://www.wolfram.com/
- Wolfram Alpha: https://www.wolframalpha.com/
- Python: https://www.python.org/
- scipy: https://scipy.org/
- Julia: https://julialang.org/
- R: https://www.r-project.org/

WEBSITES

- As designated by the supervisor, according to the specific research topic undertaken.

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.01	**SEMESTER**	B
COURSE TITLE	Science, Technology, Society: From History to Policy		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-b-01-science-technology-society-from-history-to-policy/ & https://eclass.uniwa.gr/courses/REEE105/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to:

(1) Use, compare and critique select concepts from the STS interdisciplinary field, with special emphasis on Gabrielle Hecht's "technopolitics", Thomas Hughes' "large technological systems" and David Edgerton's "technology in use".

(2) Understand, apply and defend the historicity of the relation between technology and society.
(3) Distinguish and assess the technopolitical aspects of contemporary challenges, including (a) "Artificial intelligence" and "technological unemployment", (b) Immigration, (c) Gender issues, (d) Environmental degradation, (e) Disability, (f) "Resource wars" and state conflict, (g) Energy transitions, (h) The "biomedical revolution".
(4) Demonstrate awareness of the social implications of their research and be able to analyze and evaluate said implications in written form.
(5) Discern social issues or challenges when they arise in their professional conduct and design future directions accordingly.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *……*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Working in an interdisciplinary environment
- Adapting to new situations
- Respect for difference and multiculturalism
- Respect for the natural environment
- Showing social, professional and ethical responsibility and sensitivity to gender issues
- Criticism and self-criticism
- Production of free, creative and inductive thinking

3. SYLLABUS

This course module introduces students to the Science Technology and Society (STS) interdisciplinary field. First, students are introduced to select concepts such as the Social Construction of Technology, Technopolitics, and Large technological systems. Then these concepts are applied to concrete aspects of the relation between society and technological and scientific change. Such aspects include: (a) Production technologies. (b) Environmental technologies. (c) Transport technologies. (d) Energy technologies. (e) Information Computation and Telecommunication Technologies. (f) Biotechnologies.

The lectures are also based on 19th and 20th century Greek and international history. Students are introduced to select narratives and debates from labour history, economic history, social history and diplomatic history.

All lectures are designed to produce discussion of current problems and challenges. This includes the discussion of topics such as (a) Geopolitics and International relations (b) Class, Racial and Gender discrimination (c) State policy (d) Emigration (e) Environmental issues. These topics come to the fore via selected abstracts taken from the daily press, and are discussed in conjunction with their often obscured technical aspects.

Syllabus:

A. Introduction

1. Introductory Concepts I
   - Is “technology” a “hazardous concept”?
   - Technological determinism
   - Large technological systems
2. Introductory concepts II
   - The Social Construction of Technology
   - Technology in use
   - Actor network theory
   - Technopolitics
   - Socio-technical imaginaries

B. First industrial revolution

3. Machinery, workers and worldviews in an age of cotton
   - The steam engine, the spinning mule, the watch
   - The historicity of the concept of “time”
   - Disassociating “labour” from “nature”
   - On “moral economy” and “technological revolutions”

C. Second Industrial Revolution

4. Taylorism
   - Management, engineering, and the organization of work – a history
   - Computation and the workplace
   - Taylorism today – software platforms and “smart” technologies
5. Fordism
   - Origins of the assembly line
   - Spaces of production and spaces of reproduction of labour power
   - The emergence of a “fordist” world
   - Immigration during a technological revolution: from the early 20th to the early 21st century.
6. Transport
   - The early twentieth century transport revolution
   - The emergence of “geopolitics”
   - Technological accidents
   - Social ramifications of the “self-driving” car
   - Geopolitics and transport technologies today: the Chinese “belt and road” initiative.
7. Energy I – The oil century
   - The transition from coal to oil – Energy and geopolitics
   - The rise of petroleum engineering – A deeply political discipline
   - Oil in the World Wars of the 20th century
   - Hydrocarbon exploration, energy transition and war in the 21st century – The Greek case

D. Third Industrial Revolution

8. Energy II – Nuclearity
   - Material configurations and state policies
   - International relations in the Cold War
   - Experts and expertise – technopolitics
   - Contemporary notions of “nuclear” – Ramifications of the AUKUS treaty
9. Information I – Calculation and computation
   - Computation and labour
   - Computing in the Cold War
   - The historicity of “computing”
   - Social gender and technology
10. Environmental challenges

- The emergence of the "environment" – another "hazardous concept"?
- Energy technologies and the environment
- Energy transitions – geopolitics and environmental concerns in the Ukranian war and beyond

E. Towards a fourth industrial revolution

11. Information II – Artificial intelligence and big data
    - Artificial intelligence and the "end of work"
    - Historical and philosophical dimensions of the Turing machine
    - Video games –between work and the reproduction of labour power
    - A world of "big data"
12. Biomedical technologies
    - "Genealogy", "power", "knowledge" and "technology" according to Michel Foucault
    - "Performativity", as seen in the case of anti-epidemic masks
    - The Intensive Care Unit: History of a peculiar "black box"
    - Technology and expertise in the recent pandemic
13. Wasn't the future wonderful? History, technology and futurism in times of crises
    - Course overview
    - Past and future of the relation between society and technology

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Distance Learning (Synchronous, MS Teams)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• E-class for course content support and teacher-student-class communication
• Google platform for seeking primary sources
• Jstor and Project Muse platforms for seeking secondary sources
• MS Powerpoint or similar for lecture presentation</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.
The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester work-load</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Study learning content</td><td>64</td></tr>
<tr><td>Composition of written essays</td><td>64</td></tr>
<tr><td>Presentation of written essays</td><td>13</td></tr>
<tr><td>Course total</td><td>180</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure</td><td>• Student performance evaluation comes from</td></tr>
</table>

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	1. 12 three-page essays that are composed individually by each student on a weekly basis 2. Individual student participation in the weekly discussions that follow. • Students deliver their essays by e-mail before each respective lecture. The instructor reads the essays and prepares the respective discussion. Plagiarism is checked by the instructor upon discussing the essays. • Essays are evaluated in terms of (1) Coverage of the topic in breadth and depth (30%) (2) Use of STS concepts (20%) (3) Quality of the results (25%) (4) Participation in the discussion that follows (25%)

5. ATTACHED BIBLIOGRAPHY

The sources listed below are divided by lecture. The first source cited in each section is required reading (for books, this means the reading of selected chapters). The rest of the sources are used by the instructor to inform the lecture and are accessible to students who are interested in further reading suggestions.

A. Introduction

1. Introductory Concepts I
   - Leo Marx, "'Technology': The Emergence of a Hazardous Concept", *Social Research,* Vol. 64, No. 3, 1997.
   - Wiebe Bijker, Thomas Hughes & Trevor Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology,* MIT Press, 1993, ([1]1987).
   - Merrit Roe Smith & Leo Marx (eds.), *Does Technology Drive History? The Dilemma of Technological Determinism,* MIT Press, 1994.
2. Introductory Concepts II
   - Gabrielle Hecht and Michael Thad Allen, "Authority, Political Machines, and Technology's History", in Gabrielle Hecht and Michael Thad Allen (eds.), *Technologies of Power: Essays in Honor of Thomas Parke Hughes and Agatha Chipley Hughes,* MIT Press, 2001.
   - Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society,* Harvard University Press, 1987.
   - Sheila Jasanoff & Sang-Hyun Kim, "Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea", *Minerva,* vol. 47, 2009.
   - David Edgerton, 'From Innovation to Use: Ten Eclectic Theses on the Historiography of Technology', *History and technology: An International Journal,* Vol. 16, No. 2, 1999.

B. First industrial revolution

3. Machinery, workers and worldviews in an age of cotton
   - Robert Friedel, *A Culture of Improvement: Technology and the Western Millennium,* MIT Press, 2007.
   - Sven Beckert, *Cotton: A Global History,* Alfred A. Knopf, 2014.
   - E. P. Thompson, "Time, Work-Discipline, and Industrial Capitalism", *Past & Present,* No. 38, 1967.
   - Edward Jones-Imhotep, "The Ghost Factories: Histories of Automata and Artificial Life", *History and Technology,* Vol. 36, No.1, 2020.

C. Second Industrial Revolution

4. Taylorism
   - Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century,* Monthly Review Press, 1974.
   - Merrit Roe Smith, "Industry, Technology and the 'Labor Question' in 19th-Century America: Seeking Synthesis", *Technology and Culture,* Vol. 32, no. 3, 1991.

- Thomas J. Misa, "The Reform of Factories, 1895-1915", in Thomas J. Misa, *A Nation of Steel: The Making of Modern America, 1865-1925,* Johns Hopkins University Press, 1995.
- Christos Karampatsos, «'Μαγικό Εργαλείο αυτός ο Υπολογιστικός Κανόνας!': Η Τεχνοπολιτική Διάσταση και η Ιστοριογραφική Σημασία της κατά Φρέντερικ Τέιλορ 'Επιστημονικής Οργάνωσης της Εργασίας» [A Magic Instrument that Slide Rule! On the Technopolitical Dimension and Historiographical Significance of Frederick W. Taylor's 'Scientific Management'], *Nefsis,* vol. 27-28, 2021.
- Allessandro Delfanti and Bronwyn Frey, "Humanly Extended Automation or the Future of Work Seen through Amazon Patents", *Science, Technology and Human Values,* Vol. 20, 2020.

5. Fordism
   - David Hounshell, *From the American System to Mass Production, 1800-1932,* John Hopkins University Press, 1984.
   - Stephen Meyer III, *The Five Dollar Day: Labor Management and Social Control in the Ford Motor Company, 1908-1921,* State University of New York, 1981.
   - Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave,* Basic Books, 1983.
   - David Nye, *America's Assembly Line,* MIT Press, 2013.
6. Transport
   - Christos Karampatsos, "Efrosini Crossing Syngrou Avenue: Automobile Accidents and the Introduction of the Automobile in Greece, 1900-1911", *History of Technology,* Vol. 33, 2017.
   - Halford J. Mackinder, "The Geographical Pivot of History", *The Geographical Journal,* Vol. 23, No. 4, Apr, 1904.
   - Wolfgang Schivelbusch, *The Railway Journey: The Industrialization of Time and Space in the Nineteenth Century,* University of California Press, 2014.
   - Ulrich Beck, "From Industrial Society to the Risk Society: Questions of Survival, Social Structure and Ecological Enlightenment", *Theory, Culture and Society,* Vol. 9, 1992.
   - Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Danger, 1880-1914,* Pickering and Ghatto, 2008.
7. Energy I – The oil century
   - Daniel Yergin, *The Prize: The Epic Quest for Money, Oil and Power,* Simon and Schuster, 2008, ([1]1991).
   - Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil,* Verso, 2011
   - Philippe Le Billion, *The Geopolitics of Resource Wars,* Frank Cass, 2005.
   - Christos Karampatsos, Spyros Tzokas and Giorgos Velegrakis, "The Endless Potentiality: A Century and a Half of Greek Oil Aspirations (and what often becomes of them)", *Journal of Energy History,* vol. 10, 2023.

