UNIVERSITY OF WEST ATTICA

SCHOOL OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

ANNEX B

Curriculum Guide

incl. Courses' Description

Academic Year 2022-2023

ATHENS, 8/10/2022

Contents

1 Introduction

The Department of Mechanical Engineering, which is an organizational part of the School of Mechanical Engineering of the University of West Attica, aims to the provision of high-quality education, offering undergraduate, postgraduate and doctoral studies that cover both traditional and constantly evolving areas in the broader field of Mechanical Engineering, integrating cutting-edge research and technology by means of modern-day education methods and tools.

1.1 Aim and Objectives of the Curriculum

A Mechanical Engineer develops technical systems via the conversion of energy, material and signals, in a way that facilitates problem solving under conflicting requirements and specifications, and generates efficient solutions based on the study, design and manufacturing of a broad range of mechanical engineering products.

Subject areas of a Mechanical Engineer include those of mechanics, machine elements, mechanical structure design, material removal (cutting) processes, additive manufacturing (3D printing) technologies, aerodynamics, materials' technology, heat transfer, fluid mechanics, thermal engines and fluid flow machines, utilization of renewable (soft) energy sources, protection of the environment, heating, cooling and air-conditioning, measurements' technology, operations research and production management.

Upon successful completion of their studies, the graduates of the Department have acquired the necessary theoretical background, with scientific and technological knowledge, competences and skills that enable them to work and act as responsible Mechanical Engineers, in fields of relevance, both in the private and the public sector, either independently or as members and executives of corporations, of organizations and of agencies oriented to Mechanical Engineering, as well as in educational institutes, and in general, for the exercise of activities falling within the practice of the Mechanical Engineering profession, according to the provisions of Presidential Decree 99/05.11.2018 (Government Gazette, Issue A' 187).

1.2 Learning Outcomes

The Department's Curriculum provides its graduates with the necessary skills so as to:

- Apply their knowledge to modern-day industrial problems, relevant to their discipline.
- Familiarize with modern techniques and methodologies across the span of technologies they have specialized in.
- Use cutting-edge tools for solving technical and scientific problems, such as information systems, computers and software packages.
- Have the potential to design new products and services, and ability to develop innovation.
- Plan, implement and manage a given project.
- Develop initiatives, communicate effectively both in writing and orally, and perform adequately within a team at the national and international environment.
- Keep up with developments in their discipline and constantly improve their knowledge.
- Promptly provide the industrial sector and the society with their services.

2 Administration of the Institution, of the School and of the Department

Senate of the University of West Attica (UniWA)

***Rector – Head of the Senate*:**		
	Kaldis Panagiotis	Professor
***Vice Rector for Administrative Affairs*:**		
	Pantziou Grammati	Professor
***Vice Rector for Academic and Student Affairs*:**		
	Papageorgiou Efstathia	Professor
***Vice Rector for Finance, Planning and Development*:**		
	Sgouropoulou Cleo	Professor
***Vice Rector for Research and Lifelong Learning*:**		
	Kaldellis Ioannis	Professor

Administration of the School of Engineering

***Dean*:**	**Ioannidis Georgios**	Professor

2.1 Administrative Instruments of the University

The administrative instruments of the University of West Attica are the following:

- The Senate.
- The Rectorate Board.
- The Rector.
- The Vice-Rectors.

The Senate of the University of West Attica is composed of:

- The Rector.
- The Vice Rectors.
- The Schools' Deans.
- The Heads of the Departments.
- Student representatives, and at least one representative of undergraduate students and one representative of postgraduate students and PhD candidates.
- Three representatives, one from each of the University's staff categories of Special Teaching Staff (STS), Laboratory Teaching Staff (LTS), and Special Technical Laboratory Staff (STLS).
- One representative of the Administrative Staff of the Institute.

The Rectorate Board is composed of:

- The Rector.
- The Vice-Rectors.
- One student representative, indicated by the elected students participating in the Senate.
- One representative of the Administrative Staff that participates in the Senate.

The Rector and the Vice-Rectors are elected for a four-year term.

2.2 Administrative Instruments of the School

The administrative structure of the University of West Attica is composed of five Schools. Each School coordinates the operation of the Departments out of which it is composed. The administrative instruments of each School are the following:

- The General Assembly.
- The School Council.
- The Dean.

The General Assembly of the Schools is composed of:

- The Dean of the School.
- The members of the Teaching and Research Staff (*hereafter called Faculty members*).
- Student representatives, and at least one representative of undergraduate students and one representative of postgraduate students and PhD candidates.
- Three representatives, one from each of the Schools's staff categories of STS, LTS, and STLS.

The School Council is composed of:

- The Dean of the School.
- The Heads of the Departments.
- Student representatives, and at least one representative of undergraduate students and one representative of postgraduate students and PhD candidates.
- Three representatives, one from each of the School's staff categories of STS, LTS, and STLS.

The Dean is elected for a three-year term.

2.3 Administrative Instruments of the Department

The administrative instruments of the Department are:

- The General Assembly of the Department.
- The Administrative Board.
- The Head of the Department.

The General Assembly is composed of:

- The Faculty members of the Department.
- Student representatives, and at least one representative of undergraduate students and one representative of postgraduate students and PhD candidates.
- Three representatives, one from each of the Department's staff categories of STS, LTS, and STLS.

The Administrative Board operates in departments of two or more divisions. In departments where an Administrative Board is not in place, it is replaced by the General Assembly of the Department. The Administrative Board is composed of:

- The Head and the Deputy Head of the Department.
- The Divisions' Directors.
- One, out of the three elected representatives from the categories of STS, LTS, and STLS, indicated by the same three elected representatives.

The Head and the Deputy Head of the Department are elected by vote and for a two-year term.

3 Department Administration and Staff

Administration

***Head*: Stergiou Constantinos** - Professor	e-mail: stergiou@uniwa.gr
***Deputy Head*: Kavadias Kosmas** - Associate Professor	e-mail: kosmas.kavadias@uniwa.gr

Administrative Board

***Head*: Stergiou Constantinos** - Professor	e-mail: stergiou@uniwa.gr
***Deputy Head*: Kavadias Kosmas** - Associate Professor	e-mail: kosmas.kavadias@uniwa.gr
***Energy Div. Director*: Kondili Emilia** - Professor	e-mail: ekondili@uniwa.gr
***Design & Manuf. Div. Director*: Chamilothoris Georgios** – Professor	e-mail: gthor@uniwa.gr
***Representative of LTS & STLS:* Sigalas Ioannis** - LTS Member	e-mail: isig@uniwa.gr

General Assembly

***Head*: Stergiou Constantinos** - Professor	e-mail: stergiou@uniwa.gr
***Deputy Head*: Kavadias Kosmas** - Associate Professor	e-mail: kosmas.kavadias@uniwa.gr
***Member*: Kaldellis John** - Professor	e-mail: jkald@uniwa.gr
***Member*: Kondili Emilia** - Professor	e-mail: ekondili@uniwa.gr
***Member*: Nikas Konstantinos** - Professor	e-mail: ksnikas@uniwa.gr
***Member*: Nikolaidis Georgios** - Professor	e-mail: gnicol@uniwa.gr
***Member*: Panayiotatos Yerassimos** - Professor	e-mail: gpana@uniwa.gr
***Member*: Sarris Ioannis** - Professor	e-mail: sarris@uniwa.gr
***Member*: Chamilothoris Georgios** - Professor	e-mail: thor@uniwa.gr
***Member*: Psyllaki Pandora** - Professor	e-mail: psyllaki@uniwa.gr
***Member*: Vairis Achilles** - Professor	e-mail: vairis@uniwa.gr
***Member*: Theodorakakos Andreas** - Associate Professor	e-mail: atheod@uniwa.gr
***Member*: Medrea Carmen** - Associate Professor	e-mail: cmedrea@uniwa.gr
***Member*: Besseris Georgios** - Associate Professor	e-mail: besseris@uniwa.gr
***Member*: Moustris Konstantinos** - Associate Professor	e-mail: kmoustris@uniwa.gr
***Member*: Tsolakis Antonios** - Associate Professor	e-mail: adtsolakis@uniwa.gr
***Member*: Zafirakis Dimitrios** - Assistant Professor	e-mail: dzaf@uniwa.gr
***Member*: Papapostolou Christiana** - Assistant Professor	e-mail: chrispap@uniwa.gr
***Member*: Kanetaki Zoi** - Lecturer	e-mail: zoekanet@uniwa.gr
***Member*: Nazos Antonios** - Lecturer	e-mail: anazos@uniwa.gr
***Member*: Proestakis Emmanouil** - Lecturer	e-mail: eproest@uniwa.gr

General Assembly of the Energy Division

***Director*: Kondili Emilia** - Professor	e-mail: ekondili@uniwa.gr
***Member*: Kaldellis John** - Professor	e-mail: jkald@uniwa.gr
***Member*: Nikas Konstantinos** - Professor	e-mail: ksnikas@uniwa.gr
***Member*: Panayiotatos Yerassimos** - Professor	e-mail: gpana@uniwa.gr
***Member*: Sarris Ioannis** - Professor	e-mail: sarris@uniwa.gr
***Member*: Theodorakakos Andreas** - Associate Professor	e-mail: atheod@uniwa.gr
***Member*: Moustris Konstantinos** - Associate Professor	e-mail: kmoustris@uniwa.gr
***Member*: Kavadias Kosmas** - Associate Professor	e-mail: kosmas.kavadias@uniwa.gr
***Member*: Zafirakis Dimitrios** - Assistant Professor	e-mail: dzaf@uniwa.gr
***Member*: Papapostolou Christiana** - Assistant Professor	e-mail: chrispap@uniwa.gr
***Member*: Nazos Antonios** - Lecturer	e-mail: anazos@uniwa.gr
***Representative of LTS:* Maitos Antonios** - LTS Member	e-mail: amaitos@uniwa.gr
***Deputy:* Sigalas Ioannis** - LTS Member	e-mail: isig@uniwa.gr
***Representative of STLS:* Mentzos Michael** - STLS Member	e-mail: mmentzos@uniwa.gr

Representatives of Undergraduate, Postgraduate and Doctoral Students:

To be appointed.

General Assembly of the Design & Manufacturing Division

***Director*: Nikolaidis Georgios** - Professor	e-mail: gnicol@uniwa.gr
***Member*: Stergiou Constantinos** - Professor	e-mail: stergiou@uniwa.gr
***Member*: Chamilothoris Georgios** - Professor	e-mail: thor@uniwa.gr
***Member*: Psyllaki Pandora** - Professor	e-mail: psyllaki@uniwa.gr
***Member*: Vairis Achilles** - Professor	e-mail: vairis@uniwa.gr
***Member*: Medrea Carmen** - Associate Professor	e-mail: cmedrea@uniwa.gr
***Member*: Besseris Georgios** - Associate Professor	e-mail: besseris@uniwa.gr
***Member*: Tsolakis Antonios** - Associate Professor	e-mail: adtsolakis@uniwa.gr
***Member*: Kanetaki Zoi** - Lecturer	e-mail: zoekanet@uniwa.gr
***Member*: Proestakis Emmanouil** - Lecturer	e-mail: eproest@uniwa.gr
***Representative of LTS:* Karellas Georgios** - LTS Member	e-mail: gkarellas@uniwa.gr

Representatives of Undergraduate, Postgraduate and Doctoral Students:

To be appointed.

Permanent Teaching Staff (Faculty Members') Grades

Full Professors	***Division***	
Kaldellis Ioannis	Energy	e-mail: jkald@uniwa.gr
Kondili Emilia	Energy	e-mail: ekondili@uniwa.gr
Nikas Konstantinos	Energy	e-mail: ksnikas@uniwa.gr
Nikolaidis Georgios	Design & Manuf.	e-mail: gnicol@uniwa.gr
Panayiotatos Yerassimos	Energy	e-mail: gpana@uniwa.gr
Sarris Ioannis	Energy	e-mail: sarris@uniwa.gr
Stergiou Constantinos	Design & Manuf.	e-mail: stergiou@uniwa.gr
Psyllaki Pandora	Design & Manuf.	e-mail: psyllaki@uniwa.gr
Vairis Achilles	Design & Manuf.	e-mail: vairis@uniwa.gr

Associate Professors	***Division***	
Theodorakakos Andreas	Energy	e-mail: atheod@uniwa.gr
Kavadias Kosmas	Energy	e-mail: kosmas.kavadias@uniwa.gr
Medrea Carmen	Design & Manuf.	e-mail: cmedrea@uniwa.gr
Moustris Konstantinos	Energy	e-mail: kmoustris@uniwa.gr
Besseris Georgios	Design & Manuf.	e-mail: besseris@uniwa.gr
Tsolakis Antonios	Design & Manuf.	e-mail: adtsolakis@uniwa.gr

Assistant Professors	***Division***	
Zafirakis Dimitrios	Energy	e-mail: dzaf@uniwa.gr
Papapostolou Christiana	Energy	e-mail: chrispap@uniwa.gr

Lecturers	***Division***	
Kanetaki Zoi	Design & Manuf.	e-mail: zoekanet@uniwa.gr
Nazos Antonios	Energy	e-mail: anazos@uniwa.gr
Proestakis Emmanouil	Design & Manuf.	e-mail: eproest@uniwa.gr

Laboratory Teaching Staff (LTS)	***Division***	
Karellas Georgios	Design & Manuf.	e-mail: gkarellas@uniwa.gr
Maitos Antonios	Energy	e-mail: amaitos@uniwa.gr
Ntourou Cleopatra	Energy	e-mail: kntourou@uniwa.gr
Papatheodosiou Konstantinos	Design & Manuf.	e-mail: kopa@uniwa.gr
Sigalas Ioannis	Energy	e-mail: isig@uniwa.gr
Spyropoulos Georgios	Energy	e-mail: geospyrop@uniwa.gr
Tsitsis Christos	Energy	e-mail: c.tsitsis@uniwa.gr

Special Technical Laboratory Staff (STLS)	***Division***	
Mentzos Michael	Energy	e-mail: mmentzos@uniwa.gr

Emeritus Professors

Axaopoulos Petros	

Secretariat		e-mail: mech@uniwa.gr
Head:	**Kokkali Maria**	tel: +30-210-5381506
	Gioftsou Anna	tel: +30-210-5381227
	Zania Irini	tel: +30-210-5381227
	Stavropoulou Eleni	tel: +30-210-5381227
	Stavropoulou Katerina	tel: +30-210-5381227
	Stylianopouloy Styliani	tel: +30-210-5381227

4 Department Structure

4.1 Divisions

Studies in the Department of Mechanical Engineering are offered by the two Divisions of the Department, i.e.

- The Energy Division
- The Design & Manufacturing Division

4.1.1 Energy Division

The Energy Division of the Mechanical Engineering Department, having foreseen the need for adressing the severe energy and environmental problems at both the national and the global level in time, has over the last decade proceeded to a series of actions with the aim to advance education and research in the energy sector.

Today, the Energy Division focuses in the subject areas of heat, fluid mechanics, thermal engines and turbomachinery, utilization of renewable (soft) energy sources, protection of the environment, measurements' technology, and techno-economic investment appraisal.