D. Third Industrial Revolution

8. Energy II – Nuclearity
   - Gabrielle Hecht, "Political Designs: Nuclear Reactors and National Policy in Postwar France", *Technology and Culture,* Vol. 35, No. 4, 1994.
   - Stathis Arapostathis, Aspasia Kandaraki, Yannis Garyfallos and Aristotle Tympas, «'Tobacco for Atoms': Nuclear Politics, Ambivalences and Resistances about a Reactor that was Never Built», *History of Technology,* Vol. 33, 2017.
   - Maria Rentetzi, "Gender, Science and Politics: Queen Frederika and Nuclear Research in Postwar Greece", *Centaurus,* Vol. 51, 2009
9. Information I – Calculation and computation
   - Jennifer Light, "When Computers Were Women", *Technology and Culture,* Vol. 40, No. 3, 1999.
   - Aristotle Tympas, *Calculation and Computation in the Pre-electronic Era: The Mechanical and Electrical Ages,* Springer, 2017.
   - Andrew Warwick, "The Laboratory of Theory, or What's Exact About the Exact Sciences?", in M. Norton Wise (ed.), *The Values of Precision,* Princeton University Press, 1995.
   - Lorraine Daston, "Calculation and the Division of Labour, 1750-1950", *Bulletin of the German Historical Institute,* Vol. 62, 2017.
10. Environmental challenges
    - Joel Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective,* The University of Akron Press, 1996.
    - George Kennan, "To Prevent a World Wasteland: A Proposal", *Foreign Affairs,* Vol. 48, No. 3, Apr. 1970.
    - Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement,* Island Press, 2005.
    - Frank Uekoetter, "The Strange Career of the Ringelmann Smoke Chart", *Environmental Monitoring and Assessment,* Vol. 106, 2005

E. Towards a fourth industrial revolution

11. Information II – Artificial intelligence and big data
    - Matteo Pasquinelli, *The Eye of the Master: A Social History of Artificial Intelligence,* Verso, 2023.
    - Colin Garvey, "Broken Promises and Empty Threats: The Evolution of AI in the USA, 1956-1996", Technologystories.org, https://doi.org/10.15763/jou.ts.2018.03.16.02, 2018.
    - Christine von Oertzen, "Machineries of Data Power: Manual versus Mechanical Census Compilation in Nineteenth-Century Europe", *Osiris,* Vol. 32, 2017.
    - Hubert Dreyfus, *What Computers Still Can't Do: A Critique of Artificial Reason,* MIT Press, 1992.
    - Bruno Strasser and Paul Edwards, "Big Data Is the Answer... But What is the Question?", *Osiris,* Vol. 32, 2017.
    - Alexander Galloway, *Gaming: Essays on Algorithmic Culture*, University of Minnesota Press, 2006.
    - Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power,* Public Affairs, 2019.
    - Simon Schaffer, 'OK Computer', in Michael Hagner (ed.), *Ecce Cortex: Beitraege zur Geschichte des modernen Gehirns*, Wallstein Verlag, 1999.
    - George Caffentzis, "Why Machines Cannot Create Value, or Marx's Theory of Machines", στο Jim Davis, Thomas Hirschl & Michael Stark (επιμ.), *Cutting Edge: Technology, Information, Capitalism and Social Revolution,* Verso, 1997.
12. Biomedical technologies
    - Nancy Kentish – Barnes, "'Death Organized by the Doctor': End of Life Decisions in Intensive Care Units", *Revue Française de Sociologie,* Vol. 50, 2009.
    - Michel Foucault, *Discipline and Punish: The Birth of the Prison,* Vintage Books, 1995 ([1]1975).
    - Christos Lynteris, "Plague Masks: The Visual Emergence of Anti-Epidemic Personal Protection Equipment", *Medical Anthropology,* Vol. 37, No. 6, 2018.
    - John Luce & Douglas White, "A History of Ethics and Law in the Intensive Care Unit", *Critical Care Clinic,* no. 25, 2009.
    - Samuel Cohn Jr., *Epidemics: Hate and Compassion from the Plague of Athens to AIDS,* Oxford University Press, 2018.
13. Wasn't the future wonderful? History, technology and futurism in times of crises
    - Paul Ceruzzi, "An Unforeseen Revolution: Computers and Expectations, 1935-1985", in Joseph Corn, *Imagining Tomorrow: History Technology and the American Future,* MIT Press, 1986.
    - Claudia Castaneda & Lucy Suchman, "Robot Visions", *Social Studies of Science,* Vol. 44, No. 3, 2014.

TOOLS:

Each lecture is supported by a specially prepared Power Point presentation. Presentations change over time according to students' feedback. Short video streams are also occasionally used. In selected instances, the instructor and students jointly locate primary and secondary sources using platforms such as google.com, Jstor.org and Project MUSE.

WEBSITES:

Selected contemporary newspaper articles accompany each lecture. Students read these articles during the course of each lecture and comment on them using the concepts and approaches suggested in the bibliography. The list of newspaper articles is kept up-to-date and changes over time, taking into account the students' contribution.

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.01	**SEMESTER**	B
COURSE TITLE	Selected Topics in image Processing and Computer Vision		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	LECTURES	1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	*None:* *However:* We will assume you have a basic level of expertise in programming, computer science, and mathematics, especially linear algebra and probabilities. For example if you are unfamiliar with the topics of elementary linear algebra or calculus, then you might want to consider to introduce yourself to them: without these tools, most likely you will struggle with the course. Concretely, we will assume that you are familiar with the following topics; they will not be reviewed in class: • **Linear Algebra**: In addition to basic matrix and vector operations, it will be good to know least squares, Eigen- and singular-value decompositions. • **Calculus**: You should be comfortable with the chain rule, and taking gradients and partial derivatives of vector-valued functions. • **Probabilities**: It is desirable to know basic postulates of probability theory, including the concepts of multi-variable distributions. • **Programming,** including algorithms and data structures. • **Matlab**: Potential course assignments will involve programming in Matlab. You should either have prior experience, or be able to quickly learn a new language. *Desirable*:		

	• **Python-PyTorch**: You should either have prior experience, or be able to quickly learn this exciting language and machine learning library.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/REEE108/ & https://mres.eee.uniwa.gr/mres-b-02-01-selected-topics-in-image-processing-and-computer-vision/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

1) Summarize and distinguish the terms computer vision - computer vision and image processing
2) Identify the general principles of image processing by applying image processing techniques such as:
   a) Image enhancement with histograms
   b) Image transformations in the space and frequency domain.
3) Understand the main concepts that concern the relevant contemporary research and organize research directions such as:
   a) Feature detection from images
   b) Extracting features from images
4) Recommend, apply, operate and practice basic image processing algorithms (Canny, SIFT, SURF, Harris, etc.)
5) Recommend, apply, operate and practice basic low-level feature learning algorithms with data-driven computational learning techniques (Bag of Visual Words, Sparse Coding and Dictionary Learning, etc.)
6) Analyze and organize an image processing problem and recommend the required solutions through the application of appropriate algorithms and transformations.
7) Analyze a computer vision problem and synthesize solutions through the appropriate algorithm - Machine Learning tool.
8) Comparatively evaluate the main visualization tools and choose the appropriate one for a given application problem among:
   a) Noise reduction – denoising.
   b) Image reconstruction
9) Create and develop visualizations of the data, as for example in the creation of visual dictionaries or individuals and especially in the case of sparse representation and dictionary learning.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

Computer vision is perhaps one of the most thrilling fields which combines the concepts of data-driven Machine Learning and image processing. Computer vision exists in numerous applications ranging from Navigation, e.g., by any type of an autonomous vehicle; document analysis and understanding, mixed reality etc. The course contains selected topics in computer vision and pattern recognition. An extended syllabus contains the following topics:

- A review on image processing and computer vision methods. Image transforms, image compression & morphological transformations.
- Feature detection and extraction. Edge detection: Lines, edges and ridges with the Sobel, Prewitt, Roberts and Canny operators.
- Feature detection and extraction. Corner detection: the role of Hessian and the Harris operator.
- Feature detection and extraction. Blob detection with Laplacian of Gaussian (LoG) and Difference of Gaussian (DoG).
- Data-driven feature detection and extraction. Identification and coding of Regions of Interest (ROI). Key-point detection and visual descriptor with the Scale-invariant feature transform (SIFT). Local correspondence and the RANSAC algorithm.
- Image matching and recognition by considering image features as words. The Bag-of-visual-words model.
- Special topic: Dictionary learning (DL) and sparse representation (SR) methods: The K-SVD & OMP pairs of algorithms.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly) • E-class for course content support and teacher-student-class communication • Matlab or similar for project work • MS Powerpoint or similar for project presentation
TEACHING METHODS	

Activity	***Semester workload***
Lectures	8

The manner and methods of teaching are described in detail. *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	Study learning content: 17 Project preparation: 30 Project presentation: 5 **Course total: *60***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	• Student performance evaluation comes from ✓ Homework Assignments (30%): There will be two programming assignments over the course. The first assignment is worth 15% while the other assignment is worth 15% (individual or teamwork, depending on the number of enrolled students per year) ✓ Course Project (70%): A computer vision related project. (individual or teamwork, depending on the number of enrolled students per year) • Projects are turned in in electronic form. Plagiarism is checked by TURNITIN (20% max similarity) • The use of LLM (e.g., ChatGPT or similar) is strongly discouraged as non-scientific; in case is has to be used, the student must clearly state which part of the project and for which specific reasons had to be generated by such models. • Projects are evaluated in terms of ✓ Coverage of the topic in breadth and depth (30%) ✓ Suitability of the approach/method (20%) ✓ Quality of the results (25%) ✓ Presentation (25%)

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

i. *Computer Vision: Algorithms and Applications* by Richard Szeliski. Available for free online here
ii. *Computer Vision: A Modern Approach (Second Edition)* by David Forsyth and Jean Ponce. Available for free online here:
iii. *Elements of Statistical Learning* by Trevor Hastie, Robert Tibshirani, and Jerome Friedman. Available free pdf online here.
iv. *Multiple View Geometry in Computer Vision (Second Edition)* by Richard Hartley and Andrew Zisserman. Available for free pdf online here
v. *Digital Image Processing*, by R. C. Gonzalez and R. E. Woods 4th edition.

- Related academic journals:

1. An anthology of research papers offered by:

A. Computer Vision Foundation. openaccess.thecvf.com/menu. Research papers from top notch conferences such as:

- *Computer Vision & Pattern Recognition (CVPR)*

- *International Conference on Computer Vision (ICCV)*
- *Winter Applications on Computer Vision (WACV)*

B. European Computer Vision Association repository, www.ecva.net/papers.php. Research papers from top notch conferences such as:

- *European Conference on Computer Vision (ECCV)*

C. IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)

D. IEEE signal processing society

2. Highly cited research papers.

- *Aharon, M., Elad, M. and Bruckstein, A., 2006. K-SVD: An algorithm for designing overcomplete dictionaries for sparse representation. IEEE Transactions on signal processing, 54(11), pp.4311-4322.*
- *Wright, J., Ma, Y., Mairal, J., Sapiro, G., Huang, T.S. and Yan, S., 2010. Sparse representation for computer vision and pattern recognition. Proceedings of the IEEE, 98(6), pp.1031-1044.*
- *LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. "Deep learning." nature 521.7553 (2015): 436-444.*
- *LeCun, Y., Bottou, L., Bengio, Y. and Haffner, P., 1998. Gradient-based learning applied to document recognition. Proceedings of the IEEE, 86(11), pp.2278-2324.*
- *Fei-Fei, Li, Robert Fergus, and Pietro Perona. "One-shot learning of object categories." IEEE transactions on pattern analysis and machine intelligence 28, no. 4 (2006): 594-611.*
- *Lowe, David G. "Distinctive image features from scale-invariant keypoints." International journal of computer vision 60 (2004): 91-110.*
- *Perona, Pietro, and Jitendra Malik. "Scale-space and edge detection using anisotropic diffusion." IEEE Transactions on pattern analysis and machine intelligence 12, no. 7 (1990): 629-639.*
- *Simonyan, Karen, and Andrew Zisserman. "Very deep convolutional networks for large-scale image recognition." arXiv preprint arXiv:1409.1556 (2014).*
- *Olshausen, Bruno A., and David J. Field. "Emergence of simple-cell receptive field properties by learning a sparse code for natural images." Nature 381, no. 6583 (1996): 607-609.*
- *Ng, Andrew, Michael Jordan, and Yair Weiss. "On spectral clustering: Analysis and an algorithm." Advances in neural information processing systems 14 (2001).*
- *He, Kaiming, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. "Deep residual learning for image recognition." In Proceedings of the IEEE conference on computer vision and pattern recognition, pp. 770-778. 2016.*
- *Tuzel, O., Porikli, F., & Meer, P. (2008). Pedestrian detection via classification on riemannian manifolds. IEEE transactions on pattern analysis and machine intelligence, 30(10), 1713-1727.*
- *Deng, Jia, Wei Dong, Richard Socher, Li-Jia Li, Kai Li, and Li Fei-Fei. "Imagenet: A large-scale hierarchical image database." In 2009 IEEE conference on computer vision and pattern recognition, pp. 248-255. Ieee, 2009.*
- *Lazebnik, Svetlana, Cordelia Schmid, and Jean Ponce. "Beyond bags of features: Spatial pyramid matching for recognizing natural scene categories." In 2006 IEEE computer society conference on computer vision and pattern recognition (CVPR'06), vol. 2, pp. 2169-2178. IEEE, 2006.*
- *Jiang, Xingyu, Jiayi Ma, Guobao Xiao, Zhenfeng Shao, and Xiaojie Guo. "A review of multimodal image matching: Methods and applications." Information Fusion 73 (2021): 22-71.*
- *Mikolajczyk, Krystian, Tinne Tuytelaars, Cordelia Schmid, Andrew Zisserman, Jiri Matas, Frederik Schaffalitzky, Timor Kadir, and L. Van Gool. "A comparison of affine region detectors." International journal of computer vision 65 (2005): 43-72.*