Adequacy of the scientific, technological and also professional knowledge offered to the students of the Energy Division is ensured by the recent upgrade of the curriculum of the Department, supporting the aim to develop executives of high expertise that will be employed in the industrial sector, in small-medium enterprises, in consultancy firms and design offices in the field of engineering, in public organizations, in the agro-industry and agri-business sector, in the hotel sector, in local authorities, in energy and environmental certification bodies and in technological education bodies.

Additionally, the high academic standards of the courses offered and the scientific and research expertise of the teaching staff of the Energy Division, both strongly support graduates of the Division to continue their studies and embark on post-graduate programs.

4.1.2 Design & Manufacturing Division

The Design & Manufacturing Division of the Mechanical Engineering Department supports, through a modern and advanced curriculum, all required courses in the discipline of Mechanical Engineering that allow the Department to stand out for its studies at the national level. Our graduates are highly appreciated in the labour market and one of the main reasons for that relates to the fact that the Division manages to combine practical knowledge and skills with strong theoretical learning in the best possible way.

The courses offered develop a nexus of basic knowledge, gained via theory lectures and engineering laboratories in the first semesters, and complemented during the semesters of specialization with modern courses that both provide a strong theoretical background and make extensive use of cutting-edge computational tools and informatics in the laboratories' section.

Teaching is offered by teaching staff of high academic prestige, experienced and established not only in class lecturing and laboratories, but also in the fields of industry and production.

4.2 Research Laboratories

4.2.1 Energy Laboratory

The Energy Laboratory aims to respond to the challenges introduced in the field of Energy both nationally and internationally, in the interest of people and the society as a whole. Towards this direction, the Laboratory develops activities in the reseach and education sectors and offers consulting services in the broader area of energy, addressing the nexus of technological, economic, environmental and also social aspects. Amongst the areas of activity of the Energy Laboratory, the following are included:

- Energy saving in the building and transporation sectors, in the industry, in the public sector, in the agricultural sector, in tourism, and in everyday human routines and activities.
- Rational use of energy.
- Cogeneration and multigeneration systems.
- Cooling and heating systems.
- Conventional power generation stations.
- Renewable energy sources utilization.
- Hybrid power generation stations.
- Energy storage.
- Hydrogen technologies and alternative fuels.
- Desalination systems coupled with renewable energy sources.
- Energy crops – use of energy in the primary sector.
- Technoeconomic evaluation of energy investments.
- Energy projects' financing.
- Social acceptance of energy solutions.
- Energy policy and strategic management.
- Environmental impacts of the energy sector.
- Energy supply chains.
- Energy pricing.
- Application of modern methods and technologies for reducing energy consumption in the transportation sector.
- New energy technologies and modern trends in the utilization of conventional fuels (lignite, hydrocarbons, etc.).
- Dissemination actions concerning the objectives and activities of the Laboratory on energy issues.
- Every aspect relevant to the production, transmission, distribution and consumption of energy.

4.2.2 Environment Laboratory

Establishment of the Environment Laboratory lies on the provision of consulting services on the one hand and research and development on the other, in the fields of environmental technologies and systems. The areas covered under the scope of the Laboratory introduce the following activities:

- Design, implementation and operation of anti-pollution projects, e.g. units of collection, processing and management, transport and disposal of air, liquid, solid, toxic and hazardous waste, and of drinking water.
- Development and application of pollution sources' inventory systems and of measuring and monitoring methods concerning the emission of air pollutants to the atmosphere.
- Environmental impact assessment of projects and activities, and development of relevant environmental impact studies.

- Design of integrated solid waste management processes.
- Appraisal of investment opportunities and relevant potential in the areas of environmental management and recycling.
- Technoeeconomical studies and investment appraisal in the area of the environment (e.g. recycling units, drinking water production units, soil restoration and area utilization studies).
- Feasibility, development and application studies for environmental management systems.
- Technical consulting on environmental issues for different types of entities.
- Design and support in the implementation of water supply projects in areas lacking water resources and comparative assessment of different solutions.
- Specialized teaching and training activities.
- Dissemination actions concerning the objectives and activities of the Laboratory on environmental issues.

4.2.3 Thermo-Fluid Systems Laboratory

The Laboratory of Thermo-Fluid Systems (LTFS) was established by the University decision no. 13745 (Government Gazette 1119 B', 4/4/2019). It covers the teaching and research needs of the Department of Mechanical Engineering of the University of West Attica in issues directly or indirectly related to the following scientific fields: fluid dynamics, heat and mass transfer, turbulence, modeling/simulations/measurements of internal and external flows, combustion, analysis/measurements/simulations/design of fluid systems, flows in thermal and hydrodynamic machines, etc. The main purpose of LTFS is the realization of high quality research and the promotion of scientific knowledge from research teams with common or complementary research fields, related with transport phenomena. LTFS, being a research laboratory, contributes to the development of an attractive academic environment using synergies with other laboratories, the realization of high quality doctoral dissertations, and the research upgrading of highly qualified new faculty members. LTFS consists of the following sectors or units: aerodynamics sector, heat transfer sector, fluid engineering sector and internal combustion engine sector.

4.2.4 Engineering Design Laboratory

Establishment of the Laboratory of Engineering Design lies on the scope of covering the need and gap identified concerning the development of research work, the provision of seminars, the dissemination of klowledge and the provision of services in the field of engineering design. The areas covered under the scope of the Laboratory are the following:

- Study, design, planning, manufacturing and maintenance of engineering structures.
- Development of CAD/CAM/CAE systems and relevant applications.
- Analysis, simulation and optimization of structures.
- Production, manufacturing and optimization with the use of CNC machine tools.
- Optimization of industrial production processes.
- Additive manufacturing – 3D printing methods.
- Machine elements.
- Machine dynamics.
- Elevating and transporting machines.
- Biomechanics.
- Mechatronics.
- Structure calculation by means of numerical analysis methods (F.E.M, B.E.M, etc).
- Development of advanced materials for structures (metals, polymers, ceramics, composite materials).

4.2.5 Machine Elements and Vehicles Laboratory

The objectives of the Machine Elements and VEhicles (MEVE) Laboratory include the following:

- To introduce and maintain students in a field of Applied Mechanical Engineering in terms of development and research, through team work and through work dedicated to actual and applicable projects.
- To perform tasks via the implementation of physical or numerical experiments and simulations.
- To familiarize students with Applied Mechanical Engineering.
- To develop and support doctoral studies of high scientific value and prestige.
- To attract funding via donations and/or collaborations.
- To liaison with the local industry and introduce the Department of Mechanical Engineering of the University of West Attica as a promising partner for the development of mutually beneficial bonds.
- To become the incubator of new ideas and applications in the sector of Applied Mechanical Engineering and Manufacturing.
- To develop synergies with other laboratories active in relevant and also complementary research areas.
- To develop educational and learning programs for business and public / private sector executives, as well as for executives with a different background, in topics falling within the areas addressed by the Laboratory.
- To offer services to different bodies and organizations, in accordance with the provisions of Presidential Decree 159/1984 "Conditions for the provision of services from University Laboratories to private actors and to organizations of any legal status" (A' 53).
- To adress social issues within the scope the Laboratory, when the need for such contribution arises.

5 Structure of Studies

5.1 Duration of Studies

The minimum duration of studies corresponds to 5 academic years, divided into ten (10) academic semesters. Each semester corresponds to at least 13 weeks of full teaching.

The standard period of studies suggests a minimum number of semesters required for the award of the Mechanical Engineering Diploma (equivalent of a Master's Degree), which is 10 semesters, that may be increased by another 6 semesters (or equivalently, n+3 academic years, with n=5 being the minimum number of academic years required for the award of the diploma). Students are entitled to student welfare benefits throughout the standard period of studies.

Concerning the maximum duration of studies for students enrolled in first-cycle programs of studies of Higher Education Institutes and not having exceeded the minimum duration of studies at the time that Law 777/2021 (Government Gazette 25/A/17-02-2021) came into effect, it begins with the start of academic year 2021-22 and is determined in accordance with par. 1 of article 34.

Concerning the time available for the completion of studies for students registered in first-cycle programs of studies of Higher Education Institutes and having exceeded the minimum duration of studies at the time that the current law came into effect, it is equivalent to the minimum duration of studies that begins with the start of academic year 2021-2022, without considering the provision of par. 1 of article 34 for an extension of the academic time.

After filing a relevant application to the Engineering School Council, students are able to suspend their studies for a time period that does not exceed two (2) years. During the suspension time, the student status becomes inactive. The suspension period is not counted as part of the regular period of studies. Regardless of the submission date of the application, the suspension of studies comes into effect with the start of the succeeding semester.

After the end of the suspension period, the students are readmitted in the body of active students of the Department. During the suspension period, the students are not entitled to the use of institutional infrastructure and the provisions deriving from the student status.

The Internal Regulation of the University of West Attica details the process of ascertaining suspension of studies, as well as the supporting documents required for the application.

Students that provably work for at least twenty (20) hours per week, students with disabilities and also athletes belonging to athletic associations / unions that are registered under the General Secretariat of Sports may a) for the years that they achieve a distinction between the first and eighth place in national championships of individual sports with the participation of at least twelve (12) athletes and eight (8) unions, or contest as team members in the top two leagues of team sports, or participate as members of national teams in pan-European championships, world championships or other international events with the Hellenic Olympic Committee, or b) participate, even once, during the period of their studies, in the program of studies for which they apply for a part-time status, in Olympic games, Paralympic games and Deaflympics games, enroll as part-time students, following the approval of a relevant application submitted to the Council of the Engineering School. For the students enrolled under a part-time status, each semester is counted as half an academic semester, while they cannot also enroll and take exams in more than half of the courses of a given semester, as these are foreseen by the program of studies, with the maximum permitted duration of studies applying in such cases being the one introduced by par. 1.

The Internal Regulation of the University of West Attica may set further requirements and demand additional details regarding the application of the above subparagraphs' conditions. Students, may, following a justified application to the Secretariat of the Department (e.g. enrollment in another

academic department), apply for their withdrawal from the registry of active students of the Department and immediately receive a withdrawal certificate.

5.2 Enrollment of First-Year Students

The enrollment of new students, who are admitted to the Department according to the provisions in effect concerning the admission to tertiary education institutes, is realized through the electronic platform of the Hellenic Ministry of Education and Religious Affairs, following the procedure and dates set by the Ministry.

If a newly admitted student does not complete her/his enrollment within the foreseen dates, for either health or force majeure reasons, she/he may submit an application to the Department, mentioning the reason for which she/he did not complete her/his enrollment in time, which application will also include the necessary supporting documents proving the reasons claimed. The student's application is subject to the approval of the General Assembly of the Department. In any case, the enrollment is succesfully completed after registering in the electronic platform of the Ministry of Education and Religious Affairs, with the submission of supporting documents to the Department Secretariat taking place in a way and at a time announced by the Secretariat.

At the beginning of each semester, a welcoming ceremony is organized for first-year students, followed by a briefing on the mission and objectives of the Department, informing also the students on their rights and obligations in the course of their studies. Upon their enrollment, first-year students must enroll to all courses of the first semester.

5.3 Course Enrollment

Twice a year, all students of the Department have to enroll for the succeeding semester (spring, winter) and declare the courses they wish to participate and be examined. In time, and prior to the start of the semester, the School defines the time period of enrollment via a relevant announcement.

After the expiration of the submission date for the declaration of courses, the students that did not submit their declaration, may, within 10 calendar days, submit an application for late enrollment to the Secretariat of the Department, in which they shall state the reason why an electronic declaration was not submitted, also including the courses they wish to attend.

After the expiration of the 10 calendar day extension, late declarations of courses are not accepted by the Secretariat. The students that did not a submit a declaration of courses for either the winter or the spring semester, are not eligible to participate in the course examinations, for both the regular and the resit exam period.

In any case, the total number of attendance hours of courses that can be selected by the student on a weekly basis, may not exceed:

- Forty (40), in the case that the student has not exceeded the minimum required number of semesters for the award of the graduation Diploma under the program of studies that she/he attends.
- Fifty two (52), in the case that the student has exceeded the minimum required number of semesters for the award of the graduation Diploma under the program of studies that she/he attends.

Students may declare additional compulsory/optional courses to those required for obtaining the Degree, compulsory or elective ones, which are listed in the Annex of the Diploma, also including the relevant credits, which are however not taken into account in the grade of the Degree.

Upon their admission, first-year students must enroll to all courses of the first semester of studies. For the next period of declarations and thereafter, they should submit a declaration of courses' attendance, in accordance with the conditions in effect.

Following the approval of the declarations for the attendance of courses from the Department Secretariat, an amendment is possible, for up to three (3) courses of the submitted declaration, at dates determined by the Secretariat.

5.4 Course Books

The declaration for the selection of course books for all the courses of the program of studies is made through the electronic service of integrated book management "Eudoxus" of the Ministry of Education and Religious Affairs (https://eudoxus.gr/).

In addition, students may, through the "Kallipos" repository (https://repository.kallipos.gr/), search for books and learning subjects of the academic and research community.

The General Assembly of the Department, following a relevant proposal from the Divisions of the Department, approves the list of books per course, which is next communicated to the students. The students are entitled to select one book per course, within the deadline set by the Ministry of Education and Religious Affairs.

5.5 Evaluation & Exams

The President of the Department has the general responsibility for the coordination of the Department exams. The exams take place after the completion of the courses, in accordance with the academic calendar, at dates determined by the Department and announced on the Department website.

Resit exams for courses of both semesters (winter and spring) take place in September, at dates determined and announced in the same way. The student is entitled to take part in the exam of courses that she/he has selected in the declaration of courses.

The assessment of the student performance is done by the teacher or the teachers of each course. Teachers may, at their discretion, organize written or oral exams or even rely on assignments given to students in the context of the course. The assessment is completed in the way and within the deadlines determined by the teachers. In addition, teachers should provide the required support for the examination of students with disabilities.

5.6 Diploma Thesis

The diploma thesis is an extensive assignment project, that is analytic, compositional, experimental or application-relevant, and is carried out by the senior students of the Department in order to receive the Diploma awarded from the Mechanical Engineering Department of the University of West Attica. The minimum duration for completing the diploma thesis is a full academic semester (the tenth semester) and this completes the stage of specialization provided by the Department, through direction courses in the last semesters of the program of studies.

The diploma thesis aims mainly to the strengthening of self-motivation and the deepening of students' knowledge in a given topic that is directly related to the science of mechanical engineering, by applying a rigorous, systematic and scientific approach. More specifically, during the thesis stage, the student is called to a) apply various aspects of knowledge that she/he gained over the course of her/his studies, b) to familiarize herself/himself with the process of critical review of the literature and of additional information and c) to apply the scientific methodology for addressing the problems

falling within her/his specialization. The diploma thesis is the crowning achievement of students in the course of their studies and at the same time comprises a stepping stone for embarking on a career or a postgraduate program in a domestic or foreign university.

The thesis is carried out individually by each student, or, in exception, from a group of students, should this be required by the nature of the topic, considering that in this case, full justification is required, together with a clear allocation of roles and of individual work amongst the students during both the conduction of the thesis and the presentation stage. The extent of the examined topic should be such that it allows completion of the thesis within an academic semester, assuming full time commitment of the student, although the actual time of completion depends on both the level of response against the requirements of the examined topic and the level of invested effort. The estimated total number of hours of systematic effort is in the order of 500 per student.

The thesis topics, introduced by Faculty members or proposed by students and supported by Faculty members, are approved by the General Assembly of the responsible Division of the Department. The scientific responsibility for the conduction of the thesis rests with the Faculty member who is responsible for the supervision and the support of the student.

In any case, the principle applying is that the student assumes primary responsibility for the conduction of the thesis, with the thesis aiming also to the development of legitimate initiatives from the student's end. In that sense, the mere adoption of directions provided by the supervisor, without critical thinking and previous analysis from the student side, should be avoided. The thesis should be presented in a form that is both comprehensive and provides a thorough description of the examined topic and the adopted methodology.

Concerning the subject of examination, a thesis may comprise:

- A theoretical research, concerning the development of a new theoretical model or the advancement of an existing one and its application for the solution of relevant problems.
- A development research, under which an experimental device or apparatus is designed and manufactured, experimental measurements are executed and/or processed, or a computational methodology or algorithm is devised.
- An empirical investigation of a problem, by means of collecting, processing, analyzing and documenting the relevant data and information.
- A study of a topic of technological interest, which is examined analytically or computationally from a research point of view.
- An independent literature review and synthesis of a given topic, representing and recording the existing knowledge and providing a substantiated critical analysis.

The aim of the diploma thesis is for students to acquire the necessary skills so as to:

- Analyze a complex problem, identifying the basic knowledge and means required for its solution.
- Design and apply a structured, modular methodology of solving problems through the adoption of scientific practices.
- Document the sequence of problem analysis, the methodology and the results of their assignment in a comprehensive and articulate way.
- Present their assignment to an audience and be prepared to adequately respond to all relevant questions.

Finally, through the thesis, the following are evaluated:

- The level of general knowledge acquired by the student, which is evaluated by her/his ability to transfer and adjust such knowledge to the goals and objectives set, forming her/his own approach or fully adopting initially given specifications.
- The student's ability to search, utilize and also evaluate literature and other types of sources, in order to properly apply them for achieving the intended purpose.
- The student's ability to analyze and to compose data and information to a certain extent so that the completed thesis may a) be expanded or exploited by others in a similar way, b) be used as a guide for similar cases and c) have a contribution, even a minimum one, in the investigation of a similar topic.

The proposed thesis topics are announced at the beginning of each semester by Faculty members of the Deparment, and are then approved and announced by the responsible Division of the Department. The formal assignment of a proposed thesis topic to a student requires that the number of courses not completed by the student does not exceed the number of courses of the 9th semester or an equal number of courses of other semesters with the addition of another three courses. Deviations from the above rule may be possible, at the discretion of and with the responsibility of the supervisor, normally during the first stages of thesis implementation (e.g. the literature review).

The Faculty member who supervises the progress of a thesis guides the student in the pursuit of a better solution, providing the necessary accommodating means together with access to the required infrastructure and equipment. In addition, if completion of a thesis requires the procurement of equipment and/or materials, the supervisor should proceed with a timely request to the Division of the Department regarding the approval of the necessary funding for e.g. consumables, etc, so as to avoid delays that may lead to an extension of the thesis.

The assignment and supervision of a thesis essentially define a framework of collaboration between the student and the supervisor – Faculty member, which is binding for both parts. In this sense, withdrawal from a diploma thesis is considered inconceivable, unless there are valid reasons which objectively render its completion infeasible.

Throughout the implementation of the thesis, the supervisor, having the scientific responsibility of its conduction, is responsible for monitoring the relevant progress. In particular, she/he supports the student by providing her/him with guidelines to be followed in the approach and the development of the topic examined while at the same time encouraging her/him and evaluating her/his scientific initiatives. Beyond the scientific responsibility, the supervisor maintains only an advisory role and thus the thesis is conducted by the student. If the student does not attend scheduled regular meetings and does not work systematically and consistently, he/she bears the sole responsibiliity for the non-timely completion of her/his thesis project.

Conduction of the thesis is accomplished in a sequence of steps and actions, which, by factoring in the parameters of the type of work and time, may be divided in three distinct stages of implementation, i.e. the preliminary, the main and the final stage. During the preliminary stage, literature review concerning state of the art technologies is carried out, and at the same time the problem under investigation and the appropriate methodology approach are defined, together with the thesis contents. During the second stage of implementation, which is also the longest in time, the plan and methodology for addressing the problem of investigation are developed and implemented. During the third stage, writing of the thesis and its presentation are undertaken. Importance of the last stage of implementation is crucial for the assessment of the thesis and for the reward of the student's effort. Writing and presentation of the thesis bears the sole responsibility of the student, while the supervisor contributes with corrections, remarks and suggestions during the editing of the manuscript. Writing of the thesis should follow the academic ethics, avoiding plagiarism, and complying with the thesis template of the Department, which

determines the formatting standards of the manuscript. When writing of the thesis is completed, the manuscript is handed over to the supervisor, whose remarks and suggestions are taken into account for the development of the final version of the thesis.

The student, acknowledging the remarks and suggestions of the supervisor proceeds to the necessary corrections and prepares the final original (master) document of the thesis, out of which three (3) double-sided copies are produced in DIN A4 pages. The original document of the thesis, the final versions of the primary electronic documents of the assignment, the electronic pdf file of the assignment and the three (3) copies are delivered by the student to the supervisor, in order for the latter to develop the explanatory report for the completion of the thesis that she/he then duly submits to the Secretariat so that the three-member committee for the assessment of the thesis may be appointed.

After the end of the exam periods of February, June and September, and within the two (2) succeeding weeks, the examination-assessment of theses takes place. At least one (1) week before the beginning of the above two-week period for the examination of theses, and based on the preceding applications of students for the examination of their thesis, the Secretariat is required to determine the examination schedule which should be:

a) communicated to the students concerned, to the supervisors and to the members of examination committees,

b) communicated to all Faculty members and to the rest of Department staff, and at the same time announced on the Department website and in the announcement board of the Secretariat.

The members of the three-member examination committee attend the presentation of the thesis and address both comprehension and assessment questions in order to form an opinion on the validity and completeness of the solution of the investigated problem.

For the evaluation of the thesis, the following criteria are mainly considered: Literature investigation, the acquisition and evaluation of specific data (by conducting lab experiments or collection of in situ data, or theoretical calculations' results), the logical processing/sequence (e.g. data processing, mathematical model formulation, computational testing, application to specific problems, evaluation of the results), the structure of the thesis and its written presentation (e.g. consistency of the text, right use of terminology and of language, the exact wording of meanings and concepts, the scientifically sound support of the conclusions, etc), the novelty of the thesis, the eagerness and the initiatives of the student as well as the oral presentation of the thesis. The weights of the above criteria vary according to the nature of the topic and are assessed at the discretion of the examination committee. To facilitate the composition of the final score, special marking documents are used. The final score of the thesis results as the average of the final scores given by each of the examiners, rounded to the nearest integer or half, with the lowest success score being 5,0 (scale of 0-10).

In the case that a thesis is assessed from the examination committee as incomplete, it is referred for further processing and a resubmission is required to the Department Secretariat, including the necessary additions and/or corrections, in accordance with the suggestions of the examination committee.

5.7 Practical Training (Internship)

The Practical Training (Internship) is part of the 9th semester of the Department program of studies and it is optional. The Practical Training (MM010E00) corresponds to 10 ECTS credits and has a duration of two (2) months. The duration and the internship host organization are stated in the Annex of the Diploma awarded by the Department. After the completion of the Practical Training, an essay is developed by the students, and a relevant certificate of completion is provided to the

students regarding their internship in the host organization. The Practical Training is mentioned in the Annex of the Diploma, including the relevant ECTS credits, which are not counted in the final grade of the Degree.

5.8 Diploma, Grade of the Diploma and Annex of the Diploma

For the award of the Diploma, the student should both:

- Succeed in the exams of all courses (compulsory and compulsory elective courses).
- Complete the required number of ECTS credits.

Courses are graded on the numerical scale of 10 (0 to 10), with an accuracy of a tenth (one decimal place).

The final grade of the Diploma is equal to the quotient of the sum product of the courses' grades multiplied by the respective ECTS [course grade x course ECTS], divided by the sum of ECTS credits:

$$B = \frac{\sum_{i=1}^{v}[B_i \times (ECTS)_i]}{\sum_{i=1}^{v}(ECTS)_i}$$

where B_i is the grade of the *i*-course and $(ECTS)_i$ refers to the corresponding course ECTS credits, with *v* representing the number of courses required for the competion of studies and the Degree award. The final grade of the Diploma is calculated with an accuracy of a hundredth (two decimal places). The graduation date mentioned in the Diploma is the date of the last day of the two-week examination period of theses.

Grade characterization of the Diploma for the graduates of the University of West Attica is determined as following:

- from 5,00 to 6,49 «Good»
- from 6,50 to 8,49 «Very Good»
- from 8,50 to 10,00 «Excellent».

Upon the completion of the necessary procedures, the Secretariat of the Department issues a certificate of successful completion of the studies, which serves as a copy of the Diploma, while the Diploma Degree is awarded after the award ceremony.

5.9 The Insitution of the Academic Counselor

5.9.1 Academic Counselor

According to article 62 of the Internal Regulation of Operation of the University of West Attica (Government Gazette 4621/21-10-2020, Issue B'), the General Assembly of each Department appoints, for the succeeding academic year, the duties of the Academic Counselor to one or more Professors of the Department, granting them an exemption from other administrative tasks. Academic Counselors advise and support first-year students in order to facilitate their transition from the secondary to the tertiary education. Through their teaching, research and professional experience, they provide support and guidance to the students regarding issues relevant to their progress and successful completion of their studies, as well as concerning career issues.

Faculty members and members of the STS, the LTS, the STLS and the rest of teaching staff, administrative staff, the Directors of Laboratories, the Directors of Divisions and the Presidents of Departments, as well as the responsible services of the Institute, collaborate with and support the Academic Counselors in their work, while they receive their feedback in the form of information,

remarks, suggestions and requests on possible deficiencies and malfunctions that may create problems to the students, alongside recommendations on how to address the former.

5.9.2 SwD Counselor

According to article 61 of the Internal Regulation of Operation of the University of West Attica (Government Gazette 4621/21-10-2020, Issue B'), Departments of the University appoint the role of Counselor for Students with Disabilities (SwD) to Professors. The services of the Institute in collaboration with the Professors SwD Counselors take action in the following areas:

- Continuous recording of SwD and of students belonging to Vulnerable Social Groups, and of their special needs.
- Assessment of individual functionality and barriers in the context of the studies.
- Determination and proper adjustment of supportive technologies.
- Counseling and psychological support.
- Accessible, digital learning material – Accessible institute website.
- Volunteerism – Education – Awareness.
- Space accessibility.
- Financial support for students facing financial insecurity, aiming to address the problem of students' dropout.
- Special equipment procurement.

6 Structure of the Program of Studies

6.1 Structure of the Program Studies

The special features of the program of studies of the Mechanical Engineering Department of the University of West Attica are summarized as follows:

- The option of two course directions: 1) Direction 1 (Energy Sector) and Direction 2 (Design & Manufacturing Sector). A Diploma in Mechanical Engineering (equivalent of a Master's Degree) is awarded in either of the two options. The Diploma offers to all students access to the same job opportunities as professional Mechanical Engineers. Upon graduation, there is no indication on the Diploma Certificate regarding the specific track which was selected by the student.
- Both directions are of broad-content and consist of a balanced combination of courses that blend traditional-core mechanical engineering knowledge with cutting-edge technologies in the areas of energy and design & manufacturing while including high demand areas such as environmental engineering, nano/composite/smart materials and production management.
- Core courses comprise the first three years of study.
- The students have an opportunity to customize their specialization preferences from the seventh to the ninth semester. Both directions offer their own track options.
- Teaching of the newly-introduced scientific areas is carried out by modern educational techniques and it is supported by extensive laboratory work.
- There is a low student-to-teacher ratio, which is accomplished by giving the students exposure to a group of teachers from diverse scientific and professional backgrounds. Team work and cooperation is encouraged. Student assessment is based on objective approaches.
- The student becomes acquainted to theoretical aspects of the study in the classroom and gains professional skills in the lab by working hands-on on real world problems.
- Laboratory facilities are utilized in a manner such that to allow students to get direct exposure to leading-edge research equipment.

The quantitative requirements of the program of studies, are tabulated below:

Quantitative requirements of the program of studies of the Mechanical Engineering Department

Quantitative category	*Total*
Total number of required courses to graduation	50
Total number of courses' credits to graduation (ECTS)	300
Total number of core-courses' credits to graduation (ECTS)	180
Total number of specialization-courses' credits to graduation (ECTS)	120
Total number of core courses – compulsory (semesters 1 to 6) (*NOTE: it includes the course «Foreign Language-Technical Terminology»*)	33
Total number of specialization courses (semesters 7 to 9)	17
Compulsory core courses for both directions	2
Total number of compulsory courses for each direction (8+2)	10
Total number of optional courses in Direction 1 (Energy)	6
Total number of optional courses in Direction 2 (Design & Manufacturing)	8
Total number of optional courses in both directions	10
Total number of optional courses	24
Total number of offered courses in the program (obligatory and optional)	75

To summarize, the student must successfully complete fifty (50) courses by the end of the ninth semester, and an independent Diploma Thesis in the tenth semester in order to be awarded a Diploma in Mechanical Engineering. The total number of compulsory core courses is thirty-three (33), direction-required courses are ten (10) in total, and the total optional (elective) courses in each direction are seven (7). The total number of credits for completing the program requirements is three hundred (300). Total accumulation of credits per semester is thirty (30) ECTS. The practical training (internship) is optional and its duration period is two (2) months. To participate, the student must have completed the core course load of the program of studies.