3. TOOLS

- *VLFEAT: https://www.vlfeat.org/*
- *SPAMS: SPArse Modeling Software*
- *TENSORFLOW: www.tensorflow.org/*
- *OPENCV: opencv.org/*
- *PyTorch: pytorch.org/*
- *MANOPT: www.manopt.org/*

4. WEBSITES

- *Google machine learning education: https://developers.google.com/machine-learning*
- *Prof. M. Harandi website: https://sites.google.com/site/mehrtashharandi/*
- *Prof. M. Elad website: https://elad.cs.technion.ac.il/*
- *Prof. F. Porikli website: https://www.porikli.com/*
- *Prof. A. Ng website: https://www.andrewng.org/*
- *Prof. Y. LeCun website: http://yann.lecun.com/*
- *Prof. A. Zisserman website: https://www.robots.ox.ac.uk/~az/*
- *Prof. Fei-Fei Li website: http://vision.stanford.edu/*
- *Stanford University DL-CV: cs231n.stanford.edu/index.html*

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.02	**SEMESTER**	B
COURSE TITLE	Multifunctional Materials and Wearable Devices		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	NONE		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	ENGLISH		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-b-02-02multifunctional-materials-and-wearable-devices/ & https://eclass.uniwa.gr/courses/REEE109/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

(1) Understand and generate the basic principles of a Wearable System.

(2) To be familiarized and evaluate the textile and clothing technology.

(3) Understand and categorize the properties of multifunctional materials.

(4) Select and design a textile-based sensing system.

(5) Consider and evaluate the energy issues of the wearable systems

(6) To use and to implement communication tools for the handling of the data

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

The course “Multifunctional Materials and Wearable Devices” focuses on a multidisciplinary field of the electronic devices and the clothing items used for the operation of the sensors, the actuators and the communication devices for the acquisition of biological signals, process and transmission of the respective information, the operation of actuators etc. The textile based electrical energy harvesting is also an important function of the wearable systems.

Among the multifunctional materials, the most interesting ones are those which can be found or transformed in fibrous form, permitting their integration in the textile materials of the clothing items. Consequently, the course covers both fields and enables the analysis and the design of wearable electronic systems based on textile substrates on the human body.

Course syllabus outline:

1. Principles of wearable technology

1.1 Wearable devices

1.2 Wearable signal interfaces

1.3 Interaction of wearables

2. Principles of clothing technology

2.1 Textile materials

2.2 Textile fabrics

2.3 Clothing design and structure

3. Properties of multifunctional materials

3.1 Conductive fibres

3.2 Piezoelectric fibres and triboelectric textiles

3.3 Heat – Light – Colour etc.

4. Sensors and textile-based components

4.1 Yarns and fabrics with sensorial properties

4.2 R, C, L textile-based components

4.3 Power and transmission components

4.4. Textile antennas

5. Connectivity of distributed units

5.1 Hardware connections

5.2 Flexible structures

5.3 Wireless interconnections

6. Communication of wearable systems

6.1 Communication protocols

6.2 Data transmission

6.3 Internet applications

Mini project:

Short project for the analysis of the performance of multifunctional materials and basic wearable systems.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly) • E-class for course content support and teacher-student-class communication • MS Powerpoint or similar for project presentation
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester workload***
Lectures	13
Study learning content	13
Project preparation	26
Project presentation	8
Course total	***60***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	• Student performance evaluation comes from ✓ Mini project (30 % of the final grade) – individual or teamwork, depending on the number of enrolled students per year ✓ Final written exam (70 % of the final grade) • Projects are turned in in electronic form. Plagiarism is checked by TURNITIN (20% max similarity) • The use of LLM (e.g., ChatGPT or similar) is strongly discouraged as non-scientific; in case is has to be used, the student must clearly state which part of the project and for which specific reasons had to be generated by such models. • Projects are evaluated in terms of ✓ Coverage of the topic in breadth and depth (30%) ✓ Suitability of the approach/method (20%) ✓ Quality of the results (25%) ✓ Presentation (25%)

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. "Electronics and Computing in Textiles", Vassiliadis S. Editor., ISBN 978-.87-403-082-0. Bookboon Publ. http://bookboon.com/en/textbooks/it-programming/electronics-and-computing -in-textiles.

2. "Piezoelectric Melt-Spun Textile Fibers: Technological Overview", Matsouka D and Vassiliadis S., in "Piezoelectricity" (ed. S. Vassiliadis), Intechopen Publ., ISBN: 978-1-78923-647-7, 2018.

- Related academic journals:

1. uranga Seneviratne, Yining Hu, Tham Nguyen, Guohao Lan, Sara Khalifa, Kanchana Thilakarathna, Mahbub Hassan, and Aruna Seneviratne, 'A Survey of Wearable Devices and Challenges', IEEE Communications Surveys & Tutorials 19, 4 Fourth Quarter (2017)
2. Konstantinos Salonitis, John Pandremenos, John Paralikas and George Chryssolouris, 'Multifunctional materials: engineering applications and processing challenges', Int J Adv Manuf Technol 49, pp 803–826 (2010)
3. Rebecca R. Ruckdashel, Ninad Khadse and Jay Hoon Park, 'Smart E-Textiles: Overview of Components and Outlook', Sensors 22, 6055 (2022)
4. Jae Sang Heo, Jimi Eom, Yong-Hoon Kim, and Sung Kyu Park, 'Recent Progress of Textile-Based Wearable Electronics: A Comprehensive Review of Materials, Devices, and Applications', Small, 14, 1703034 (2018)
5. Kang Du, Rongzhou Lin, Lu Yin, John S. Ho, Joseph Wang, and Chwee Teck Lim, 'Electronic textiles for energy, sensing, and communication', iScience 25, 104174 (2022)
6. Ruiyang Yin, Depeng Wang, Shufang Zhao, Zheng Lou, and Guozhen Shen, 'Wearable Sensors-Enabled Human–Machine Interaction Systems: From Design to Application', Adv. Funct. Mater., 31, 2008936 (2021)
7. Repoulias, A., Vassiliadis, S., Galata, S.F., "Triboelectricity and textile structures", Journal of the Textile Institute, 2021, 112(10), pp. 1580–1587

TOOLS

- Audiovisual equipment
- Internet learning platform

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.03	**SEMESTER**	B
COURSE TITLE	Multilayer structures in organic optoelectronic devices		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	LECTURES	1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	A course on Photonics A course on Optical Communications A course on Optoelectronics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/REEE110/ & https://mres.eee.uniwa.gr/mres-b-02-03-multilayer-structures-in-organic-optoelectronic-devices/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

1. Understand the basic structure of organic semiconducting optoelectronic devices.

2. Become familiar with the basic materials that are used in their structure, both for OLEDs (Organic Light Emitting Diodes) and OPVs (Organic Photovoltaics).
3. Analyze and calculate the outcoupling efficiency throughout a multilayer structure of an OLED.
4. Learn the modeling and the calculation methods of the outcoupling efficiency for OLEDs.
5. Analyze and calculate the external quantum efficiency for a single and bulk heterojunction multilayer structure for OPVs.
6. Learn the methods for the calculation of the short circuit photocurrent for OPVs structure.
7. Develop software code using the methods of OPVs' photocurrent calculation.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of new research ideas
- Project planning and management
- Working independently
- Team work

3. SYLLABUS

This course aims to provide students with an in-depth understanding of the organic optoelectronic devices' multilayer structure which covers organic light emitting diodes (OLED) and organic photovoltaics (OPV). These devices have opened novel applications in both display applications and solar cells. The characteristic of these devices is their multilayer structure which is crucial for both the outcoupling efficiency for the OLEDs and the external quantum efficiency for the OPVs. The course will cover topics such as the structure of OLEDs and OPVs, the involved organic semiconducting and conducting materials, the methods of simulating their operation based on the electromagnetic theory and the respective modelling for optimization purposes.

Course Outline:

1. Multilayer structure of OLEDs
   • Transparent conducting materials
   • Hole and electron injection organic materials
   • Spectral refractive indices for the visible spectrum
2. Calculation models for OLEDs
   • Dipole antenna modelling of the excited states
   • Ray tracing calculation scheme
   • Transmission lines modelling
3. Multilayer structure of OPVs
   • Organic photovoltaic materials

- Single and bulk heterojunctions
- Planar and cylindrical geometries
- Spectral refractive index and extinction coefficient
- Perovskite solar cells

4. Calculation models for OPVs
   - Transfer matrix modelling
   - Transmission lines modelling
   - Normal and inclined illumination
   - Anisotropy, and interface roughness

Mini project: Short circuit photocurrent calculation for an OPV structure.

Groups of 2-3 students will analyse the structure of an OPV for its external quantum efficiency and thus its respective short circuit photocurrent. The materials of the OPV's multilayer structure will be followed by the respective spectral refractive indices and extinction coefficients.