Table abbreviations in the course descriptions

CCC	Compulsory core course
CCD1	Compulsory course for Direction 1 – Energy direction
CCD2	Compulsory course for Direction 2 – Design & Manufacturing direction
CCCB	Compulsory core course for both directions
OCD1	Optional (elective) course for direction 1 - Energy sector
OCD2	Optional (elective) course for direction 2- Design & Manufacturing direction
OCDB	Common optional (elective) courses for both directions
OPT	Optional (elective) course
TH	Teaching hours
ECTS	Credit units (ECTS)

1st Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM001Y01	Mathematics I	CCC	5	5.5	A. Iatridis[NSRF], P. Makrygianis[OTS]
MM001Y02	Mechanics I	CCC	5	5.5	A. Vairis[FM]
MM001Y03	Computer Aided mechanical Design I (CAD I)	CCC	3	3.5	Z . Kanetaki[FM], E. Proestakis[FM], C. Stergiou[FM], V. Sagias[AF], K. Rossis[AF], M. Margaritou[AF], A. Tsainis[AF]
MM001Y04	Computer Programming	CCC	5	5.5	N. Zacharis[FM*]
MM001Y05	Physics	CCC	5	5.5	G. Nikolaidis[FM], M. Petraki[AF], E. Adamidis[AF]
MM001Y06	Chemistry	CCC	4	4.5	S. Theochari [FM*], E. Pantatosaki[AF], O. Adamopoulos[AF], K. Theologos[AF]

2nd Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM002Y01	Strength of Materials	CCC	5	5.5	D. Savvas[(FM under appointment)], S. Georgiopoulos[AF]
MM002Y02	Electric Circuits - Electronics Technology	CCC	5	5.5	Y. Panayiotatos[FM]
MM002Y03	Mathematics II	CCC	5	5.5	G. Besseris[FM]
MM002Y04	Mechanics II	CCC	4	4.5	D. Savvas[(FM under appointment)]
MM002Y05	Computer Aided mechanical Design II (CAD II)	CCC	5	5.5	C. Stergiou[FM], Z. Kanetaki[FM], M. Margaritou[AF], K. Rossis[AF], V. Sagias[AF], A. Tsainis[AF]
MM002Y06	Machining Technology	CCC	3	3.5	E. Proestakis[FM], S. Georgiopoulos[AF], G. Karellas[OTS], L. Loukidis[AF]

3rd Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM003Y01	Applied Statistics	CCC	5	6.0	G. Besseris[FM]
MM003Y02	Thermodynamics I	CCC	5	6.0	K.-S. Nikas[FM]
MM003Y03	Mathematics III	CCC	5	6.0	M. Poulou[AF], FM[(to be appointed-2022)]
MM003Y04	Machine Elements I	CCC	5	6.0	A. Tsolakis[FM]
MM003Y05	Technology of Metallic Materials	CCC	5	6.0	C. Medrea[FM], G. Karellas[OTS], D. Papageorgiou[AF]

4th Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM004Y01	Numerical Methods	CCC	5	6.5	I. Sarris[FM]
MM004Y02	Industrial Measurements: Principles & Applications	CCC	5	6.5	G. Vasilopoulos[NSRF], M. Petraki[AF], Th. Papadopoulos[AF], I. Sarris[FM]
MM004Y03	Fluid Mechanics I	CCC	5	6.5	K. Moustris[FM], K.-S. Nikas[FM], C. Ntourou[OTS], I. Sigalas[OTS], C. Tsitsis[OTS], E. Papazoglou[AF]
MM004Y04	Environment & Industrial Development	CCC	4	4.0	I. Kaldellis[FM], E. Kondili[FM], C. Papapostolou[FM], K. Christopoulos[AF]
MM004Y05	Machine Elements II	CCC	5	6.5	A. Tsolakis[FM], K. Raptis[AF]

5th Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM005Y01	Electrical Machines – Power Electronics	CCC	5	6.0	P. Karaisas[FM*]
MM005Y02	Heat Transfer	CCC	5	6.0	K.-S. Nikas[FM], M. Mentzos[OTS], E. Papazoglou[AF]
MM005Y03	Internal Combustion Engines I	CCC	5	6.0	A. Theodorakakos[FM], S. Provataris[AF]
MM005Y04	Fluid Flow Machines	CCC	5	6.0	I. Kaldellis[FM], I. Sarris[FM], Ev. Karvelas[AF], Th Papadopoulos[AF]
MM005Y05	Automatic Control Systems	CCC	5	6.0	G. Chamilothoris[FM]

6th Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM006Y01	Industrial Automation	CCC	5	6.5	M. Papoutsidakis[FM*], G. Chamilothoris[FM]
MM006Y02	Operations Research	CCC	3	4.0	E. Kondili[FM], C. Papapostolou[FM]
MM006Y03	Heating, Cooling & Air-Conditioning I	CCC	5	6.5	A. Nazos[FM], A. Maitos[OTS], G. Sofiadis[407]
MM006Y04	Advanced Materials Technology	CCC	5	6.5	G. Nikolaidis[FM], P. Psyllaki[FM]
MM006Y05	Engineering Economics	CCC	5	6.5	C. Papapostolou[FM], E. Kondili[FM], K. Stylianopoulou[AF]
MM006Y06	English Language & Technical Terminology (*)	CCC	3	4.0	P. Tsatsaros[FM*]

(*) (Required course with credit units, no grade contribution)

7th Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM107Y01	Heating, Cooling & Air- Conditioning II	CCD1	5	5.5	A. Nazos[FM], A. Maitos[OTS], S. Livaniou[AF], G. Sofiadis[AF]
MM107Y02	Fluid Mechanics II	CCD1	5	5.5	I. Sarris[FM], K. Moustris[FM], I. Sigalas[OTS]
MM207Y01	Elevating & Transporting Machines	CCD2	5	5.5	A. Tsolakis[FM], K. Raptis[AF]
MM207Y02	Manufacturing Processes	CCD2	5	5.5	P. Psyllaki[FM], S, Georgiopoulos[AF], L. Loukidis[AF]
MM907Y01	Renewable (Soft) Energy Sources	CCCB	5	5.5	I. Kaldellis[FM], K. Kavadias[FM], D. Zafirakis[FM], G. Spyropoulos[OTS], K. Christopoulos[AF], S. Tzelepis[AF], A. Anastasiadis[AF]
MM907Y02	Engineering Design	CCCB	5	5.5	C. Stergiou[FM]
MM107E01	Environmental Engineering	OCD1	4	4.0	C. Papapostolou[FM], E. Kondili[FM] , K. Stylianopoulou[AF]
MM207E01	Surface Engineering	OCD2	4	4.0	A. Mourlas[NSRF]
MM207E02	Advanced Machining Technology	OCD2	4	4.0	A. Mourlas[NSRF]
MM907E01	Numerical Methods of Partial Differential Equations	OCDB	4	4.0	A. Iatridis[NSRF]
MM907E02	Electrical, Hydraulic and Pneumatic |Motion Systems	OCDB	4	4.0	M. Papoutsidakis[FM*]
MM907E03	Production and Maintenance Management	OCDB	4	4.0	E. Kondili[FM], V. Sagias[AF]
MM907E04	Physical Methods of Analysis	OCDB	4	4.0	Y. Panayiotatos[FM]

8th Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM108Y01	Smart Energy Buildings	CCD1	5	6.0	K. Kavadias[FM], A. Maitos[OTS], K. Christopoulos[AF]
MM108Y02	Thermal Turbomachines	CCD1	5	6.0	A. Goudas[NSRF]
MM108Y03	Internal Combustion Engines II	CCD1	5	6.0	A. Theodorakakos[FM]
MM208Y01	CNC-CAM	CCD2	5	6.0	C. Stergiou[FM], V. Sagias[AF], A. Tsainis[AF]
MM208Y02	Heat Treatment of Metallic Materials	CCD2	5	6.0	C. Medrea[FM], G. Karellas[OTS], D. Papageorgiou[AF]
MM208Y03	Vibrations- Machine Dynamics	CCD2	5	6.0	A. Pournaras[NSRF]
MM108E01	Thermodynamics II	OCD1	4	4.0	E. Sakellariou[NSRF]
MM108E02	Transport Phenomena	OCD1	4	4.0	K.-S. Nikas[FM], I. Sarris[FM], A. Goudas[NSRF]
MM208E01	Engineering Failure Analysis	OCD2	4	4.0	C. Mendrea[FM], G. Karellas[OTS], D. Papageorgiou[AF]
MM208E02	Computer Aided Engineering (CAE)	OCD2	4	4.0	C. Stergiou[FM], V. Sagias[AF], A. Tsainis[AF], K. Rossis[AF]
MM208E03	Advanced Welding Technology	OCD2	4	4.0	A. Mourlas[NSRF]
MM908E01	Production Systems Optimisation	OCDB	4	4.0	E. Kondili[FM], C. Papapostolou[FM], K. Stylianopoulou[AF]

MM908E02	Scientific Research Methodology	OCDB	4	4.0	I. Kaldellis[FM], E. Kondili[FM], D. Zafirakis[FM], G. Besseris[FM], E. Adamidis[AF]
MM908E03	Mechanical Facilities	OCDB	4	4.0	A. Nazos[FM]
MM908E04	Artificial Neural Networks & Machine Learning	OCDB	4	4.0	K. Moustris[FM]

9th Semester

Course Code	Course Title	Type	TH	ECTS	Course Tutors
MM109Y03	Air Pollution	CCD1	5	7.0	K. Moustris[FM], C. Ntourou[OTS], C. Tsitsis[OTS], G. Spyropoulos[OTS], K. Fameli[AF]
MM109Y01	Thermal Power Stations	CCD1	5	7.0	E. Sakellariou[NSRF]
MM109Y02	Hybrid Systems of Energy Generation	CCD1	5	7.0	K. Kavadias[FM], D. Zafirakis[FM], K. Christopoulos[AF], S. Tzelepis[AF]
MM209Y01	Mechatronics	CCD2	5	7.0	G. Chamilothoris[FM], M. Tsainis[AF]
MM209Y03	Ground Vehicles	CCD2	5	7.0	A. Tsolakis[FM]
MM209Y02	Additive Manufacturing (3D-Printing)	CCD2	5	7.0	V. Sagias[AF], M. Tsainis[AF], C. Stergiou[FM]
MM109E01	Aerodynamics	OCD1	4	4.5	A. Goudas[NSRF]
MM109E02	Energy Storage and Energy Saving	OCD1	4	4.5	I. Kaldellis[FM], D. Zafirakis[FM], A. Maitos[OTS], G. Spyropoulos[OTS], S. Tzelepis[AF]
MM109E03	Introduction to Computational Fluid Dynamics	OCD1	4	4.5	I. Sarris[FM]
MM209E01	Reverse Engineering	OCD2	4	4.5	C. Stergiou[FM]
MM209E02	Industrial Robotics	OCD2	4	4.5	A. Pournaras[NSRF]
MM209E03	Quality Assurance Management	OCD2	4	4.5	G. Besseris[FM]
MM909E01	Occupational Safety - Ergonomics	OCDB	4	4.5	A. Nazos[FM]
MM909E02	Supply Chain Management	OCDB	4	4.5	E. Kondili[FM], C. Papapostolou[FM]
MM010E00	Practical Training (Internship)	OPT		10	

10th Semester

Course Code	Course Title	Type	TH	ECTS
MM010Y00	Diploma Thesis	CCC		30

FM: Faculty Member, FM: Faculty Member from other University Department, AF: Academic Fellow, OTS: Other Teaching Staff, NSRF: National Strategic Reference Framework, 407: Ministerial Decree 407 Lecturers. Spring semesters have not been updated for academic year 2022-23, with the exclusion of tutors that have retired or have not been reappointed.*

7 Courses' Description

7.1 1st Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM001Y01	*Semester*	1
Course title	**7.1.1.1 Mathematics I**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	5.5
Laboratory exercises		-	
Course type		General background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH183/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe axiomatically notions and corresponding mathematical entities.
- Solve problems of Linear Systems with Linear Algebra Methods as well as equations on the Complex Plane.
- Distinguish / Interpret the physical meaning of the derivative, the integral as well as their use in modeling engineering problems, Field theory and elsewhere.
- Apply / perform calculations with differentiable and integral functions.
- Recognize / correlates notions and processes.

b2. General competences

- Working independently.
- Team work.
- Respect for difference and multiculturalism.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.
- Generation of new research ideas.

c) Syllabus

Vector Calculus: Vectors: Definition, Norm, Basic operations and their properties. Angle between two vectors and their Inner and Cross products. Vector spaces definition and properties. Linear independence of Vectors. Base of a Vector Space. Complex Numbers: The imaginary unit i as solution of $x^2+1=0$. Definition of Complex Numbers. Conjugate Complex Numbers. Addition, multiplication and fractions of Complex Numbers. Complex Plane and Geometric Representation of a Complex Number. Modulus and Argument of a Complex Number. Trigonometric, Polar and exponential form of a Complex Number. Nth roots of a Complex Number and Nth-roots of unity. De Moivre's Theorem. Matrices: Definition of a Matrix and the

determinant function. Evaluation and Properties of Determinants. Crammer's Method. Equality of matrices. Addition and Multiplication of Matrices. Classification of Matrices (Unitary, Symmetric, Diagonal, triangular), Transpose of a Matrix. Inverse and its evaluation. Solution of Linear Systems using Matrices. Characteristic equation of a square Matrix, Eigen values, and Eigen Vectors. Differential and Integral Calculus: Limits and Continuum of Functions of one Variable. Tangent of a Function, Rate of Change. Derivative of a function. Properties and Derivatives of Basic Functions. Rolle's and Mean Value Theorems. Study of differentiable Functions. Indefinite Integral: Definition and evaluation of characteristic cases. Integration by Parts. Evaluation with change of Variables. Definite Integral: Definition and Geometric Interpretation. The Fundamental Theorem of Integral Calculus. Improper Integrals.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab and distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	55
	Tutorials	10
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Intermediate assessment (20%) and final (written) examination (80%).	

e) Suggested bibliography
1. Vrizidis, L., Makrigiannis, Ar. And Sassalos, Sp., General Mathematics. Publisher Synchroni Ekdotiki. 2. Rassis Th., Mathematical Analysis I, Publisher Tsiotras. 3. Koutelieris, F., and Siannis, N., Linear Algebra for Engineers. Publisher Tziolas.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM001Y02	*Semester*	1
Course title	**7.1.1.2 Mechanics I (Statics)**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	5.5
Laboratory exercises		-	

Course type	General background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH228/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand the main principles of Statics.
- Calculate and plot the internal loads and moment diagrams of beam structures.
- Perform structural analysis and evaluate the structural integrity of trusses, beams, frames and 3-hinge arches.
- Calculate centroids and moments of inertia of section areas.

b2. General competences

- Team work
- Working independently
- Generation of new research ideas

c) Syllabus

- Introduction to Statics and Vector Calculus.
- Rigid Body Equilibrium.
- Centroids – Moments of inertia.
- Analysis of trusses.
- Analysis of frames and arches.
- Internal loads and moment diagrams of beam structures.
- Machines.
- Method of Virtual Work.
- Friction.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning.	
Use of information andcommunications technology	- Commercial/free/open source software - Multimedia applications - Eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	52
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written final examination	

e) Suggested bibliography

1. Βουθούνης, Π. Α. *Μηχανική απαραμόρφωτου στερεού* - Στατική, εκδ. Ανδομάχη Βουθούνη.
2. Beer, F.P. Johnston R.E., and Mazurek, F.D. *Τεχνική Μηχανική – Στατική*, εκδ.Τζιόλα.

3. Γδούτος, Ε Ε. *Στατική*, εκδ. Συμμετρία.
4. Γδούτος, Ε.Ε. Κάλφας, Χ.Ν. *Στατική: Μηχανική του στερεού σώματος, Ασκήσεις Ι*, εκδ. Συμμετρία
5. Wagner, W. and Erlhof, G. *Εφαρμοσμένη Στατική*, εκδ. Κλειδάριθμος.
6. Hibbeler, R.C. *Engineering Mechanics: Statics*. Pearson.
7. Meriam, J.L. Kraige, L.G. and Bolton, J.N. *Engineering Mechanics: Statics*, Wiley.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM001Y03	*Semester*	1
Course title	**7.1.1.3 Computer Aided mechanical Design I (CAD I)**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	-	3.5
Laboratory exercises	3	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=454/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:
- Familiarize with design rules and develop a technical thinking perception.
- Develop an understanding of basic and fundamental principles of 2D CAD modelers.
- Have an understanding of the technical specifics of mechanical drawings (parts and assemblies).
- Apply mechanical drawings specifications in order to produce sketches and 2D CAD drawings.
- Evaluate the manufacturing cost of a technical drawing.
- Analyze in form of drawing the technical specifications of a part – mechanism.
- Compose parts that consist on completing a project or a mechanism at the stage of manufacturing.

b2. General competences

- Research, analysis and synthesis of data and information with the use of the innovative technologies of Computer Aided Design.
- Working independently
- Team work

c) Syllabus

Mechanical drawings specifications, machine elements in Mechanical Drawings, Technical drawings compatible with standards, creating sketches, introduction to Computer Aided Design, Basic principles and techniques used in Computer Aided Design, Composition of simple geometric forms aiming to create views and sections, creating, modifying and Dimensioning geometric forms, creating parts numbering and parts list, define tolerances type – Assemblies, Machine elements standardization used in CAD systems.

d) Teaching and learning methods - Evaluation

Delivery	Face to face (incl. lab working groups) & distance learning

Use of information and communications technology	- Commercial software and free open source software - Multimedia applications - MS Teams & Moodle	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	-
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	-
	Individual work	65
	Course total	104
Student performance evaluation	- Final exam based on laboratory exercises. - Assessment of individual projects and group based projects per case study.	

e) Suggested bibliography

1. Αντωνιάδης, Α. (2014). *Μηχανολογικό Σχέδιο.* Εκδόσεις ΤΖΙΟΛΑ.
2. Βούλγαρης, Μ. *Μηχανολογικό Σχέδιο*. Β' έκδοση. Σύγχρονη Εκδοτική.
3. Μπουζάκης, Κ., Διονύσιος, Ε. *Κανονισμοί μηχανολογικού σχεδίου*. Εκδόσεις Ζήτη Πελαγία & Σια Ι.Κ.Ε.
4. Fuller A., Ramirez, A., Smith, D. (2017). *Technical Drawing 101 with AutoCAD 2018*. SDC Publications.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM001Y04	*Semester*	1
Course title	**7.1.1.4 Computer Programming**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	5.5
Laboratory exercises		-	
Course type		General background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		No	
Course website (url)		https://moodle.uniwa.gr/enrol/index.php?id=2267	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- handle the integrated application development environment.
- create a graphical interface for the purpose of entering information.
- distinguish the information that needs to be encoded in the context of a problem and select the appropriate data types for its representation.
- formulate ways to solve simple algorithmic problems.
- use the built-in classes, functions and procedures from the programming language.

- use debugging tools to detect and repair bugs in a program's source code. - work alone or work with fellow students or engineers on software application development.
b2. General competences
- Search for, analysis and synthesis of data and information with the use of the necessary technology. - Working independently. - Team work.
c) Syllabus
Introduction to Programming and Informatics, The key elements of a software program and application development environment, Data types, variables, operators and expressions, Flow control commands, Looping commands, Tables (one-dimensional and multidimensional tables), sorting and searching for values, Functions and procedures , Calling a function with value and reference, Reading and storing values in a file, data structures for storing information in computer memory, Introductory concepts in object-oriented literacy and classes.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial and/or free-open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	55
	Tutorials	10
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Final written exam.	

e) Suggested bibliography
1. *Microsoft Visual C# 2008 Βήμα*, John Sharp, Εκδόσεις Κλειδάριθμος 2008, Αθήνα. 2. *Οδηγός της C# 3.0*, Schildt, Herbert, Εκδόσεις ΓΚΙΟΥΡΔΑΣ 2009, Αθήνα. 3. Visual Studio Magazine (https://visualstudiomagazine.com). 4. Code Magazine (http://www.codemag.com).

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM001Y05	*Semester*	1
Course title	**7.1.1.5 Physics**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	5.5
Laboratory exercises		2	

Course type	General background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	Yes
Course website (url)	https://eclass.uniwa.gr/courses/MECH152/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand physics laws and principles required in the specialization courses.
- Understand physics laws that apply to mechanical engineering systems.
- Give solutions to technological problems using among other their Physics background too.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology
- Decision-making
- Working in an international environment
- Working independently
- Team work
- Working in an interdisciplinary environment

c) Syllabus

Electromagnetism and elementary Nuclear Physics, Electrostatics (charge and its properties, Coulomb's Law, Electric field, Gauss Law, electric energy and potential, Capacitance and Dielectric materials, Electric current, Magnetic field and Magnetic force, Amperes Law, Electromagnetic induction, Faraday's Law, Maxwell equations, Electromagnetic waves, Light propagation, self-inductance, ac circuits, Optics, Introduction to the principles and applications of Nuclear Physics.

d) Teaching and learning methods – Evaluation

Delivery	Face-to-face, lab and distance learning, etc.	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Midterm and final examinations. For the lab, weekly (personal or group) written reports preparation and final oral examination/presentations, per exercise and case study.	

e) Suggested bibliography

1. Raymond A. Serway, John W. Jewett, (2013). Φυσική για Επιστήμονες και Μηχανικούς: Ηλεκτρισμός και Μαγνητισμός, Φως και Οπτική, Σύγχρονη Φυσική. Κλειδάριθμος ΕΠΕ.
2. Giancoli, (2011). Φυσική για Επιστήμονες και Μηχανικούς. Τζιόλα & Υιοι ΑΕ.

3. Young H., Freedman R., (2010). Πανεπιστημιακή Φυσική με σύγχρονη φυσική. Α. Παπαζήσης.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM01Y06	*Semester*	1
Course title	**7.1.1.6 Chemistry**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.5
Laboratory exercises		2	
Course type		General background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH176/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- distinguish the basic chemical reactions of mechanical interest and perform the relevant calculations.
- perform basic physicochemical measurements.
- identify the basic physical and chemical processes as well as the production technologies related to her/his specialization.
- apply the appropriate materials and production methods.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Respect for the natural environment.
- Production of free, creative and inductive thinking.

c) Syllabus

Solutions, Chemical reactions, Combustion reactions, incomplete, complete, with excess air, Exhaust gases, Chemical reaction velocity, Chemical equilibrium, pH, Water chemistry, Physicochemical measurements, Mass and energy balances, Process flow diagrams, Reverse osmosis desalination, Electrolysis, Plating, Corrosion and protection of materials, Production technologies related to the specialization of Mechanical Engineering and laboratory exercises.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Audio-visual material and multimedia applications - Moodle/eclass	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	20
	Tutorials	6
	Laboratory exercises	26
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Written final exam (100%), which includes short answer questions (40%) and problem solving (60%). For the laboratory part of the course, individual work per exercise and a written final exam.	

e) Suggested bibliography

1. Φουντουκίδης Ε. (2015). Εργαστηριακές Ασκήσεις Χημικής και Περιβαλλοντικής Τεχνολογίας. Εκδόσεις Πουκαμισά.
2. Σδούκου Α., Πομωνή Φ. (2010). *Ανόργανη Χημική Τεχνολογία*. Εκδόσεις Τζιόλα.
3. Παπαστεφάνου Σ., Λάλια Μ., (2012). *Γενική και Ανόργανη Χημεία*. Εκδόσεις Ζήτη.
4. Ζουμπούλης Δ., Ζουμπούλης Α., Μάτης Κ., Μαύρος Π. (2009). *Εισαγωγή στη Χημική Τεχνολογία*. Εκδόσεις Τζιόλα.
5. Καραγιαννίδης Π. (2008). *Ανόργανη Χημεία*. Εκδόσεις Ζήτη.

7.2 2nd Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM002Y01	*Semester*	2
Course title	**7.2.1.1 Strength of Materials**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	5.5
Laboratory exercises		1	
Course type		Special background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH205/	

b) Learning outcomes and general competences
b1. Learning outcomes
Upon successful completion of this course, the student will be able to: - understand the main principles of strength of materials. - decide the proper material and its dimensions in order to use it in a construction. - understand and solve problems of structural analysis and static integrity.
b2. General competences
- Team work. - Working independently. - Generation of new research ideas

c) Syllabus
Introduction to the mechanics of deformable solids (normal and shear stresses-strains, idealized constitutive material laws). Elasticity theory, generalized Hooke's law. Tension, compression, shear, bending and torsion of structural elements. Buckling of beams. Theory of beams. Failure theories. Dynamic strength of materials, fatigue of materials, Wohler's and Smith's diagrams. Hyperstatic problems. Energy methods.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab, and distance learning.	
Use of information and communications technology	- Audio-visual material and multimedia applications - Moodle - Open courses - Commercial/free/open source software	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	52
	Tutorials	-
	Laboratory exercises	13
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Individual or group exercises (30%) and written final examination (70%)	

e) Suggested bibliography

1. Χαρώνης Π. Αντοχή των υλικών. Σύγχρονη εκδοτική ΕΠΕ (2002).
2. Βουθούνης Π. Αντοχή των Υλικών – Μηχανική παραμορφώσιμου στερεού. Ιδιωτική έκδοση (2017).
3. Timothy A. Philpot & Jeffery S. Thomas. Μηχανική Υλικών, Επιμέλεια: Γ. Σαββαΐδης, Γ. Χαμηλοθώρης, Α. Ζήσης. Εκδ. Κριτική (2022)
4. Παπαμίχος, Ε. και Χαραλαμπάκης Ν. *Αντοχή των υλικών*. Εκδ. Τζιόλα (2015).
5. Ferdinand Beer, Jr., E. Russell Johnston, John DeWolf, David Mazurek, Μηχανική των Υλικών. Εκδ. Τζιόλα (2010).
6. Nash, W.A., Potter, M.C. Schaum's Outline of *Strength of Materials*. McGraw-Hill (2010).
7. Russell C. Hibbeler. *Mechanics of Materials*. Prentice Hall (2010).

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM002Y02	*Semester*	2
Course title	**7.2.1.2 Electric Circuits - Electronics Technology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	5.5
Laboratory exercises	1	
Course type	General background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH133/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of the course, the student will be able to:

- identify and describe the key elements of an electrical circuit to combine the construction of simple electrical circuits.
- distinguish the different configurations of sources and resistors and explain their functionality.
- apply Kirchhoff's laws in simple and more complex circuits and solve the basic equations that describe their function

- apply methods for resolving linear and nonlinear circuits (superposition method, equivalent source voltage and current, independent methods of loop currents and potentials of the nodes, graphic methods)
- create the equivalent Thevenin and Norton circuits and calculates the maximum power transfer to them.
- evaluate the circuits to solve and compare the different methodologies which can be resolved.
- recognize the physical structure, distinguish operating areas and design and evaluate the characteristic voltage-current curves of the bipolar transistor connection (BJT), draw the load line and explain and define its operating point BJT, calculate the continuous current analysis of the BJT and evaluate its switching function.
- clarify the differences between FET, MOSFET, Thyristors.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Adapting to new situations.
- Working independently.
- Teamwork.
- Generation of new research ideas.
- Production of free, creative and inductive thinking.

c) Syllabus

Electric current, electric circuit, voltage, Kirchhoff laws, Resistors, Ohm law, Voltage and current sources, Wiring resistance, open circuit and short circuit, voltage and current divider, sources assembly, Methods for resolving linear and nonlinear circuits (superposition method, equivalent source voltage and current, independent methods of loop currents and potentials of the nodes, graphic methods), Equivalent Thevenin and Norton circuits and calculation of the maximum power transfer to them, p-n junction diode (Diode with forward and reverse bias, Characteristic curve of P-N junction, Load line), Diode circuits, Diode applications, Bipolar transistor (BJT): Physical structure, Operation, Characteristic I-V curves, Load line, transistor as switch, amplifier and oscillator, bias circuits, MOSFETs, Thyristors.

Laboratory training of students carrying 13 laboratory exercises focused on key items of theoretical courses.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab.	
Use of information and communications technology	- Audio-visual material and multimedia applications - Eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	52
	Tutorials	-
	Laboratory exercises	13
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	For the theory: Course work 20% and written final exam 80% or written final exam 100%. For the laboratory part of the course, individual and / or group papers and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Κ. Καρύμπακας (2014). Ηλεκτρονικά Κυκλώματα, Θεωρία και Ασκήσεις. Θεσσαλονίκη: Χριστίνα και Βασιλική Κορδαλή Ο.Ε.
2. Λουτρίδης Σπυρίδων (2014). Εισαγωγή στα Ηλεκτρονικά. Αθήνα: Α. Τζιόλα & Υιοί Α.Ε.
3. Malvino A., Bates D. (2016). Ηλεκτρονική (8η έκδ.) Αθήνα: Α. Τζιόλα & Υιοί Α.Ε.

4. Λιαπέρδος, Ι. (2015). Εισαγωγή στην Ηλεκτρονική. Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
5. Τόμπρας, Γ. (2016). Εισαγωγικά Θέματα Ηλεκτρονικής Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM002Y03	*Semester*	2
Course title	**7.2.1.3 Mathematics II**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	5.5
Laboratory exercises		-	
Course type		General background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH164/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe the important role of functions of several values and Differential equations.
- Solve basic topics of differential and integral calculus with functions of 2 and 3 variables as well as the ability of standardization by ordinary and partial differential equations.
- Distinguish the meaning of analytic and theoretical methods in the solution of problems as well as the ability of utilization of the related software.
- Handle functions of several values, evaluate double, triple, line and surface integrals as well as recognize, distinguish, classificate and solve differential equations that are useful in the attendance of other engineering courses.

b2. General competences

- Working independently.
- Team work.
- Generation of new research ideas.
- Production of free, creative and inductive thinking.

c) Syllabus

Calculus of Several Variables: Notion of a function of several real variables. Limits, Continuation. Partial derivative and Geometric interpretation. Partial Derivatives of Composite and implicit functions, the chain rule. Derivatives of inverse functions-Derivatives of higher order, Jacobians. Directional Derivatives. Gradient of a function. Tangent Plane and normal line to surface in space. Extreme Values, Lagrange method. Euler's equation, transition from Lagrange's mechanics to Euler's mechanics. Double, triple integrals and their applications. Change of coordinate systems and Region transformation. Line Integrals. Field Theory by means of vector analysis. Green's and Gauss's Theorems and their applications.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, Distance learning, etc.	
Use of information and communications technology	- Course material and communication through the course website and via email.	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	65
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	-
	Individual work	65
	Course total	156
Student performance evaluation	Intermediate assessment (20%) and final (written) examination (80%).	
e) Suggested bibliography		
1. Georgoudis, I., Makrigiannis, A. and Prezerakos, N. (2016). Mathematics for Engineers Functions of Several Variables-Differential Equations. Publisher Synchrony Ekdotiki E.P.E. 2. Rassis Th., Mathematical Analysis II, Publisher Tsiotras.		