Through this project, students will have the opportunity to develop a simple software code based on an OPV's structure modelling method.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly) • E-class for course content support and teacher-student-class communication • Matlab • MS Powerpoint or similar for project presentation
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester work-load***
Lectures	13
Study learning content	23
Mini project preparation	8
Mini project report	16
Course total	***60***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation,*	Student evaluation comes from • Mini project x 40% • Final written exam x 60%

laboratory work, clinical examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	

5. ATTACHED BIBLIOGRAPHY

- ***Suggested bibliography:***

(1) *Stephen R. Forrest, " Organic Electronics: Foundations to Applications", OXFORD University Press, 1st edition, 2020*
(2) *Mitsuhiro Koden, "OLED Displays and Lighting", IEEE Press, 1st edition, 2017*
(3) *Barry P. Rand, Henning Richter (editors), "Organic Solar Cells: Fundamentals, Devices, and Upscaling", CRC Press, 2014*

- Related academic journals:

(1) *K. A. Neyts, "Simulation of light emission from thin-film microcavities" J. Opt. Soc. Amer. A, vol. 15, p. 962, 1998.*
(2) *K. A. Neyts, "Microcavity effects and the outcoupling of light in displays and lighting applications based on thin emitting films," Appl. Surface Sci., vol. 244, pp. 517–523, 2005.*
(3) *T. Granlund, L. A. A. Pettersson, and O. Inganas, "Detrmination of the emission zone in a single-layer polymer light-emitting diode through optical measurements," J. Appl. Phys., vol. 89, no. 11, pp. 5897–5902, 2001.*
(4) *E. Hartmann, P. Boher, Ch. Defranoux, L. Jolivet, and M.-O. Martin,"UV-VIS and midIR ellipsometer characterization of layers used in OLED devices," J. Lumin., vol. 110, pp. 407–412, 2004.*
(5) *S.P.Savaidis, N.A.Stathopoulos 'Simulation of light emission from planar multilayered OLEDs, using a transmission-line model' IEEE – JQE Vol.45, No 9, pp 1089-1099, 2009.*
(6) *L.A.A.Pettersson, L.S.Roman, and O.Inganas, "Modeling photocurrent action spectra of photovoltaic devices based on organic thin films," J. Appl. Phys., vol. 86, no. 1, pp. 487–496, 1999.*
(7) *L.C.Roman, W.Mammo, L.A.A.Pettersson, M.R.Andersson, and O.Inganas, "High quantum efficiency polythiophene/C60 photodiodes," Adv. Mater., vol. 10, no. 10, pp. 774–777, 1998.*
(8) *A.J.Moule, J.B.Bonekamp, and K.Meerholz, "The effect of active layer thickness and composition on the performance of bulk-heterojunction solar cells," J. Appl. Phys., vol. 100, no. 9, pp. 4503-1–4503-7, 2006.*
(9) *A.M.C.Ng, K.Y.Cheung, M.K.Fung, A.B.Djurisic, and W.K.Chan, "Spectroscopic ellipsometry characterization of polymer-fullerene blend films," Thin Solid Films, vol. 517, no. 3, pp. 1047–1052, 2008.*
(10) *G.Dennler, K.Forberich, M.C.Scharber, C.J.Brabec, I.Tomiš, K.Hingerl, T.Fromherz, "Angle dependence of external and internal quantum efficiencies in bulk-heterojunction organic solar cells", J. Appl. Phys., 102, 054516, 2007.*
(11) *N.A.Stathopoulos, L.C.Palilis, S.P.Savaidis, S.R.Yesayan, M.Vasilopoulou, G.Papadimitropoulos, D.Davazoglou and P.Argitis 'Optical modeling of hybrid polymer solar cells using a transmission line model and comparison with experimental results' IEEE – JSTQE 16 (6), pp. 1784-1791, 2010.*
(12) *N.A.Stathopoulos, L.C.Palilis, S.R.Yesayan, S.P.Savaidis, M.Vasilopoulou, and P.Argitis, "A transmission line model for the optical simulation of multilayer structures and its application for oblique illumination of an organic solar cell with anisotropic extinction coefficient" J. Appl. Phys. 110, 114506, 2011.*

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.04	**SEMESTER**	B
COURSE TITLE	Fiber Bragg gratings in optical fiber communications and sensing applications		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES	1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge
PREREQUISITE COURSES:	A course on Photonics A course on Optical Communications A course on Optoelectronics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/REEE111/ & https://mres.eee.uniwa.gr/mres-b-02-04fiber-bragg-gratings-in-optical-fiber-communications-and-sensing-applications/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

(1) Understand the fundamental theory of spectral reflection and transmission from a periodic index variation of a fiber's core.
(2) Describe the various types of fiber Bragg gratings and their potential applications in fiber optic communications and as a sensing element.
(3) Understand the inscription techniques and compare them with the most common ones such as the phase mask and the fs-Laser.
(4) Learn and assess the basic FBG interrogation methods.
(5) Develop a simulation software for the analysis of typical uniform and non-uniform FBG.
(6) Construct an equalizer optical filter for an EDFA application using FBG.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	……

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of new research ideas
- Project planning and management
- Working independently
- Team work

3. SYLLABUS

This course aims to provide students with an in-depth understanding of a crucial component that is applied not only in optical fiber communication systems but also proves to have an extensive application as a sensor with several advantages in comparison with the traditional electrical ones. This component is based on the fiber Bragg gratings and may be used in optical communications as an optical filter for optical "Add and Drop" multiplexers in a WDM system; as a superstructure FBG for spectral filtering; or as chirped FBG for dispersion compensation. Moreover, it may be an excellent fiber optic sensor when used in a variety of different forms, and is able to cover a broad area of sensing applications. The course will cover topics such as the fundamental theory of FBG operation, the FBG types, the inscription techniques, the interrogation methods, the applications in optical communications and sensing applications.

Course Outline:

1. Fundamental theory of FBG operation
   - CMT technique for uniform gratings
   - Transfer Matrix and Transmission Line method for FBG simulation
   - Simulation of uniform and non-uniform FBGs
2. Different types of FBG
   - Chirped FBGs
   - Tilted FBGs
   - Phase shifted FBGs

- Superstructure FBGs
- Polymer FBGs
- Long Period Gratings (LPFG)

3. Inscription Techniques
   - Photosensitive fibers
   - Phase mask technique
   - fs-Laser technique
   - Other techniques of inscription
4. FBG interrogation methods
   - Spectrum analysis method
   - Tunable Laser method
   - Peak power detection methods
   - Other interrogation methods
5. Applications in fiber optic communications
   - Optical Add and Drop multiplexors
   - Superstructure FBG for spectrum filtering
   - Dispersing compensation with CFBGs
   - FBGs in EDFA design
6. Sensing applications
   - Stress and strain applications
   - Structural health monitoring
   - Temperature sensitivity and compensation
   - Humidity and pH measurements
   - LPFG environmental sensing applications
7. Lab project
   - Measurement of an FBG spectral reflectivity using an Optical Spectrum Analyzer
   - Calculation of the index modulation and the length of inscription
   - Measurement of the spectral emission of a pumped Erbium doped fiber
   - Design of an FBG for the equalization of the EDF's emission spectrum

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly) • E-class for course content support and teacher-student-class communication • Matlab • Laboratory education • MS Powerpoint or similar for presentation
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*	

Activity	*Semester workload*
Lectures	13
Study learning content	29

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS	Lab preparation	5
	Lab report	13
	Course total	***60***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Student evaluation comes from • Lab project x 30% • Final written exam x 70%	

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. *A.Othonos and K.Kalli, "Fiber Bragg grating: Fundamental and applications in telecommunications and sensing." Artech House, 1999.*
2. *R.Kashyap, "Fiber Bragg Gratings" Elsevier, 2010*
3. *Francis T. S. Yu and Shizhuo Yin, "Fiber Optic Sensors", Marcel Dekker, Inc. 2002.*

- Related academic journals:

1. *T. Erdogan, "Fiber Grating Spectra", IEEE J. Lightwave Technol. 15 (8) 1277–1294 (1997).*
2. *T. Erdogan, "Cladding-mode resonances in short and long period fiber grating filters," J. Opt. Soc. Am. A 14, 1760–1773 (1997).*
3. *N.A.Stathopoulos, S.P.Savaidis, H.Simos, E.Rigas, R.G.Correia, S.W.James, R.P.Tatam "Transmission line method for the simulation of Fiber Bragg Gratings", Applied Optics, Vol. 58, Issue 2, 353-360, (2019)*
4. *N.A.Stathopoulos and I.Simos "Modelling of non-uniform and fs-Laser inscribed fibre Bragg gratings", Optical Fiber Technology, 70, 102878 (2022)*
5. *S.J.Mihailov, D.Grobnic, C.W. Smelser, P.Lu, R.B.Walker, and H.Ding "Induced Bragg Gratings in Optical Fibers and Waveguides Using an Ultrafast Infrared Laser and a PhaseMask" Hindawi Publishing Corporation Laser Chemistry Vol 2008, Article ID 416251, 20 pages doi:10.1155/2008/416251*
6. *S.A.Slattery, D.N.Nikogosyan and Gilberto Brambilla, "Fiber Bragg grating inscription by high-intensity femtosecond UV laser light: comparison with other existing methods of fabrication" J. Opt. Soc. Am. B Vol. 22, No. 2 February 2005*
7. *K.Zhou, M.Dubov, C.Mou, L.Zhang, V.K.Mezentsev, and Ian Bennion "Line-by-Line Fiber Bragg Grating Made by Femtosecond Laser" IEEE Phot. Tech. Lett., VOL. 22, NO. 16, AUGUST 15, 2010*
8. *T.Geernaert, K.Kalli, C.Koutsides, M.Komodromos, T.Nasilowski, W.Urbanczyk, J.Wojcik, F.Berghmans, and H.Thienpont, "Point-by-point fiber Bragg grating inscription in free-standing step-index and photonic crystal fibers using near-IR femtosecond laser" Opt Lett. Vol. 35, No. 10, 1647 (2010)*
9. *Chao Wang and Jianping Yao "Chirped Microwave Pulse Compression Using a Photonic Microwave Filter With a Nonlinear Phase Response" IEEE TMTT, VOL. 57, NO. 2, 496-504 (2009)*
10. *S. W. James and R. P. Tatam, "Optical fibre long-period grating sensors: characteristics and application," Meas. Sci. Technol. 14, R49–R61 (2003).*

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.05	**SEMESTER**	B
COURSE TITLE	Advanced Antenna Design and 5G Communications		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES		1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	Antenna Theory, RF Design, Microwaves		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-b-02-05-advanced-topics-in-antennas-and-5g-communications/ & https://eclass.uniwa.gr/courses/REEE112/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

(1) Evaluate the principles of antenna design for 5G/6G telecommunication systems, including the key parameters that influence antenna performance.
(2) Analyse the various types of antennas used in 5G/6G systems, such as patch antennas, microstrip antennas, and array antennas.
(3) Design advanced antenna concepts, such as MIMO antennas, beamforming, and millimeter-wave antennas.
(4) Analyze antenna performance, with the aid of simulation tools such as CST and ADS.
(5) Evaluate the importance of antenna design in 5G/6G systems and the impact it has on overall network performance.
(6) Develop critical thinking skills to solve practical antenna design problems for 5G/6G systems.
(7) Communicate technical concepts related to antenna design for 5G/6G systems to technical and non-technical audiences.
(8) Prioritize the ethical implications of antenna design for 5G/6G systems, such as privacy, security, and environmental concerns.
(9) Develop an appreciation for ongoing developments in 5G/6G systems and the role of antenna design in shaping the future of telecommunications.
(10) Explore potential career paths in the field of antenna design and 5G/6G telecommunications.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

This course aims to provide students with an in-depth understanding of advanced antenna design techniques for 5G/6G telecommunication systems. The course will cover topics such as antenna arrays, MIMO systems, millimeter-wave antennas, beamforming, and mmWave propagation models. The course will also include practical design projects that will allow students to apply the concepts learned in class.

Course Outline:

1. Introduction to 5G/6G Telecommunication Systems
   - Overview of 5G/6G technology
   - Antenna requirements for 5G/6G systems
   - Challenges in antenna design for 5G/6G systems
2. Antenna Fundamentals
   - Introduction to antennas
   - Antenna parameters
   - Antenna types and characteristics
   - Antenna radiation pattern and polarization
3. Antenna Arrays
   - Array geometries and configurations
   - Linear and planar arrays
   - Beamforming techniques
   - Adaptive beamforming
4. MIMO Systems
   - Introduction to MIMO systems
   - MIMO antenna design
   - Diversity techniques
   - Spatial multiplexing
5. Millimeter-Wave Antennas
   - Introduction to millimeter-wave technology
   - Millimeter-wave antenna design
   - Substrate-integrated waveguide antennas
   - Dielectric resonator antennas
6. Propagation Models for mmWave Systems
   - Introduction to mmWave propagation
   - Propagation models for mmWave systems
   - Path loss models
   - Channel models
7. Practical Design Projects (mini group project)
   - Design and simulation of antenna arrays for 5G/6G systems
   - Design and simulation of millimeter-wave antennas
   - Beamforming simulation and analysis
   - Performance evaluation of MIMO systems

For the mini group project, students will work in groups of 3-4 to design and analyze an advanced antenna system for a 5G/6G telecommunication application. Each group will be assigned a specific problem statement related to antenna design and will be expected to use simulation tools and techniques to propose a solution that meets the specified performance requirements.

The project will consist of the following key components:

- Problem statement: Each group will be assigned a specific problem statement related to antenna design for 5G/6G systems.
- Antenna design: Students will use simulation tools and techniques to design and optimize an advanced antenna system that meets the specified performance requirements.

- Analysis: Students will analyze the performance of their antenna system and evaluate its impact on overall network performance.
- Report: Each group will be required to submit a report detailing their design methodology, analysis results, and conclusions.
- Presentation: Each group will give a short presentation to the class summarizing their project and highlighting key findings.

Through this project, students will have the opportunity to apply the theoretical concepts they have learned in class to a real-world antenna design problem. They will also develop critical thinking skills and the ability to work collaboratively in a group setting.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Distance Learning (Synchronous, MS Teams)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• MS Teams for distance learning classes (weekly)
• E-class for course content support and teacher-student-class communication
• Matlab / ADS / CST or similar for project work
• Gephi / ProM / Tableau for project work
• MS Powerpoint or similar for project presentation</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.
The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>13</td></tr><tr><td>Study learning content</td><td>13</td></tr><tr><td>Project preparation</td><td>26</td></tr><tr><td>Project presentation</td><td>8</td></tr><tr><td>Course total</td><td>60</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure
Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other
Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>• Student evaluation comes from
  • Average Grade of Homework Assignments (best 3 out of the total of 4 grades obtained) x 20%
  • Mini group project x 50%
  • Final written exam x 30%
• Projects are turned in in electronic form. Plagiarism is checked by TURNITIN (20% max similarity)
• The use of LLM (e.g., ChatGPT or similar) is strongly discouraged as non-scientific; in case is has to be used, the student must clearly state which part of the project and for which specific reasons had to be generated by such models.
• Projects are evaluated in terms of
(1) Coverage of the topic in breadth and depth (30%)
(2) Suitability of the approach/method (20%)
(3) Quality of the results (25%)</td></tr>
</table>

	(4) Presentation (25%)

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Constantine A. Balanis, "Antenna Theory: Analysis and Design", 4th edition, Wiley, 2016
- Richard A. Horn, "MIMO Antenna Technology for Wireless Communications", CRC Press, 2018.
- S. Raghavan and R. Abhari, "Millimeter Wave Antennas: Configurations and Applications", CRC Press, 2016.
- Kao-Cheng Huang and Mohsen Kavehrad, "Millimeter Wave Communication Systems", Wiley, 2019
- Theodore S. Rappaport, Robert W. Heath Jr., and Robert C. Daniels, "Millimeter Wave Wireless Communications", Prentice Hall, 2014
- Erik Dahlman, Stefan Parkvall, and Johan Skold, “5G NR: The Next Generation Wireless Access Technology", Academic Press, 2018
- Hrishikesh Venkataraman and Ramakrishna Marappa, "5G System Design: Architectural and Functional Considerations and Long-Term Research", Springer, 2018
- Mehdi Bennis, Meryem Simsek, and Alan Gatherer, "6G Mobile Communications", Wiley, 2021

- Related academic journals:

- S. Shrestha, N. Kumar, and B. P. Joshi, "Design and analysis of a dual-band antenna with switchable polarization for 5G communication systems", Microwave and Optical Technology Letters, vol. 63, no. 2, pp. 529-534, Feb. 2021.
- S. Gupta, S. Kumar, and V. Singh, "Design of a circularly polarized planar antenna for 5G communication systems", International Journal of Microwave and Wireless Technologies, vol. 12, no. 3, pp. 249-257, Mar. 2020.
- J. Zhang, M. Chen, and W. Hong, "A compact wideband millimeter-wave antenna for 5G communication systems”, IEEE Antennas and Wireless Propagation Letters, vol. 17, no. 2, pp. 290-293, Feb. 2018.
- S. R. Chowdhury, S. Sanyal, and A. K. Bhattacharjee, "Design and analysis of a compact multiband MIMO antenna for 5G communication systems", International Journal of Electronics and Communications, vol. 107, pp. 100-107, Oct. 2019.
- H. Zhang, H. Guan, and Z. Chen, "Design and implementation of a 28-GHz millimeter-wave phased array antenna for 5G communication systems", Journal of Electromagnetic Waves and Applications, vol. 33, no. 7, pp. 852-862, Mar. 2019.

TOOLS

- CST - Studio Suite®
- ADS - PathWave Advanced Design System
- MATLAB

WEBSITES

- IEEE Antennas and Propagation Society: The IEEE Antennas and Propagation Society is a professional organization dedicated to the advancement of antenna and propagation science and technology. Their website provides access to publications, conferences, and other resources related to antenna design. https://ieeeaps.org

- Antenna Magus: Antenna Magus is a software tool that provides a large database of antenna designs and allows users to simulate and optimize antenna performance. Their website provides access to tutorials, case studies, and other resources related to antenna design. https://www.3ds.com/products-services/simulia/products/antenna-magus/
- Keysight Technologies: Keysight Technologies is a company that provides electronic measurement solutions, including simulation tools for antenna design such as the PathWave Advanced Design System (ADS). Their website provides access to application notes, whitepapers, and other resources related to antenna design. https://www.keysight.com/us/en/products/software/pathwave-design-software/pathwave-advanced-design-system.html
- CST Studio Suite® is a high-performance 3D EM analysis software package for designing, analyzing and optimizing electromagnetic (EM) components and systems. https://www.3ds.com/products-services/simulia/products/cst-studio-suite/
- Ansys: Ansys is a company that provides simulation software for a variety of engineering applications, including antenna design. Their website provides access to webinars, case studies, and other resources related to antenna design. https://www.ansys.com/applications/antenna-design-and-placement
- Radio-Electronics.com: Radio-Electronics.com is a website that provides tutorials, articles, and other resources related to electronics and telecommunications, including antenna design for 5G/6G systems. https://www.electronics-notes.com
- Microwave Journal, an international magazine that provides articles, white papers from the industry and application notes https://www.microwavejournal.com
- Microwaves & RF, an international magazine that provides articles, white papers from the industry and application notes https://www.mwrf.com

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.06	**SEMESTER**	B
COURSE TITLE	Special Control Schemes in Wireless Sensor Networks		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	LECTURES	1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-b-02-06-special-control-schemes-in-wireless-sensor-networks/ & https://eclass.uniwa.gr/courses/REEE113/		

2. LEARNING OUTCOMES

Learning outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. *Consult Appendix A* • *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* • *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B* • *Guidelines for writing Learning Outcomes*
Upon successful completion of the course, students are expected to be able to: 1. Analyze the basic structure and operation of wireless sensor nodes. 2. Illustrate both the architecture and the operation of a typical WSN

3. Distinguish the features of WSNs that differentiate them from conventional wired networks.
4. Prioritize the advantages of WSNs.
5. Categorize the numerous applications of WSNs.
6. Assess the interconnection that exists between WSNs and Internet of Things.
7. Judge the various problems and weaknesses that obstruct the operation of WSNs.
8. Assess the platforms that are used in order to implement and simulate WSNs for research purposes.
9. Judge the hardware-based and software-based mechanisms that may be used in order to prolong the lifetime of WSNs.
10. Assess algorithms that are used for the maximization of coverage and k-coverage in WSNs.
11. Recommend how connectivity of sensor nodes in WSNs can be maintained.
12. Evaluate the way of operation of congestion avoidance schemes and congestion control schemes in WSNs.
13. Defend the necessity of the Quality of Service maximization in WSNs and how this may be accomplished.
14. Recommend the mechanisms that may be used to strengthen the security in WSNs.
15. Judge how multi-objective optimization can be accomplished in WSNs.
16. Distinguish special control issues that exist in specific categories of WSNs.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *……*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of free, creative and inductive thinking
- Decision-making
- Working independently
- Team work
- Working in an international environment
- Working in an interdisciplinary environment
- Production of new research ideas
- Project planning and management

3. SYLLABUS

This course is related to the study of Wireless Sensor Networks (WSNs) that, thanks to their ever-increasing number of applications, are among the most important areas of Science and Technology. In particular, the course focuses on the methodologies that have been proposed to solve the problems that hinder the operation of WSNs.

For this reason, first of all, the appropriate theoretical background is created, regarding:

- the structural and functional characteristics of wireless sensor nodes,
- the structure and operation of WSNs,
- the comparison of WSNs with conventional wired networks,
- the use and applications of WSNs,
- the weaknesses and problems of WSNs, and
- the implementation and simulation platforms used for WSNs.

The course then focuses on control schemes that have been proposed for WSNs for:

- energy sustainability of sensory nodes,
- maximizing coverage,
- maintain connectivity,
- avoiding and/or controlling congestion,
- maximizing the quality of services,
- ensuring the integrity of communications and data, and
- multi-objective optimization.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly), • E-class for course content support and teacher-student-class communication, • MS Powerpoint or similar application for project presentation.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester workload***
Lectures	13
Study learning content	13
Project preparation	26
Project presentation	8
Course total	***60***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical*	• The evaluation language is English. • The assessment of the students is carried out through a project that forms 100% of the final grade. • The project is submitted in electronic format and must be checked for similarity to published material through the use of TURNITIN online similarity detection service. The maximum allowable percentage of similarity is set to be equal to 20%. • The use of Large Linguistic Model (LLM) –based chat boxes, such as ChatGPT or similar, is strongly discouraged as non-scientific. However, if such means were used, the

examination of patient, art interpretation, other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	student must clearly state which part of the project and for which specific reasons had to be generated by using such models. • The grade of the work results from the following criteria: (1) Covering the topic in breadth and depth (50%) (2) Quality of outcome assessment (25%) (3) Presentation (25%)

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Akyildiz, I. F., & Vuran, M. C. (2010). Wireless sensor networks. John Wiley & Sons.
2. Al-Turjman, F. (2018). Wireless sensor networks: Deployment strategies for outdoor monitoring. CRC Press.
3. Ammari, H. M. (2022). Theory and Practice of Wireless Sensor Networks: Cover, Sense, and Inform (Vol. 214). Springer Nature.
4. Bhargava, B. K., Paprzycki, M., Kaushal, N. C., Singh, P. K., & Hong, W. C. (2020). Handbook of wireless sensor networks: issues and challenges in current Scenario's. Springer.
5. Chai, S., Wang, Z., Zhang, B., Cui, L., & Chai, R. (2020).Wireless sensor networks. Springer.
6. Cui, L., & Xie, X. (2019). Wireless sensor networks, Springer.
7. De, D., Mukherjee, A., Das, S. K., & Dey, N. (Eds.). (2020). Nature inspired computing for wireless sensor networks. Singapore: Springer.
8. Edla, D. R., Kongara, M. C., Lipare, A., Kuppili, V., & Kannadasan, K. (2020). Wireless Sensor Networks: Evolutionary Algorithms for Optimizing Performance. CRC Press.
9. Fahmy, H. M. A. (2020). Wireless sensor networks. Springer.
10. Kanoun, O. (Ed.). (2018). Energy Harvesting for Wireless Sensor Networks: Technology, Components and System Design. Walter de Gruyter GmbH & Co KG.
11. Nelson, A. (2021). Advanced Principles of Wireless Sensor Networks. Clanrye International.
12. Mishra, B. B., Dehuri, S., Panigrahi, B. K., Nayak, A. K., Mishra, B. S. P., & Das, H. (Eds.). (2019). Computational intelligence in sensor networks. Springer.
13. Obaidat, M. S., & Misra, S. (2014). Principles of wireless sensor networks. Cambridge University Press.
14. Rani, S., Maheswar, R., Kanagachidambaresan, G. R., & Jayarajan, P. (Eds.). (2020). Integration of WSN and IoT for smart cities. Springer.
15. Selmic, R. R., Phoha, V. V., & Serwadda, A. (2016). Wireless Sensor Networks. Springer.
16. Shankar, K., & Elhoseny, M. (2019). Secure image transmission in wireless sensor network (WSN) applications. Springer International Publishing.
17. Wu, W., Zhang, Z., Lee, W., & Du, D. (2020). Optimal coverage in wireless sensor networks. Springer.
18. Yellampalli, S. (Ed.). (2021). Wireless Sensor Networks: Design, Deployment and Applications. BoD–Books on Demand.