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM002Y04	*Semester*	2
Course title	**7.2.1.4 Mechanics II**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	4.5
Laboratory exercises		-	
Course type	General background		
Course category	Compulsory		
Prerequisite courses	-		
Language of instruction and examinations	Greek		
Is the course offered to Erasmus students	No		
Course website (url)	https://eclass.uniwa.gr/courses/MECH137/		
b) Learning outcomes and general competences			
b1. Learning outcomes			
Upon successful completion of this course, the student will be able to: - Realize the basic concepts of kinematic and dynamics. - Understand the basic principles of engineering mechanics & solve complex engineering problems. - Analyse the mechanisms that are subject to dynamic stresses. - Recognise & evaluate dynamic loading / systems.			
b2. General competences			

- Team work. - Working independently. - Generation of new research ideas.
c) Syllabus
Kinematics of Particles, Kinetics of Particles: Newton's Second Law, Kinetics of Particles: Energy and Momentum Methods, Impulse and Momentum, Impacts, Systems of Particles, Kinematics of Rigid Bodies, Plane Motion of Rigid Bodies: Forces and Accelerations, Plane Motion of Rigid Bodies: Energy and Momentum Methods, Kinetics of Rigid Bodies in Three Dimensions, Mechanical Vibrations.
d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning	
Use of information and communications technology	- Multimedia applications - MS Teams and eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	52
	Tutorials	-
	Laboratory exercises	-
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Final Exam	

e) Suggested bibliography
1. Beer, F.P., Jhonston, E. R. and Cornwell, P.J. (2016). *Vector Mechanics for Engineers.* 11th Ed. Ελληνική Έκδοση, Εκδόσεις Τζιόλα.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM002Y05	*Semester*	2
Course title	**7.2.1.5 Computer Aided mechanical Design II (CAD II)**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	5.5
Laboratory exercises	3	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=251

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- know the fundamental principles of modern 3D CAD modelers.
- understand modeling techniques for the optimal design of mechanical components.
- efficiently implement 3D modeling methods to conduct complex technical drawings.
- identify and evaluate any CAD system, based on designs to be conducted in line with his/her capabilities.
- Compile components for the production of complex assemblies.
- Analyse the needs of related technologies (CAM, CAE, 3D Printing) with regard to the CAD underlying geometric model.

b2. General competences

- Production of free, creative and inductive thinking.
- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision-making on the modeling of components and assemblies.
- Working independently.
- Component-mechanism design and design rules management
- Design techniques' management in 2D and 3D
- Knowledge of automated standardization and application in the production of industrial designs and studies.

c) Syllabus

Introduction to 3D Computer Aided Design, 3D modeling methodology, Analysis of modern 3D CAD modelers, Solid model creation methods, Boolean operations, Form changing functions, Modeling of machine elements and components, Creation of mechanical assemblies, Technical designs according to standardization, Wireframe/Surface/Solid modelers, Parametric/Direct modelers, CAD collaboration with CAM systems, CAE, additive manufacturing, Industrial case studies.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups, in the lab, and distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Audio visual material and multimedia applications - MS Teams/Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	39
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Final exam in theory. For the lab part, individual and/or group assignments and written or oral exam or presentation, per exercise and case study.	

e) Suggested bibliography

1. Μπιλάλης, Ν. και Μαραβελάκης, Ε. (2020). *Συστήματα CAD/CAM και τρισδιάστατη μοντελοποίηση*. 3η έκδοση. Εκδόσεις Κριτική.
2. Faux, I.D. and Pratt, M.J. *Computational Geometry for Design and Manufacture*. Publisher: Ellis Horwood Ltd.
3. Kuang-Hua Chang (2014). *Product Design Modeling using CAD/CAE*. Academic Press.
4. Συναφή επιστημονικά περιοδικά: *Computer Aided Design* (Elsevier Science), *Computer aided geometric design* (Elsevier Science).

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM002Y06	*Semester*	2
Course title	**7.2.1.6 Machining Technology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	-	3.5
Laboratory exercises	3	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/modules/document/?course=MECH127	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Acquire and follow general principles as well as special regulations for health and safety, as required to be applied in manufacturing production.
- Recognize key parameters affecting material removal processes, i.e., cutting tool geometry, chip formation mechanism, cutting temperature and cutting forces.

- Design and evaluate the quality of machined surfaces and select the appropriate measuring technique/apparatus.
- Recognize and select suitable material removal operations, as well as the corresponding tools (i.e., number of cutting edges, material) for a given material, with reference to geometric dimensioning and tolerancing quality requirements.
- Combine / select, advantageous combinations for process parameters according to the material to be machined, for each of the conventional material removal processes (drilling, turning, milling, grinding, etc).
- Prepare and deliver accurate process plans for producing engineering parts and products.

b2. General competences

- Working individually.
- Team work.
- Project planning and management.

c) Syllabus

General principles and special regulations on health and safety imposed in manufacturing/production areas. Use of measuring instruments and related apparatus to determine the geometrical features of machined products. Dimensional tolerances and assemblies. Geometric dimensioning and Tolerancing (GD&T). Quality control. Introduction to material removal processes (Distinguishing between conventional / non-conventional processes. General principles of metal-cutting operations and cutting tools). Material removal with geometrically defined cutting tools: turning, drilling, milling, grooving, reaming and grinding. Material removal with abrasive cutting tools: grinding and superfinishing operations. Setup sheet and documentation / process planning for manufacturing a given end object.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in the lab and in working groups.	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/e-class	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	-
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	-
	Individual work	65
	Course total	104
Student performance evaluation	Intermediate assessment and final written examination in laboratory exercises. Delivery of individual and group projects per case study.	

e) Suggested bibliography

1. Στεργίου Ι. Στεργίου Κ. Τεχνολογία Κατεργασίας Μετάλλων. Σύγχρονη Εκδοτική.
2. Αντωνιάδης Αριστομένης. Μηχανουργική Τεχνολογία. Τόμος Β, Εκδ. Τζιόλα.
3. Braun Herwig. (Μετάφραση Βούλγαρης Μ.). Βασική Μηχανολογία. Εκδοτικός οίκος ΙΩΝ.
4. Πετρόπουλος Πέτρος. Μηχανουργική Τεχνολογία. Τόμος ΙΙ-Ι, Εκδ. Ζήτη.

Related Journals: Journal of Manufacturing Processes, Journal of Materials, Processing Technology, CIRP Annals – Manufacturing Technology, CIRP Journal of Manufacturing Science and Technology, Materials Manufacturing and Processes.

7.3 3rd Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM003Y01	*Semester*	3
Course title	**7.3.1.1 Applied Statistics**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	6.0
Laboratory exercises	-	
Course type	General background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek/English	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH154/	

b) Learning outcomes and general competences

b1. Learning outcomes

The Applied Statistics course is an introduction to the modelling and analysis of stochastic systems. Error Theory is presented through the Laws of Statistics and makes the uncertainty of mechanical measurements measurable, so that empirical cause-and-effect predictions are constrained by reliable confidence intervals. Separating the concepts of central tendency and variability of a measurable characteristic is crucial for proper quantification and evaluation of its performance. The aim is to familiarize students with the concepts of random variables, distributions and their parameters, and to acquire skills in quantitative stochastic calculations. In addition, ways of estimating unknown quantities in stochastic models using information provided by random samples are developed. By using available professional statistical analysis software, such as MATLAB and SPSS, it is possible to process engineering data quickly and in a standardized way. The ability to display data in the form of graphs and the necessary interpretation of statistical results in summary tables speeds up the decision-making process in engineering studies.

b2. General competences

- Autonomous work.
- Teamwork.
- Generation of new research ideas.
- Promoting creative and inductive thinking.

c) Syllabus

Descriptive statistics. Probability: The concept of probability and its laws, Conditional probability, Independent contingencies, Total probability theorem and Bayes type. Combined. Random variables: Specific discrete and continuous distributions of a variable, Mean and variation of random variables, Multivariate distributions: Marginal functions, Independence of random variables. Central Limit Theorem. Estimation: Method of Maximum Likelihood, Estimators. Confidence intervals: Mean and variance of a sample, Mean difference of two samples and two sample ratio of variances. Approximate confidence interval. Hypothesis tests: Mean population and variance of a population, Conclusion for two populations. Chi-square tests, Correlation, Simple linear regression.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face	
Use of information and communications technology	Information and supportive educational material through the Course Website and via email.	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Mid – term evaluation and written final examination.	

e) Suggested bibliography

1. Ε. Παπαγεωργίου, Μ. Χαλικιάς (2020). Εφαρμοσμένη Στατιστική και Πιθανότητες για Μηχανικούς, με χρήση SPSS και MATLAB. Εκδόσεις Broken Hill.
2. D.C. Montgomery, G.C. Runger (2017). Εφαρμοσμένη Στατιστική και Πιθανότητες για Μηχανικούς. Εκδόσεις Τζιόλα.
3. J.P. Marques de Sá (2003). Applied Statistics Using SPSS, Statistica, and MATLAB. Springer.
4. W. Marinez, Chapman & Hall, (2002). Computational Statistics Handbook with MATLAB.
5. Μωυσιάδης Π. (1997). Εφαρμοσμένη Στατιστική. Εκδόσεις Ζήτη.
6. Α. Αλεξανδρόπουλος, Ε. Κατωπόδης, Α. Παλιατσός, Ν. Πρεζεράκος (1994). Στατιστική. Σύγχρονη Εκδοτική Ε.Π.Ε.
7. Κοκολάκης Γ., Σπηλιώτης Ι. (2010). Θεωρία Πιθανοτήτων και Στατιστική με Εφαρμογές. Εκδόσεις Συμεών.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM003Y02	*Semester*	3
Course title	**7.3.1.2 Thermodynamics I**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	6.0
Laboratory exercises	-	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH146

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Know the fundamental laws of thermodynamics.
- Understand the thermodynamic properties that govern energy systems.
- Solve simple thermodynamic problems.
- Apply thermodynamic laws to solve energy problems.
- Evaluate the performance of heat engines, refrigeration machines and heat pumps.
- Analyze and calculates various thermodynamic quantities in energy systems.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision-making.
- Working independently.

c) Syllabus

Thermodynamic Systems, Thermodynamic Properties, Thermodynamic Equilibrium, Thermodynamic Processes, Thermodynamic Cycles, Energy, Work, Heat, Ideal Gases, Equations of Stage (VDW Equation), Two Phase Thermodynamics, Charts, Steam tables, First Law of Thermodynamics, Conservation of mass, Joule-Thomson effect, Second Law of Thermodynamics, Thermal Engine, Cooling Machine, Heat Pump, Carnot Cycle, T-S and H-S charts (Mollier), Clausius-Clapeyron equation, Maxwell and Tds relations, Thermodynamic analysis of reversible processes, Entropy of irreversible processes, Thermodynamic cycles (Otto, Diesel, Brayton, Rankine), One dimensional flow, Nozzles.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	13
	Individual work	91
	Course total	156
Student performance evaluation	Written final examination.	

e) Suggested bibliography

1. Νίκας, Π. Κ. (2011). Εφαρμοσμένη Θερμοδυναμική για Μηχανικούς. Leeder Enterprises.
2. Cengel & Boles. (2011). Θερμοδυναμική για Μηχανικούς (Μετάφραση). Εκδόσεις Τζιόλας.

3. Παπαϊωάννου, Α. (2007). Θερμοδυναμική (Βασικές αρχές και νόμοι-Καθαρές ουσίες). Τόμοι 1 & 2. Εκδόσεις Κοράλι.
4. Πολυζάκης, Α. (2013). Θερμοδυναμική και Προχωρημένη Θερμοδυναμική. Heat Cool Power.
5. Holman, J., P. (1988). Thermodynamics 4th Edition. NY. McGraw Hill Co.
6. Moran & Shapiro. (2006). Fundamentals of engineering Thermodynamics. J. Wiley & Sons.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM003Y03	*Semester*	3
Course title	**7.3.1.3 Mathematics III**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	6.0
Laboratory exercises	-	
Course type	General background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH151/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Know the important role of differential equations.
- The ability of standardization through ordinary and partial differential equations.
- Perceive the importance of analytic and theoretical methods to the solution of the problems and the possibility to utilize the relevant software.

b2. General competences

- Working independently.
- Team work.
- Generation of new research ideas.
- Production of creative and inductive thinking.

c) Syllabus

Elementary first order non linear differential equations. First and second order equations with constant coefficients. Introduction to applications of differential and integral calculus in problems of Physics and Engineering Sciences. General theory of Ordinary Differential equations and Introduction in the standardization of simple physical problems with ordinary differential Equations. Linear ordinary D. E. of higher order: Homogeneous and non homogeneous D. E. The methodology of specifiable coefficients and parameter change (Lagrange) for the solution of non homogeneous differential equations. The demotion of order as a technique in the solution of linear ordinary differential equations. Systems of ordinary D. E. Relation between solutions of systems of D.E. and D.E. of higher order. Linear homogeneous and non-homogeneous systems with constant coefficients. Stability of non Linear systems. Method of Linearization. Solution of second order D.E. – of variable coefficients – with power series. Development of solutions in

normal and regular singular points. Special functions and their applicability. Laplace Transformation. Properties and reversal of Laplace Transformation. Convolution and applications in the solution of initial value problems and systems of D.E. Partial Differential Equations. Introduction in the modeling of natural processes- 9th Summary of course content- and problems in the Engineering science with partial differential equations. Introduction in P.D.E. of 1st order. Classification of 2nd order P.D.E. in problems of elliptical, parabolic and hyperbolic type. Sturm-Liouville problems and generalized Fourier series. Development of methodology of variable separation in Cartesian, polar, cylindrical and spherical coordinates. Application of variable separation in the solution of boundary problems for P.D.E. Laplace and Poisson, and problems of initial boundary problems for diffusion and wave equation. Introduction in solutions and Green functions. Fourier και Hankel Transformations. Solution of problems in infinite and semi-infinite sets by use of integral transforms.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face and distance learning.	
Use of information and communications technology	Information and supportive educational material through the Course Website and via email.	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	65
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	-
	Individual work	65
	Course total	156
Student performance evaluation	Intermediate assessment and written final examination.	

e) Suggested bibliography
1. Georgoudis, I., Makrigiannis, A. and Prezerakos, N. (2016) Mathematics for Engineers Functions of Several Variables-Differential Equations. Publisher Synchrony Ekdotiki E.P.E. 2. Boyce, W. And Di Prima, R. (2015). Elementary differential equations and Boundary value problems. Publisher Panepistimiaki Ekdosis N.T.U.A.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM003Y04	*Semester*	3
Course title	**7.3.1.4 Machine Elements I**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	6.0
Laboratory exercises		-	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH118/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon completion of the course, students will be able to:

- Describe and identify the main Machine parts and their subcategories.
- Design and develop the appropriate element for each application.
- Analyze the stress-strain state of each element under loading.
- Calculate the strength of each case study.
- Select materials and processing method of non-standard elements.
- Design and analyze Mechanical multiple-element arrangements.
- Predict potential failure conditions.
- Specify maintenance program of every element.
- Make damage assessment.

b2. General competences

- Decision making.
- Working independently.
- Team work.
- Work in an international environment.
- Work in an interdisciplinary environment.
- Generation of new research ideas.

c) Syllabus

Introduction, Tolerance – Connectors, Introduction to Dynamic Loading. Shafts-Spindles, Shaft-Hub Connections, Screws-Fasteners, Mechanical Springs, Rolling Contact Bearings, Journal Bearings, Couplings-Clutches.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	65
	Tutorials	-
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written examination.	

e) Suggested bibliography

1. Shigley's, Budynas, Nisbett (2016). *Στοιχεία Μηχανών*. Εκδόσεις Γ.Χ. Φούντας.
2. Niemann, G. (2013). *Στοιχεία Μηχανών*. Εκδόσεις Φούντα.