- Related academic journals:

1. ACM Transactions on Sensor Networks, ACM
2. Ad Hoc Networks, Elsevier
3. Ad-Hoc and Sensor Wireless Networks, Old City Publishing
4. EURASIP Journal on Wireless Communications and Networking, Springer
5. Future Internet, MDPI
6. IEEE Internet of Things Journal, IEEE
7. IEEE Sensors Journal, IEEE
8. IEEE Transactions on Mobile Computing, IEEE
9. IET Wireless Sensor Systems, John Wiley & Sons Inc.
10. International Journal of Ad Hoc and Ubiquitous Computing, Inderscience Publishers
11. International Journal of Distributed Sensor Networks, SAGE Publications Inc.

12. International Journal of Sensor Networks, Inderscience Publishers
13. International Journal of Wireless Information Networks, Springer
14. Journal of Sensor and Actuator Networks, MDPI
15. Journal of Sensors, Hindawi Publishing Corporation
16. Mobile Information Systems, Hindawi Publishing Corporation
17. Mobile Networks and Applications, Springer
18. Sensors, MDPI
19. Wireless Communications and Mobile Computing, Hindawi Publishing Corporation
20. Wireless Networks, Springer

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.07	**SEMESTER**	B
COURSE TITLE	Selected Topics in Small Hydro-electric Power Plant		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	LECTURES	1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	Mandatory: A course/ two courses on electric circuits (dc, ac, multi-phase ac) A course / two courses on electric machines (electromechanical transformation principles, three-phase transformers, three-phase synchronous generators (cylindrical, salient pole), three-phase induction machines (squirrel, double-fed), dc machines, steady state and transient analysis) A course / two courses on power systems (power system elements, p.u. power system representation, steady state and transient analysis of power systems with emphasis on short circuits, stability and power quality issues) A course / two courses on automatic control systems (concept of feedback, Laplace transformation, system description-block diagrams, dynamic response of first and second order systems, steady state errors, controllers (P,PI, PD, PID), stability issues and criteria (Routh-Hurwitz, root locus, Bode plots, Nyquist plots), state space representation & analysis, controllability, observability, Lypapunov stability, state feedback techniques, transient response analysis, optimal control principles) A course on mechanics (static & kinematic equations, isostatic and hyper-static formations, Elasticity theory, Hooke's law, uniaxial and biaxial stress, strain, tension, compression, shearing, bending torsion and combined loading, buckling, creep, impact etc.) Desirable:		

	A course on automatic control electric power systems (stability criteria, governor and automatic voltage control) A course on fluid mechanics (on pipes, open channels, turbines and pumps)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-b-02-07-selected-topics-in-small-hydroelectric-power-plants/ & https://eclass.uniwa.gr/courses/REEE114/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

1. Describe and explain the basics of a small hydro-electric power plant
2. Categorize by name, describe and classify major problems that are typically addressed through different technologies of small hydro-electric power plants (especially dam, intakes, turbines, generators)
3. Design with civil engineers and hydrologists the civil structures such as dam and spillway
4. Design the hydraulic structures such as pipe, open channel, intake, sediment traps for nominal flow supply
5. Compare and recommend the proper electro-mechanical structures such as hydro-turbine, generator, step-up transformer for nominal flow supply, as well as evaluate the respective power capacity and energy output
6. Evaluate the technical-economic viability of a small hydro-electric power plant in a preliminary design stage
7. Judge, explain and interpret results from the aforementioned stage; comment on their validity; recommend solutions on the basis of these results
8. Design and compose a small hydro-electric plant with others in a team in order to address a realistic (but not real) situation/problem
9. Develop the skills acquired in this field in order to address real situations/problems.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…*

	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

An overview of Small Hydro-electric Power Plants:

- General introduction to hydro-electric power plant (Basic operation principles, categorization, differences between small and large hydro-electric power plant, definition of small hydro-power, site configurations (Run-of-river, at the base of a dam, within an irrigation canal, in a water abstraction system), planning)
- Fundamental of Hydraulic Engineering (introduction, water flow in pipes (head losses due to friction, local head losses, transient flow, hydraulic hammer), water flow in open channels (Classification of open channel flows, uniform flow, efficient cross-section & principles of energy in open channel flows))
- Evaluating stream flow (introduction, stream flow records, evaluating stream flows by discharge measurements (with velocity-area, weir, slope-area methods), stream flow characteristics (hydrograph, flow duration curves, standardised flow duration curves, water pressure)), residual, reserved or compensation flow, estimation of plant capacity and energy output (influence of flow variation and head variation on the turbine capacity, peaking operation, firm energy, floods (flood control design, statistical analysis of flood data, hydrological modelling of the catchment area))
- Site evaluating methodologies (cartography, geochemical studies, practical cases, learning from failures)
- Hydraulic structures (dams (types: embankment, concrete, other; loads and stability, dam safety), weirs and spillways (gated, ungated), energy dissipating structures, intake structures (types, head losses, trashracks, vorticity), sediment traps (efficiency, design), gates and valves, open channels (design and dimensioning, excavation and stability), forebay tanks, penstocks, tailraces)
- Electromechanical structures (powerhouse, hydraulic turbines (types and configuration, specific speed and similitude, preliminary design, selection criteria, efficiency), speed increasers (types, design, maintenance), generators (configurations, synchronous- asynchronous –dc generators, exciters, voltage regulation and synchronization, special specifications), turbine control, switchgear equipment, automatic control (governor – automatic voltage regulator – case of autonomous operation), ancillary electrical equipment (plant service transformer, DC control power supply, headwater and tailwater recorders, outdoor substation))
- Connection of hydro-power plant with grid through transmission / distribution lines: steady state and transient state current analysis for different operation modes, faults, power quality issues, power stability
- Environmental impact and its mitigation ((introduction, burdens and impacts identification, impacts in the construction phase (reservoirs, water intakes, open canals, penstocks, tailraces), impacts arising from the operation of the scheme (sonic, landscape, biological impacts), impacts from transmission lines (visual, health)))
- Economic analysis (basic considerations, time value of money, methods of economic evaluation (payback time period, net present value, benefit-cost ratio, internal rate of return), tariffs and incentives)

- Administrative procedures (types of procedures (energy regulation – water rights, environmental procedures, public inquiry, construction requirements, connection to the grid, others), examples)
- Special issues: Small hydropower plant in the modern electricity market, possibility for pump hydropower plants, etc.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly) • E-class for course content support and teacher-student-class communication • Matlab or similar tool for project work
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Student evaluation comes from • Class participation, mini-tests and contribution in the discussions held in class and online x 10% • Grade of Homework Assignment x 40% • Final written exam x 50%

Activity	***Semester workload***
Lectures	13
Study learning content	32
Project	13
Exam	2
Course total	***60***

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

i. European Small Hydropower Association (2004). *Guide on How to develop a Small Hydropower plant* (1st Edition), p. 296.
ii. Hydro-power – V. Schnitzer (2009). *Micro Hydro scout guide*. GTZ publishing, Germany (1st edition), p. 118.
iii. Celso Penche (1998). *Layman's guidebook on how to develop a small hydropower plant*. European Small Hydropower Association (1st Edition), p. 266.
iv. SWECO Norge AS (2012). *Cost base for small scale hydropower plants (With a generating capacity of up to 10 000 kW).* Norwegian Water Resources and Energy Directorate (NVE), editor Jan Slapgård, (1st edition), p. 91.

v. PPA-SEIAPI (2020). *Micro Hydropower System Design Guidelines.* The Pacific Power Association (PPA) and the Sustainable Energy Industry Association of the Pacific Islands (SEIAPI), (1st edition), p. 72.
vi. SWECO Norge AS (2012). *Cost base for small scale hydropower plants (With a generating capacity of up to 10 000 kW).* Norwegian Water Resources and Energy Directorate (NVE), editor Jan Slapgård, (1st edition), p. 91.
vii. Bureau of Reclamation (1987). *Design of small dams.* United States Department of Interior, Bureau of Reclamation, A Water Resources Technical Publication, (3rd edition), p. 904.
viii. A. J. Peterka (1984). *Hydraulic Design of Stilling Basins and Energy Basins*. United States Department of Interior, Bureau of Reclamation, Engineering Monograph No.25, (8th printing), p. 240.
ix. R.E. Krueger (1976). *Selecting Hydraulic Reaction Turbines.* United States Department of Interior, Bureau of Reclamation, Engineering Monograph No.20, (4th edition), p. 54.
x. A. N. Goncharov (1972). *Hydropower stations Generating equipment and its installation*. Energiya, Moskva, translated in English by Th. Peltz, Keter Publishing, Israel (1st edition), p. 367.

- Related academic journals:

xi. S. Roy. Optimal planning of generating units over micro-hydro resources within a catchment area. IEEE Transactions on Energy Conversion, vol. 20, no. 1, March 2005, 231-236,
xii. J.S.Anagnostopoulos, D.E.Papantonis. Optimal sizing of a run-of-river small hydropower plant. Energy Conversion and Management, Vol. 48, no. 10, October 2007, 2663-2670.
xiii. A.D.Karlis, D.P.Papadopoulos. A systematic assessment of the technical feasibility and economic viability of small hydroelectric system installations. Renewable Energy. Vol. 20, no. 2, June 2000, 253-262.
xiv. V. Yildiz, J.A.Vrugt. A toolbox for the optimal design of run-of-river hydropower plants. Environmental Modelling & Software, vol. 111, January 2019, 134-152.
xv. R. Peña, A. Medina, O. Anaya-Lara, James R.McDonald. Capacity estimation of a minihydro plant based on time series forecasting. Renewable Energy, Vol. 34, no. 5, May 2009, 1204-1209.
xvi. X. Liu, Y. Luo, B.W.Karney, W. Wang. A selected literature review of efficiency improvements in hydraulic turbines. Renewable and Sustainable Energy Reviews. Vol. 51, November 2015, 18-28.
xvii. A.H. Elbatran, M.W. Abdel-Hamed, O.B. Yaakob, Y.M. Ahmed, I. M. Arif. Hydro power and turbine systems reviews. Jurnal Teknologi, Vol. 74, no. 5, 2015, 83 - 90.
xviii. K.X.Soulis, D.Manolakos, J. Anagnostopoulos, D. Papantonis. Development of a geo-information system embedding a spatially distributed hydrological model for the preliminary assessment of the hydropower potential of historical hydro sites in poorly gauged areas. Renewable Energy. Vol. 92, July 2016, 222-232.
xix. S. Basso, G. Botter. Streamflow variability and optimal capacity of run-of-river hydropower plants. Water Resources Research, Vol. 48, no.10, W10527, 13.
xx. G.-K. Sakki, I. Tsoukalas, A. Efstratiadis. A reserve engineering approach across small hydropower plants: a hidden treasure of hydrological data? Hydrological Sciences Journal, vol. 67, no.1, 2022, 94-106.
xxi. I.A. Niadas, P.G. Mentzelopoulos. Probabilistic Flow Duration Curves for Small Hydro Plant Design and Performance Evaluation. Water Resources Management 2008, Vol. 22, 509–523.
xxii. C. Monteiro, I.J. Ramirez-Rosado, L.A. Fernandez-Jimenez, "Short-term forecasting model for electric power production of small-hydro power plants," Renewable Energy, Vol. 50, February 2013, 387-394.
xxiii. K.K. Drakaki, G.K. Sakki, I. Tsoukalas, P. Kossieris, A. Efstratiadis, "Day-ahead energy production in small hydropower plants: uncertainty-aware forecasts through effective coupling of knowledge and data," Adv. Geosci., Vol. 56, 2022, 155–162.
xxiv. Angelos P. Moschoudis, George J. Tsekouras, Fotios D. Kanellos, Antonios G. Kladas. Generator and Transformer Efficiency Study for the Design of a Run-of-River Small Hydropower Plant with One Hydro-Turbine. 7th International Conference on Mathematics and Computers in Sciences and Industry, Marathon Beach, Athens, Greece, August 22-24, 2022, p. 9.
xxv. Vasiliki-Eleftheria K. Sarantopoulou, Korina Konstantina Em. Drakaki, George J. Tsekouras, Anastasios D. Salis, Georgia-Konstantina Sakki, Andreas Efstratiadis, Dimitrios E. Papantonis,

Vasilis Riziotis, George Caralis, Konstantinos X. Soulis. Optimal Operation of a Run-of-River Small Hydropower Plant with Two Hydro-Turbines. 7th International Conference on Mathematics and Computers in Sciences and Industry, Marathon Beach, Athens, Greece, August 22-24, 2022, p. 9.

- Tools:

xxvi. *Geographical data for renewable energy sources: https://geo.rae.gr/*
xxvii. *MATLAB: https://www.mathworks.com/products/matlab.html*
xxviii. *Meteorological data for Greece: https://meteo.gr*
xxix. *Topographical data: https://en-gb.topographic-map.com*

- Websites:

xxx. *https://ich.no/*
xxxi. *https://www.alpiq.com/power-generation/new-renewable-energy-sources/small-scale-hydropower-plants*
xxxii. *https://www.gilkes.com/small-hydropower-solutions/gilkes-turbines*
xxxiii. *https://www.global.toshiba/ww/products-solutions/renewable-energy/products-technical-services/hydro-power.html*
xxxiv. *https://www.andritz.com/hydro-en/about-andritz-hydro*
xxxv. *http://voith.com/en/products-services/hydro-power/small-hydro-power-plants-552.html*
xxxvi. *https://www.irem.it/en/hydro-power/pelton-turbines/*
xxxvii. *https://www.sulzer.com/en/applications/power-generation/renewables/hydro-power-generation*
xxviii. *https://www.spaansbabcock.com/hydropower/hydro-power/*
xxxix. *https://www.akersolutions.com/what-we-do/renewable-energy-solutions/hydropower*

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.02.08	**SEMESTER**	B
COURSE TITLE	E-learning: Mining, Analytics and Visualization of Educational Data		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	LECTURES	1	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/b-2-8-e-learning-mining-analytics-and-visualization-of-educational-data/ & https://eclass.uniwa.gr/courses/REEE115/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students are expected to be able to:

1. Define EDM and LA and differentiate the two terms
2. Describe the major types of educational data, their value and the means and processes for data collection

3. State the major problems the relevant research seeks to solve and the major research questions that are open to date
4. Implement major Machine Learning algorithms (ANN-DNN, SVM, Decision Trees, Bayesian etc.)
5. Analyze a classification problem and compose a solution using appropriate Machine Learning algorithms and tools
6. Analyze a prediction problem and compose a solution using appropriate Machine Learning algorithms and tools
7. Analyze a clustering problem and compose a solution using appropriate Machine Learning algorithms and tools
8. Comparatively evaluate major data visualization tools and select the appropriate for the problem at hand
9. Develop visualizations of educational data for the learner and/or the instructor.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Team work
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

This course module focuses on E-Learning technologies as implemented in modern e-learning platforms that support synchronous and/or asynchronous education events and activities. The core content of the module is Educational Data Mining (EDM) a topic that covers the collection, retrieval, analysis and visualization of educational data produced in digital form. Such data is automatically collected by an e-learning platform (an LMS or a VLE, such as moodle) during the interaction of learners with the platform and the learning content as well as the collaboration of learners who work in teams over a platform. Educational data is subsequently analyzed in order to answer specific research questions that aim to provide feedback to learners, instructors and decision-making parties in Education, in an attempt to improve the learning outcomes as well as the learning experience. The later field is known as Learning Analytics (LA). Data analysis is performed by artificial intelligence / machine learning algorithms, methods and tools. Data visualization is performed using modern relevant tools and visualization environments.

Syllabus

1. Introduction to Big Data, Data Mining and Educational Data Mining
2. Data Mining Nomenclature – EDM or LA or both?
3. Overview of current research and open questions

4. Types of problems EDM addresses and the corresponding Machine Learning methods employed
5. Classification, Prediction, Clustering: worked examples and case studies
6. From Data Visualization to Visual Analytics: current state, gaps and potentials

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for distance learning classes (weekly) • E-class for course content support and teacher-student-class communication • Matlab / WEKA / RapidMiner of similar for project work • Gephi / ProM / Tableau for project work • MS Powerpoint or similar for project presentation
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure
Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other
Specifically-defined evaluation criteria are given, and if and where they are accessible to students.
	• Student performance evaluation comes from
	  • An EDM / LA project (50% of the final grade) – individual or teamwork, depending on the number of enrolled students per year
	  • A visualization project (50% of the final grade) – individual or teamwork, depending on the number of enrolled students per year
	• Projects are turned in in electronic form. Plagiarism is checked by TURNITIN (20% max similarity)
	• The use of LLM (e.g., ChatGPT or similar) is strongly discouraged as non-scientific; in case is has to be used, the student must clearly state which part of the project and for which specific reasons had to be generated by such models.
	• Projects are evaluated in terms of
	  • Coverage of the topic in breadth and depth (30%)
	  • Suitability of the approach/method (20%)
	  • Quality of the results (25%)
	  • Presentation (25%)

Activity	***Semester workload***
Lectures	13
Study learning content	13
Project preparation	26
Project presentation	8
Course total	***60***

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. *Baker, R. S. J.d., & Inventado, P. S. (2014). Educational data mining and learning analytics. In J. A. Larusson & B. White (Eds.), Learning analytics: From research to practice. Berlin, Germany: Springer.*
2. *Baker, R. S. (2015). Big data and education (2nd ed.). New York, NY: Teachers College, Columbia University.*
3. *D'Mello, S. (2017). Emotional learning analytics. In Handbook of learning analytics (p. 115). New York, NY: SOLAR*
4. *Lang, C., Siemens, G., Wise, A., & Gasevic, D. (2017). Handbook of learning analytics. SOLAR, Society for Learning Analytics and Research. New York, NY: SOLAR.*
5. *Leitner, P., Ebner, M., & Ebner, M. (2019). Learning analytics challenges to overcome in higher education institutions. In Utilizing learning analytics to support study success (pp. 91–104). Cham, Switzerland: Springer*
6. *Romero, C., & Ventura, S. (2006). Data mining in E-learning. Southampton, England: Wit-Press*
7. *Romero, C., Ventura, S., Pechenizky, M., & Baker, R. (2010). Handbook of educational data mining. Data Mining and Knowledge Discovery Series. Boca Raton, FL: Editorial Chapman and Hall/CRC Press, Taylor & Francis Group.*

- Related academic journals:

1. *P. Macfadyen and S. Dawson, "Mining LMS data to develop an ''early warning system'' for educators: A proof of concept," Computers and Education, vol. 54, no. 2, pp. 588–599, 2010, doi: 10.1016/j.compedu.2009.09.008.*
2. *Siemens and R. S. Baker, "Learning analytics and educational data mining: Towards communication and collaboration," In Proc. 2nd International Conference on Learning Analytics and Knowledge (LAK'12), Vancouver, BC, Canada, 2012, pp. 252–254*
3. *Romero and S. Ventura, "Data mining in education," WIREs Data Mining and Knowledge Discovery, vol. 3, pp. 12-27, 2013, doi: 10.1002/widm.1075.*
4. *Peña-Ayala, "Educational data mining: A survey and a data mining-based analysis of recent works," Expert Systems with Applications, vol. 41 (4 part 1), pp. 1432-1462, 2014.*
5. *Aldowah, H. Al-Samarraie, and W. M. Fauzy, "Educational data mining and learning analytics for 21st century higher education: A review and synthesis," Telematics and Informatics, vol. 37, pp. 13-49, 2019.*
6. *H. Bin Roslan and C. J. Chen, "Educational Data Mining for Student Performance Prediction: A Systematic Literature Review (2015-2021)," International Journal of Emerging Technologies in Learning (iJET), vol. 17, no. 5, pp. 147–179, 2022, https://doi.org/10.3991/ijet.v17i05.27685.*
7. *Charitopoulos, M. Rangoussi, and D. Koulouriotis, "On the Use of Soft Computing Methods in Educational Data Mining and Learning Analytics Research: a Review of Years 2010–2018," International Journal of Artificial Intelligence in Education, vol. 30, no. 3, pp. 371-430, 2020, doi:10.1007/s40593-020-00200-8.*
8. *Roll and R. L. Wylie, "Evolution and revolution in artificial intelligence in education", International Journal of Artificial Intelligence in Education, vol. 26, no. 2, pp. 582–599, 2016.*
9. *Imran, S. Latif, D. Mehmood, and M. S. Shah, "Student Academic Performance Prediction using Supervised Learning Techniques," International Journal of Emerging Technologies in Learning (iJET), vol. 14, no. 14, pp. 92–104, 2019, https://doi.org/10.3991/ijet.v14i14.10310.*
10. *Polyzou and G. Karypis, "Feature Extraction for Next-Term Prediction of Poor Student Performance," IEEE Trans. on Learning Technologies, vol. 12, pp. 237–248, 2019.*
11. *T. Tempelaar, B. Rienties, and B. Giesbers, "In search for the most informative data for feedback generation: Learning analytics in a data-rich context," Computers in Human Behavior, vol. 47, pp. 157–167, 2015.*
12. *Jokhan, B. Sharma, and S. Singh, "Early warning system as a predictor for student performance in higher education blended courses," Studies in Higher Education, vol. 44, no. 11, pp. 1900-1911, 2019, doi:10.1080/03075079.2018.1466872.*

TOOLS

- *RapidMiner: https://rapidminer.com/*

- *WEKA: https://www.cs.waikato.ac.nz/ml/weka/*
- *GEPHI: https://gephi.org/*
- *ProM: https://promtools.org/*
- *TABLEAU: https://www.tableau.com/*
- *MATLAB: https://www.mathworks.com/products/matlab.html*

WEBSITES

- *https://educationaldatamining.org/*
- *https://jedm.educationaldatamining.org/index.php/JEDM*
- *https://solaresearch.org/stay-informed/journal/*
- *https://archive.ics.uci.edu/ml/index.php*
- *https://www.adlnet.gov/projects/xapi/*
- *https://www.imsglobal.org/activity/caliper*
- *http://dmg.org/*

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.B.03	**SEMESTER**	**B**
COURSE TITLE	Supervised Research II		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Supervised Research Work		N/A	18
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge		
PREREQUISITE COURSES:	Successful completion of MRES.A.03 “Supervised Research I”.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-b-03-supervised-research-ii/ & https://eclass.uniwa.gr/courses/REEE104/		

2. LEARNING OUTCOMES

Learning outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. *Consult Appendix A* • *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* • *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B* • *Guidelines for writing Learning Outcomes*
Upon successful completion of this course module, the student is expected to be able to:

- Compose alternative solutions and comparatively evaluate them according to a set of criteria; select the optimal solution,
- Simulate and/or design and/or construct a prototype; demonstrate the feasibility of the solution, as a proof of concept,
- Comparatively evaluate this solution to alternative existing ones and state its strengths and weaknesses,
- Write and orally defend an extended technical report on the implemented experimental procedure and the results obtained.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

Supervised Research II is the second part of research on the topic selected by the student upon enrollment.