3. Στεργίου, Ι., Στεργίου, Κ. (2004). *Στοιχεία Μηχανών Ι*. Σύγχρονη Εκδοτική.
4. Φρυδάκης, Μ. (2004). *Στοιχεία Μηχανών Ι*. Σύγχρονη Εκδοτική.
5. Παπαδόπουλος, Χ. (2013). *Στοιχεία Μηχανών*, Εκδόσεις Τζιόλα.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM003Y05	*Semester*	3
Course title	**7.3.1.5 Technology of Metallic Materials**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	6.0
Laboratory exercises		2	
Course type		Special background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH117	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Distinguish the most common metals and alloys, based on their chemical composition.
- Identify the properties of metals and alloys.
- Analyze and recognize microstructure of metallic materials using specific techniques.
- Measure mechanical properties of metal materials using standard testing.
- Evaluate the critical mechanical properties of metal materials - Understand the basic principles related to fractured surfaces.
- Select the proper metallic material for a particular mechanical application.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the appropriate technology.
- Autonomous work.
- Decision making.
- Team work.
- Project planning and management.
- Ability to critize and self-criticism.

c) Syllabus

Introduction to metal materials, Chemical bonds, Effect of chemical bonds on material properties, Crystalline structure, Imperfections of crystalline structure, Atoms diffusion, Work hardening -Recovery-Recrystallization, Phase diagrams in equilibrium of two components of complete solubility, Phase diagram, Binary Isomorphous Systems, Binary Eutectic Systems, Peritectic Reactions, Eutectoid Reactions, Peritectoid Reaction, Congruent Phase Transformations, Phase Diagrams with Intermediate Phases, Phase Diagrams with Intermetallic Compounds, The Iron–Iron Carbide Phase Diagram, Steels (microstructure,

<table>
<tr><td colspan="3">classification), Effect of alloying elements steels properties, Heat treatment of metallic materials, Cast Iron, Cooper Alloys, Aluminum Alloys, Magnesium Alloys, Titanium Alloys, Zinc Alloys, Lead Alloys, Superalloys.</td></tr>
<tr><td colspan="3">d) Teaching and learning methods – Evaluation</td></tr>
<tr><td>Delivery</td><td colspan="2">Face-to-face, in working groups and in the lab</td></tr>
<tr><td>Use of information and communications technology</td><td colspan="2">- Commercial/free/open source software
- Audio-visual material and multimedia applications
- MS Teams/Moodle/eclass</td></tr>
<tr><td rowspan="7">Teaching methods</td><td>Activity</td><td>Semester workload</td></tr>
<tr><td>Theoretical lectures</td><td>36</td></tr>
<tr><td>Tutorials</td><td>13</td></tr>
<tr><td>Laboratory exercises</td><td>36</td></tr>
<tr><td>Computational exercises</td><td>13</td></tr>
<tr><td>Individual work</td><td>36</td></tr>
<tr><td>Course total</td><td>134</td></tr>
<tr><td>Student performance evaluation</td><td colspan="2">- Theory (60%): Open book written exam, including theoretical questions, judgement questions, and computational exercises.
- Lab (40%): Two open book written exams (50% and 50%) and technical essays.</td></tr>
<tr><td colspan="3">e) Suggested bibliography</td></tr>
<tr><td colspan="3">1. Χρυσουλάκης Γιάννης Δ., Παντελής Δημήτρης Ι. (2007). Επιστήμη και Τεχνολογία των Μεταλλικών Υλικών, Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.
2. Χαϊδεμενόπουλος Γρηγόρης Ν. (2020). Φυσική Μεταλλουργία, 2η Έκδοση , ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
3. Ψαρράς Γεώργιος Χρ. (2012). Υλικά: Μηχανική, Επιστήμη, Επεξεργασία και Σχεδιασμός, 2η Έκδοση, Εκδόσεις Κλειδάριθμος, Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.</td></tr>
</table>

7.4 4th Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM004Y01	*Semester*	4
Course title	**7.4.1.1 Numerical Methods**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	6.5
Laboratory exercises		-	
Course type		Special background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH115/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize and describe the practical engineering applications where the usage of numerical methods and/or numerical software can be helpful to obtain solutions.
- Solve practical mechanical engineering problems with the use of numerical methods.
- Distinguish between various numerical methodologies and apply the most suitable for each case.
- Apply the most suitable numerical procedures to solve each project and to write a complete technical report.
- Evaluate the numerical results in the solution of various practical problems and suggest possible optimal treatment.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.

c) Syllabus

Introduction, Measuring Errors, Sources of Error, Floating Point Representation, Machine ε, Errors, Solution of equations system, Direct methods Gauss elimination, Gauss-Jordan and Thomas, LU factorization, Unstable systems, table norms, Recursive methods of Jacobi, Gauss-Seidel, S.O.R., Comparison of recursive methods and definition of spectral radius, Non-linear systems, Newton's method, Solution of equations, Bisection method, Linear interpolation method, Secant Method, Newton-Raphson Method, Roots of polynomial, Interpolation, Tables of differences and finite differences operators, Newton-Gregory Interpolation, Lagrange Interpolation, Newton Interpolation, Hermite Interpolation, Quadratic and Cubic "splines" Interpolation, Least square method, Integration, Newton Cotes Integration formula, Trapezoidal Rule, Simpson's 1st and 2nd Rules of integration, Richardson method, Romberg Integration, Gauss Integration, Euler's Method, Runge-Kutta 2nd, Runge-Kutta 4th, Finite Difference Method, Shooting Method.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face and distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/ eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	26
	Individual work	91
	Course total	169
Student performance evaluation	Intermediate and final exams	

e) Suggested bibliography

1. Σαρρής, Ι.Ε. & Καρακασίδης, Θ. (2017). Αριθμητικές Μέθοδοι και Εφαρμογές για Μηχανικούς. Εκδόσεις Α. Τζιόλα.
2. Carnahan B., Luther H.A. & Wilkes, J.O. (1969). *Applied Numerical Methods*. J. Wiley & Sons.
3. Chapra, S.C. & Canade, R.P. (1998). *Numerical methods for engineers,* McGraw Hill.
4. Forsythe, G.E., Malcolm, M.A. & Moler, C.B. (1977). *Computer methods for mathematical computations*, Prentice-Hall.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM004Y02	*Semester*	4
Course title	**7.4.1.2 Industrial Measurements: Principles and Applications**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	6.5
Laboratory exercises		1	
Course type	Special background		
Course category	Compulsory		
Prerequisite courses	-		
Language of instruction and examinations	Greek		
Is the course offered to Erasmus students	No		
Course website (url)	http://eclass.uniwa.gr/courses/MECH114		

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Distinguish between precision and bias measurement errors and their sources (calibration errors, reading errors, etc.).

- Estimate the uncertainty of independent variables from sampled sets of measurements and of variables which are depended on the measured data sets (propagation of error).
- Describe time varying signals in both the time and frequency domains.
- Describe the underlying physical principles governing the behavior of commonly used sensors.
- Understand the relationship between the physical properties of a sensor and its time and frequency response when used in a measurement system.
- Process a signal from a sensor by using appropriate techniques (amplification, filtering, etc.), record the signal using an electronic data acquisition system (analog or digital), convert it to the appropriate units, and calibrate the sensor and data acquisition system.
- Make engineering measurements of physical quantities such as temperature, force and strain, using multiple instruments.
- Present data in an appropriate manner through the use of tables and graphs.
- Communicate effectively in written form information relating to the design and/or results of an engineering experiment.

b2. General competences

- Working independently.
- Team work.
- Promoting free, creative and inductive thinking
- Search for, analysis and synthesis of data and information with the use of the necessary technology.

c) Syllabus

Theory: Basic concepts and Terminology of Measurement Methods. Static and dynamic characteristics of signals (Frequency Analysis). Statistical Analysis of Signals. Uncertainty analysis. Signal Conditioning. Sampling, Digital Devices and Data Acquisition. Response of Measurement Systems. Strain or Temperature Measurements. Technical Writing.

Lab: The course includes practical training in the lab and extensive use of SCADA and data/numerical analysis software (LabVIEW, MATLAB/OCTAVE/SCILAB)**.**

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	13
	Computational exercises	-
	Individual work	104
	Course total	169
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: Individual and/or group assignments and written or oral examination or presentation, per exercise and per case of study.	

e) Suggested bibliography

1. Figliola, R.S. and Beasley, D.E., (2010). *Theory and Design for Mechanical Measurements*. (5th Ed.). John Wiley. [Available textbook in Greek].
2. Beckwith, T.G., Marangoni, R.D., and Lienhard, J.H. (2006). *Mechanical Measurements*. (6th Ed.). Pearson.
3. Dunn, P., (2010). *Measurement, Data Analysis, and Sensor Fundamentals for Engineering and Science*. (2nd Ed.). CRC Press.

4. Holman, J.P. (2011). *Experimental Methods for Engineers*, (8th Ed.). McGraw-Hill.
5. Rajput, R.K. (2016). *Electrical and Electronics Measurements and Instrumentation*. (4th Ed.) S. Chand.
6. Wheeler, A.J., and Ganji, A.R., (2009). *Introduction to Engineering Experimentation*. (3rd Ed.). Prentice Hall.
7. Teaching notes in Greek, based on the above mentioned English textbooks.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM004Y03	*Semester*	4
Course title	**7.4.1.3 Fluid Mechanics I**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	6.5
Laboratory exercises		1	
Course type	Special background		
Course category	Compulsory		
Prerequisite courses	-		
Language of instruction and examinations	Greek / English		
Is the course offered to Erasmus students	No		
Course website (url)	https://eclass.uniwa.gr/courses/MECH107/		

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe the fundamental principles governing the statics and dynamics of fluids.
- Solve hydrostatic and aerostatic problems.
- Identifu the fundamental equations for conservation of mass, momentum and energy in integral form and explain the physical significance of their individual terms.
- Implement the fundamental equations of mass, momentum and energy conservation for the analysis of problems of one-dimensional - incompressible flows in closed conduits.
- Applu analytical methods for calculating flow quantities in practical applications.
- Use the methodologies of dimensional analysis and the similarity rules for the design of experiments and the evaluation of measurements.
- Implement the required procedures for conducting laboratory activities and submit a technical report on them.

b2. General competences

- Search for analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.

c) Syllabus

Introductory concepts, Fluid statics, Kinematics of fluid flow, Integral analysis of flow fields, Turbulent flows, Dimensional analysis and similitude, One dimensional incompressible flows in closed conduits, Laboratory and computational exercises (case studies) based on the theoretical part of the course.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams and eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	10
	Laboratory exercises	13
	Computational exercises	3
	Individual work	104
	Course total	169
Student performance evaluation	Intermediate assessment (individual and / or group work and / or written examination) and written final examination. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case of study.	

e) Suggested bibliography

1. Παπαϊωάννου, Α. (2002). *Μηχανική των Ρευστών*. Εκδ. Γ. Γκέλμπεσης.
2. Παπανίκας, Δ.Γ. (2010). *Εφαρμοσμένη Ρευστομηχανική*. Media Guru.
3. Cengel, Y. and Cimbala, J. (2013). *Fluid Mechanics: Fundamentals and Applications*. McGraw Hill.
4. Elger F.D., Williams C.B., Crowe T.C. and Roberson A.J. (2018). *Μηχανική Ρευστών για Μηχανικούς*. Α. Τζιόλα & Υιοί Α.Ε.
5. Munson B.R., Rothmayer A.P., Okiishi T.H. and Huebsch W.W. (2016). *Μηχανική Ρευστών*. Α. Τζιόλα & Υιοί Α.Ε.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM004Y04	*Semester*	4
Course title	**7.4.1.4 Environment and Industrial Development**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.0
Laboratory exercises	2	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=455

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Become familiar with the main global pollution problems and the respective national allowances.
- Identify the main atmospheric pollutants, their generation sources, and the main mitigation measures.
- Evaluate the main causes of the greenhouse effect deterioration, as well as the main mitigation efforts at the national, European and global scale.
- Identify aspects of depletion for the stratospheric ozone layer and develop suggestions on the implementation of mitigation measures.
- Identify issues relevant to acid rain and develop suggestions on the implementation of mitigation measures.
- Identify issues relevant to desertification and reduced biodiversity and contribute towards the inversion of such phenomena.
- Elaborate and recommend means to tackle marine pollution.
- Identify issues of radioactive pollution, and especially environmental impacts associated with nuclear applications-accidents, and develop suggestions on the latter mitigation.
- Comprehend issues of toxic waste management and safety regulations concerning their disposal.
- Contribute to aspects of solid waste management and to the optimum management of urban wastes.
- Refer to the main legislative framework on the protection of the environment and address competent authorities at the national and European level.
- Estimate and evaluate the social and environmental costs of human activities.
- Work individually or in groups to address issues of environmental degradation through the development of mitigation techniques.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.
- Working in an interdisciplinary environment.
- Respect for the natural environment.

c) Syllabus

Natural world and the environment, Development with respect for the environment, Environment and sustainable development, Assessment of the energy and atmospheric pollution in Greece, The greenhouse effect, Greenhouse gases, Kyoto protocol and associated mechanisms, Emission allowances, The phenomenon of depletion for the stratospheric ozone layer, The acid rain phenomenon, The phenomenon of photochemical smog in urban areas, Marine pollution, Evaluation of sea cleanup methods, Desertification, Reduced biodiversity on the planet, Nuclear energy-nuclear applications, Radioactive pollution-nuclear accidents, Introduction to toxic waste, The problem of toxic waste management, Exercises and assignments on the module thematic units.

Lab exercises in the following subjects: Data loggers and solar irradiance measuring errors, Energy reserves, Wind potential effect on atmospheric pollution, Greenhouse effect, Oil products' marine pollution, Noise – noise pollution, Soil pollution, Toxicity, Radioactivity - human effects.