1. Typically, this second part continues on the path set during the previous MRES.A.03 module and builds on the progresses made in it.
2. The student proceeds to implement his/her experimental study plan and get / measure / collect data to answer research questions.
3. By the end of the semester, the student prepares a detailed Technical Report including all progress made during the semester, as well as the schedule of next semester research steps.
4. The Technical Report II is written according to the respective template, is submitted by the student and is orally presented and defended in front of the supervising committee who grades it.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Laboratory work and measurements, Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory*	• MS Teams for research supervision (weekly) • E-class for course content support and teacher-student communication

<table>
<tr><td>education, communication with students</td><td>• Pertinent mathematical / modelling / simulation software and tools (e.g., Matlab, Mathematica, SPSS, etc.) depending on the specific research topic undertaken.</td></tr>
<tr><td>TEACHING METHODS

The manner and methods of teaching are described in detail.

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>laboratory work, design and development</td><td>260</td></tr>
<tr><td>project</td><td>130</td></tr>
<tr><td>essay writing (technical report II)</td><td>130</td></tr>
<tr><td>preparation of oral presentation of research results</td><td>20</td></tr>
<tr><td>Course total</td><td>540</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>The results of supervised research achieved in the 2nd semester of study are evaluated on the basis of Technical Report II. This is written by the student, turned in in paper and in electronic form by the end of the semester, orally presented to the evaluation committee within the examination period, graded by the supervising committee and filled by the secretariat.

The supervising committee may

(i) Accept Technical Report II as it is.

(ii) Return Technical Report II to the student along with written comments for improvement. In that case, the student advances to the 3rd semester and continues his/her research to prepare the MSc Thesis, with the obligation to submit and present the improved Technical Report II along with the MSc Thesis, by the end of the 3rd semester of study.

(iii) Reject Technical Report II. In that case, the student fails in MRES.B.03 and has to repeat it.

An accepted Technical Report II is graded by the examination committee on the basis of the set of defined evaluation criteria and grade breakdown, as detailed in the MSc Program Study Regulation. The final grade is the average of the grades given individually by each committee member. The committee submits the signed Technical Report II evaluation form to the Secretariat.

The Technical Report II evaluation form along with the detailed criteria and grade breakdown per criterion can be found in the “BIBLIOGRAPHY” tab, within the course module webpage https://mres.eee.uniwa.gr/mres-b-03-supervised-research-ii/ .</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- As designated by the supervisor, according to the specific research topic undertaken.

Related Scientific Journals:

- As designated by the supervisor, according to the specific research topic undertaken.

TOOLS

- As assigned by the supervisor, according to the specific research topic undertaken.
- Matlab: https://www.mathworks.com/products/matlab.html
- Mathematica: https://www.wolfram.com/
- Wolfram Alpha: https://www.wolframalpha.com/
- Python: https://www.python.org/
- scipy: https://scipy.org/
- Julia: https://julialang.org/
- R: https://www.r-project.org/

WEBSITES

- As assigned by the supervisor, according to the specific research topic undertaken.

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.C.01	**SEMESTER**	C
COURSE TITLE	MSc Thesis		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Supervised Research Work	N/A	30
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general knowledge
PREREQUISITE COURSES:	Successful completion of mandatory course modules and of electives chosen.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-c-01-msc-thesis/ & https://eclass.uniwa.gr/courses/REEE106/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the MSc Thesis, the student is expected to be able to:

- Perform a literature review of the field of research to get acquainted with the state of the art,

- Discern a gap in knowledge and/or technology that is worth addressing at the MSc level,
- Analyze the problem(s) or issue(s) related to this gap,
- Compose alternative solutions and comparatively evaluate them according to a set of criteria; select the optimal solution,
- Simulate and/or design and/or construct a prototype to demonstrate the feasibility of the solution, as a proof of concept,
- Comparatively evaluate this solution to alternative existing ones and state its strengths and weaknesses,
- Carry out an up-scaling study, were the solution required to operate in real-field conditions and scale,
- Write and defend in public an extended research report, in the form of MSc Thesis, on the problem, the proposed solution and its merits.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Production of new research ideas
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

- MSc Thesis is the final outcome a research study on a specific topic within the broad field of Electrical and Electronics Engineering. The specific topic is defined upon enrollment of the MSc student and research on it is carried out throughout the duration of the program, culminating to the writing and oral defense of the MSc Thesis.
- The major objective of the MSc Thesis is to lead the student to delve into the selected topic of research within the broad field of Electrical and Electronics Engineering, to develop novel approaches, methods, solutions or designs and thus contribute to the advancement of science and technology in the field. In doing so, the student is gradually brought to the state of the art in the science and technology of the field.
  An equally important objective is the introduction and initiation of students to research methodology and procedures, the cultivation of their scientific and research interests, the familiarization of students to the rules and ethics of research and the development of their research skills.
- A typical MSc thesis comprises
  - an initial literature review,
  - the definition of research questions that should bear elements of novelty,
  - theoretic study of the problem at hand and results,

as well as – where applicable –

- practical implementation or construction of a prototype and measurements or data analysis to verify the results of the theoretic study.

➢ The students are guided to adopt and implement a carefully chosen methodology in order to systematically address and answer their research problems or questions.
➢ Results are used to compose answers to the research questions, followed by discussion and critical appraisal of the whole research study and conclusions.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Laboratory work and measurements, Distance Learning (Synchronous, MS Teams)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• MS Teams for research supervision and progress monitoring (weekly) • E-class for course content support and teacher-student communication • Pertinent mathematical / modelling / simulation software and tools (e.g., Matlab, Mathematica, SPSS, etc.) depending on the specific research topic undertaken.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	MSc thesis is turned in and orally defended by the student to the respective examination committee. The procedure is held in public. The examination committee may (i) accept the thesis as it is, (ii) return the thesis to the student along with comments for improvement and set a new deadline for defense, or (iii) reject the thesis. An accepted MSc thesis is graded by the examination committee on the basis of the set of defined evaluation criteria and grade breakdown, as detailed in the MSc Program Study Regulation. The final grade is the average of the grades given individually by each committee member. After the committee files the MSc thesis grading form with the Secretariat, the student has to upload the thesis in full text in

Activity	***Semester workload***
laboratory work, design and development	390
project	100
essay writing (MSc Thesis)	390
preparation of oral presentation of MSc Thesis	20
Course total	***900***

	the UNIWA repository POLYNOE, under the MSc program partition, for the grade to become final. The MSc thesis evaluation form along with the detailed criteria and grade breakdown per criterion can be found in the "BIBLIOGRAPHY" tab of the present module., within the course module webpage https://mres.eee.uniwa.gr/mres-c-01-msc-thesis/ .

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- As designated by the supervisor, according to the specific research topic undertaken.

Related Scientific Journals:

- As designated by the supervisor, according to the specific research topic undertaken.

TOOLS

- As assigned by the supervisor, according to the specific research topic undertaken.
- Matlab: https://www.mathworks.com/products/matlab.html
- Mathematica: https://www.wolfram.com/
- Wolfram Alpha: https://www.wolframalpha.com/
- Python: https://www.python.org/
- scipy: https://scipy.org/
- Julia: https://julialang.org/
- R: https://www.r-project.org/

WEBSITES

- As assigned by the supervisor, according to the specific research topic undertaken.

COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	Department of Electrical and Electronics Engineering		
LEVEL OF STUDIES	Graduate (MSc)		
PROGRAM OF STUDY	MSc by Research in Electrical - Electronics Engineering		
COURSE CODE	MRES.C.02	**SEMESTER**	C
COURSE TITLE	Publication of Research Results		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Publication of Research Results		N/A	N/A
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Skills development		
PREREQUISITE COURSES:	(-)		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://mres.eee.uniwa.gr/mres-c-02/ & https://eclass.uniwa.gr/courses/REEE107/		

2. LEARNING OUTCOMES

Learning outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. *Consult Appendix A* • *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* • *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B* • *Guidelines for writing Learning Outcomes*
Course module MRES.C.02 “Publication of Research Results” is an obligation for graduation rather than a regular course module. This is why it does not contribute any ECTS units or grades to the student record.

The outcome is a binary YES/NO that masks the final grade calculated from all the rest of the modules that carry ECTS units.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Working independently
- Decision-making
- Project planning and management
- Production of free, creative and inductive thinking

3. SYLLABUS

Course module MRES.C.02 "Publication of Research Results" is an obligation for graduation rather than a regular course module. This is why it does not contribute any ECTS units or grades to the student record. The outcome is a binary YES/NO that masks the final grade calculated from all the rest of the modules that carry ECTS units.

As stated in the MSc Program Study Regulation, research work towards the MSc thesis starts from day one, proceeds along all 3 academic semesters of the program and is culminated by the (required) publication of the results in relevant, internationally renowned journals or conference proceedings, as deemed suitable by the supervisor.

Students are expected to carry out innovative research, i.e., research that generates or employs new information/data (scientific measurements, publications or other material) or develops a novel approach or solution as compared to existing / conventional ones. This research is expected to produce a publication of its results. The requirement for at least one publication before graduation is set to support the general aim of the MSc program that is the development of advanced skills in research, in expression/communication, in the formulation of scientific hypotheses and in the interpretation and presentation of research results.

The publication must be co-authored by the student and his/her supervisor at least – and possibly by other researchers that contributed to this research, as decided by the supervisor. Acceptable publications are those in international refereed scientific journals or international refereed scientific conferences with proceedings and review in the full text of the paper. Publication sources must be accessible and renowned (indexed in Web of Science, Scopus, PubMed). For the student to meet this requirement, either a copy of the publication or a copy of the submitted manuscript along with the letter of acceptance, must be filed with the Secretariat by the supervisor.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Distance Learning (Synchronous, MS Teams)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• MS Teams for student progress monitoring (weekly)
• E-class for course content support and teacher-student communication
• Pertinent mathematical / modelling / simulation software and tools (e.g., Matlab, Mathematica, SPSS, etc.) depending on the specific research topic undertaken.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.
The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Course total</td><td>(-)</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure
Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other
Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Binary (YES/NO), submitted to the MSc Secretariat by the supervisor along with a copy of the publication or the acceptance letter.</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- As designated by the supervisor, according to the specific research topic undertaken.

Related Scientific Journals:

- As designated by the supervisor, according to the specific research topic undertaken.

TOOLS

- As assigned by the supervisor, according to the specific research topic undertaken.
- Matlab: https://www.mathworks.com/products/matlab.html
- Mathematica: https://www.wolfram.com/
- Wolfram Alpha: https://www.wolframalpha.com/
- Python: https://www.python.org/
- scipy: https://scipy.org/
- Julia: https://julialang.org/
- R: https://www.r-project.org/

WEBSITES

- As assigned by the supervisor, according to the specific research topic undertaken.

APPENDIX II: MSc thesis evaluation form and criteria

MSc Thesis Evaluation Criteria		Grade Breakdown (Max Points)	Evaluator 1 (Name)	Evaluator 2 (Name)	Evaluator 3 (Name)
			Grade (G1)	Grade (G2)	Grade (G3)
Text Evaluation Criteria		TOTAL (75)			
A	Aims and objectives, structure and literature review of the field: • Definition and documentation of the aims and objectives of the MSc Thesis • Satisfactory bibliographic search and literature review of the field • Research design and planning, selection of a suitable research methodology and justification for this selection	**25**			
B	Quality and quantity of original contribution – degree of novelty: • Qualitative and quantitative adequacy of the personal contribution of the student • Critical analysis of research within the framework of the adopted methodology (points of uncertainty, strong points and limitations of the methodology) • Degree of novelty and documentation of the contribution of the thesis to the broader scientific area it falls into	**30**			
C	Structure, quality and format of MSc Thesis text: • Text structure and clarity in the analysis of methodology and argumentation • Use of language • Quality and format of the text (reports, tables, images)	**20**			
Evaluation Criteria for MSc Thesis Presentation & Defense		TOTAL (25)			
D	MSc Thesis Presentation: • Presentation contents – thesis subject coverage • Structure and clarity of the presentation • Presentation style and mode • Presentation time management	**15**			
E	MSc Thesis Defense: • Ability to answer questions following presentation	**10**			
Evaluators' Grades		TOTAL (100)			
Average MSc Thesis Grade		(G1 + G2 + G3) / 30	(Numerical) _____ (Text) _____		