<table>
<tr><td colspan="3">d) Teaching and learning methods - Evaluation</td></tr>
<tr><td>Delivery</td><td colspan="2">Face-to-face (classroom, working groups, lab).</td></tr>
<tr><td>Use of information and communications technology</td><td colspan="2">- Audio-visual material and multimedia applications
- MS Teams/Moodle/eclass
- Site visits</td></tr>
<tr><td rowspan="7">Teaching methods</td><td>Activity</td><td>Semester workload</td></tr>
<tr><td>Theoretical lectures</td><td>26</td></tr>
<tr><td>Tutorials</td><td>12</td></tr>
<tr><td>Laboratory exercises</td><td>20</td></tr>
<tr><td>Computational exercises</td><td>6</td></tr>
<tr><td>Individual work</td><td>66</td></tr>
<tr><td>Course total</td><td>130</td></tr>
<tr><td>Student performance evaluation</td><td colspan="2">For the theoretical part of the module: a) Evaluation by means of short, follow-up “tests”, at the end of the lectures – 20%, b) Participation in individual and/or group assignments and site visits – 20%, c) Two-hour written exam (60% or up to 100% for the students that have not participated in a) and b)). Written exams include: Short-answer questions (not limited to multiple choice) (50%) and solving application problems (50%).
For the lab part of the module: Individual and/or group assignment for each lab exercise and exam (written or oral) on the subject of each lab exercise or unit. Final exam covering all taught material.
The theoretical part of the module holds 60% of the final grade weight, and the lab part holds 40%, while in any case, the theory final grade should be greater or equal to three (3) and the lab final grade should be greater or equal to four (4).</td></tr>
</table>

e) Suggested bibliography

1. Καλδέλλης Ι., Χαλβατζής Κ. (2005). *Περιβάλλον και Βιομηχανική Ανάπτυξη: Αειφορία και Ανάπτυξη-Ατμοσφαιρική Ρύπανση*. Εκδ. Αθ. Σταμούλη / 960-351-589-2.
2. Καλδέλλης Ι., Κονδύλη Αιμ. (2005). *Περιβάλλον και Βιομηχανική Ανάπτυξη: Μείζονα Περιβαλλοντικά Προβλήματα, Διαχείριση Αποβλήτων*. Εκδ. Αθ. Σταμούλη / 960-351-601-5.
3. Κούγκολος Αθ. (2017). *Περιβαλλοντική Μηχανική Ρύπανση και Προστασία Περιβάλλοντος*. Εκδ. Τζιόλα.
4. Γεντεκάκης Ι. Β. (1999). *Ατμοσφαιρική Ρύπανση: Επιπτώσεις, Έλεγχος & Εναλλακτικές Τεχνολογίες*. Εκδ. Τζιόλα.
5. Mackenzie D., Masten S. (2019). *Principles of Environmental Engineering & Science*. 4th Edition, Mackenzie Davis and Susan Masten.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM004Y05	*Semester*	3
Course title	**7.4.1.5 Machine Elements II**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	6.5
Laboratory exercises	-	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH235/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon completion of the course, students will be able to:

- Identify standard gears and mechanical assemblies as well as relevant sub-categories.
- Design and develop the appropriate gear for each application.
- Analyze the stress-strain state of power transmission train gears loading.
- Calculate the strength of each case study.
- Select materials and processing method of non-standard gears.
- Design and analyze Mechanical multiple-element arrangements.
- Design and calculate multistage gear reducers.
- Analyze and make kinematic and dynamic calculations of planetary systems mechanisms.
- Predict potential failure conditions.
- Specify maintenance program of every element.
- Make damage assessment.

b2. General competences

- Search, Analysis and Synthesis of data and information with the use of new technologies.
- Decision Making.
- Production of new research ideas.

c) Syllabus

Introduction, Fundamentals of gear meshing, Spur gears, Helical gears, Conical gears, Worm gears, Epicyclic mechanisms, Power flow.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	65
	Tutorials	-
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written examination.	

e) Suggested bibliography

1. Κωστόπουλος, Θ. (1991). *Οδοντώσεις και Μειωτήρες Στροφών*, Αθήνα: Συμεών.
2. Στεργίου, Ι., Στεργίου, Κ. (2004). *Στοιχεία Μηχανών ΙΙ* , Αθήνα: Σύγχρονη Εκδοτική.
3. Φρυδάκης, Μ. (2004). *Στοιχεία Μηχανών ΙΙΙ* , Αθήνα: Σύγχρονη Εκδοτική.
4. Τσολάκης, Α.Δ., Ράπτης, Κ.Γ. (2009). *Υπολογιστικές Εφαρμογές σε Συστήματα Οδοντωτών Τροχών*, Αθήνα: Σύγχρονη Εκδοτική.

7.5 5th Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM005Y01	*Semester*	5
Course title	**7.5.1.1 Electrical Machines - Power Electronics**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	6.0
Laboratory exercises		-	
Course type		Special background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH142/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon completion of the course, students will have acquired:

- Deep understanding and mastery of the basic concepts of the general laws of mechanics, fields, waves, electromagnetism, and their application towards solving engineering problems.
- Knowledge and use of the principles of circuit theory and electrical machines.
- Ability to calculate and design electrical machines.
- Knowledge of machine control and electrical drives and their applications.

More specifically, they will be able to:

- Understand the operation of electrical machines.
- Select the appropriate types of electric machines based on their characteristics and the specific application requirements.
- Have knowledge of the operating and safety testing of electric machines.
- Understand the mathematical models and circuit models and how to determine the corresponding parameters.
- Be able to select the applications and how the machines are used.

b2. General competences

The course aims at fostering the following capabilities:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Working independently.
- Production of free, creative and inductive thinking.

c) Syllabus

- Magnetic circuits.
- Conversion Energy.
- Transformers.
- Single - phase transformers.
- Configuration of single phase and three phase power transformers.
- Magnetic saturation and higher harmonic effects.

- DC Electric Machines.
- Types of DC machines excited.
- Dynamic analysis of DC Machines.
- Key parts of AC electrical machines, Categories of AC rotating machines, Windings of electrical machines. Operation in all four quadrants. Rotating magnetic field. Development of tension and torque.
- Asynchronous three-phase motor. Operating Principle. Equivalent single-phase circuit. Flow of power and degree of Performance.
- Asynchronous single-phase motor. Start Methods of single phase motors. Shaded pole motors.
- Synchronous generator construction. The equivalent circuit of a Synchronous generator. Power and Torque in Synchronous generator. Measuring Synchronous generator model parameters. Parallel operation of AC generators.
- Synchronous motor. Basic principles of motor operation. Steady-state Synchronous motor operation. Starting Synchronous motors.
- Line - Commutated Circuits.
- AC/DC Controllers
- Self-Commutated Circuits.
- DC/AC Inverters (Step Down converter , Step up Converter , Fly back converter, etc.
- Applications of power electronics circuits.

d) Teaching and learning methods - Evaluation

Delivery	Lectures and exercises, face-to-face.	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	26
	Individual work	65
	Course total	156
Student performance evaluation	Final Written Exams: 100% Language of Evaluation: Greek and English for Erasmus students.	

e) Suggested bibliography

1. Fitzerald A., Kingsley C., Umans S. (1983). Electric Machinery. Mc Graw-Hill. 4th Edition.
2. Zorbas D. (1989). Electric Machine. West Publishing Company. 1st Edition.
3. Malatestas P. (2013). Electric Machines. Tziolas Publication. (in Greek).
4. Safakas A., (2007). Electric Machines - Volume A, Publications of University of Patras (in Greek).
5. Chapman S. (2009). Electric Machines, Tziolas Publication Thessaloniki (in Greek).

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM005Y02	*Semester*	5
Course title	**7.5.1.2 Heat Transfer**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.0
Laboratory exercises	2	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://eclass.uniwa.gr/courses/MECH150/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe the fundamental principles governing the Heat Transfer.
- Identify the different modes of Heat Transfer (Conduction, Convection and Radiation).
- Identify the fundamental equations of heat transfer, Fourier's Law, Heat Conduction Equation in differential and integral form and explain the physical meaning of the individual terms.
- Analyze one-dimensional heat flow problems with the use of Heat Transfer fundamental equations.
- Apply analytical methods for the calculation of heat- and fluid- flow quantities in practical applications, such as heat exchangers etc.
- Evaluate the operation of practical applications and propose optimal solutions.
- Apply the necessary procedures for conducting laboratory activities and prepare a corresponding technical report.
- Analyze and present a study case (individual or in co-operation with colleagues) that may include computational and / or experimental section using computational and experimental heat transfer tools, combining information and communication technologies.
- Identify, organize and manage bibliographical sources and information from the internet.
- Use the training material as a basis for future self-education in the subject.

b2. General competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Working independently.
- Teamwork.
- Working in an international environment.

c) Syllabus

Basics of Heat Transfer, Fundamentals of Heat Conduction, One-dimensional and Steady-state Heat Conduction, Fundamentals of Heat Convection, Forced Thermal Convection on External Flows, Forced Thermal Convection on Internal Flows, Natural (Free) Heat Convection, Heat Exchangers, Heat Transfer from Finned Surfaces, Thermal Radiation, Applications on the course subjects.
Laboratory exercises and case studies (for the theoretical part of the course).

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams and eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	26
	Individual work	65
	Course total	156
Student performance evaluation	For the theoretical part of the course, written intermediate assessment (20%) and written final examination (80%), including short answer questions (20%) and problem solving (80%). For the laboratory exercises: Individual and / or group assignments – 3 students – (40%) and written or oral examination or presentation, per exercise and per case of study (60%).	

e) Suggested bibliography

1. Νίκας Κ.-Σ. Π. (2010). *Αρχές της Μετάδοσης Θερμότητας για Μηχανικούς*. (in Greek).
2. Νίκας Κ.-Σ. Π. & Παπάζογλου Ελ. (2010). *Αρχές της Μετάδοσης Θερμότητας για Μηχανικούς – Συνοπτική Θεωρία & Ασκήσεις*. (in Greek).
3. Bejan A., (2013). Heat Transfer. John Wiley & sons Inc (4th edition).
4. Cengel Y. A. (2002). Heat Transfer, A Practical Approach. McGraw - Hill (2nd edition).
5. Holman J. P. (2009). Heat Transfer. McGraw - Hill (10th edition).
6. Incropera F. P., Dewitt D. P., Bergman T. L., Lavine A. S., (2017). Introduction to Heat Transfer. John Wiley & sons, Inc. (8th edition).

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM005Y03	*Semester*	5
Course title	**7.5.1.3 Internal Combustion Engines I**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	6.0
Laboratory exercises		1	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH173/ http://icelab.uniwa.gr

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand the Internal Combustion Engine's (ICE) fundamentals and engines' classifications.
- Have basic knowledge of the main components and subsystems.
- Understand the fundamentals of the processes involved.
- Understand the technical specifications, the operation characteristics and performance charts.
- Perform simple relevant calculations.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.

c) Syllabus

Introduction. Operation of reciprocal internal combustion engines (ICE) and description of their different types (spark ignition (SI), compression ignition (CI), 2-strokes, 4-strokes, Wankel). Engine design and operating parameters. Thermochemistry of fuel-air mixtures. Ideal models of engine cycles. Real p-V diagrams. Basic properties of fuels. Combustion problems. Air fuel ratio. Mixture preparation and injection systems. Pollutants and exhaust gas aftertreetment technologies. Fluid mechanical phenomena in engines. Energy balance. Technical and thermodynamic calculations. Laboratory exercises: demonstration of operation using an engine with transparent cylinder, measurements of power, torque, fuel consumption in a laboratory engine for various conditions (speed, load, mixture composition), measurements for calculating the energy balance.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	13
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Final written exam (80%) including short answer questions (60%) and problem solving (40%). For the laboratory part, individual and / or group assignments and written examination or presentation, per exercise and per case of study (20%).	

e) Suggested bibliography
1. Heywood, J.B. (2018). Internal Combustion Engine Fundamentals. McGraw-Hill Education. 2. Pulkrabek, W. (2016). Τεχνικές Αρχές Μηχανών Εσωτερικής Καύσης. Εκδόσεις Τζιόλα. 3. Πολυζάκης Απ, (2020)Μονάδες Ισχύος και Νέες Τεχνολογίες Οχημάτων και Πλοίων, Ιδιωτική έκδοση. 4. Ferguson, C., Kirkpatrick A. (2008). Μηχανές Εσωτερικής Καύσης. Εκδόσεις Γιαπούλης Σ. & Α. - Κάιζερ Χ. Ο.Ε. 5. Ρακόπουλος, Κ.Δ. (2013). Μηχανές Εσωτερικής Καύσης Ι. Εκδόσεις Φούντας. 6. Κλιάνης, Λ., Νικολός, Ι., Σιδέρης, Ι. (2017). Μηχανές Εσωτερικής Καυσεως τ.Α'. Εκδόσεις Ίδρυμα Ευγενίδου.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM005Y04	*Semester*	5
Course title	**7.5.1.4 Fluid Flow Machines**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	6.0
Laboratory exercises		1	
Course type		Special background	
Course category		Compulsory	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://moodle.uniwa.gr/enrol/index.php?id=164	

b) Learning outcomes and general competences
b1. Learning outcomes
Upon successful completion of this course, the student will be able to: - Describe and analyze the flow inside a fluid flow machine. - Solve pipe network problems and select the type and size of the pump or pumps. - Design a pumping station and perform life cycle cost analysis of pump or pumps. - Implement the preliminary design of a pump or fan utilizing computational and cad tools. - Conduct measurements in pump, fan/blower and water turbine test rigs and submit a technical report on them.
b2. General competences
- Search for, analysis and synthesis of data and information with the use of the necessary technology. - Working independently. - Team work. - Working in an international environment.
c) Syllabus
Introduction (Classification and application of fluid flow machines, absolute and relative motion, Euler's turbomachine equation, types of impellers, dimensionless quantities and similitude laws in turbomachines, cavitation, water hammer). Rotodynamic pumps (Performance curves, similarity laws, operating point of the system "pump / network", pumps operation in parallel and series, pump installation analysis and

design, selection of pump, operation and control of pumping unit, pump life cycle cost, radial flow pump design). Water turbines (Types, principle of operation and performance, design elements and sizing, selection criteria, hydropower plants and reversible pump-turbine). Fan-Blowers-Compressors (Types, operation, performances, applications). Laboratory exercises and case studies.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams and eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	10
	Laboratory exercises	5
	Computational exercises	11
	Individual work	91
	Course total	156
Student performance evaluation	Intermediate assessment (individual and / or group work and / or written examination) and written final examination. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case of study.	

e) Suggested bibliography

1. Παπανίκας, Δ.Γ. (2012). *Ρευστοδυναμικές Μηχανές*. Εκδότης Media Guru.
2. Παπαντώνης, Δ.Ε. (2016). *Υδροδυναμικές Μηχανές: Αντλίες - Υδροστρόβιλοι - Υδροδυναμικές Μεταδόσεις*. Εκδόσεις Τσότρας.
3. Τσιρίκογλου, Θ. και Βλαχογιάννης, Μ. (2015). *Ρευστοδυναμικές Μηχανές*. Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
4. Lobanoff, V.S. and Ross, R.R. (2005). *Centrifugal Pumps: Designs and Application*. Jaico Publ. House.
5. Round, G.F. (2004*). Incompressible Flow Turbomachines: Design, Selection, Applications, and Theory*. Butterworth-Heinemann.
6. Wright, T. and Gerhart, P. (2009). *Fluid Machinery: Application, Selection, and Design*. CRC Press.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM005Y05	*Semester*	5
Course title	**7.5.1.5 Automatic Control Systems**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	6.0
Laboratory exercises		-	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	Yes
Course website (url)	https://eclass.uniwa.gr/courses/MECH153/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will possess:
- Basic theoretical knowledge of open-loop and closed-loop control systems;
- Skills and know-how for the study, mathematical modelling and simulation of automatic control systems using numerical methods.

In particular, the student will be able:
- recognize the basic theoretical notions of Automatic Control Systems, in open and closed-loop configurations.
- analyse, formulate as mathematical models and simulate the dynamic response of control systems.
- Identify the mathematical model of a system, its limits, components and functional dependencies.
- Analyse, examine and evaluate the operation of each part of a control system, using mathematical models and computer support for analysis and synthesis of data and information with the use of the necessary technology.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision making.
- Working independently.
- Team work.
- Working in an international environment.
- Working in an interdisciplinary environment.

c) Syllabus

Introduction to Automatic Control Systems, mathematical modeling of system dynamics, examples of mechanical, electrical, thermal, hydraulic systems. Linear dynamic equations, Laplace transform, transfer functions, dynamics of 1st and 2nd order systems, signals and block diagrams. State-space models: model development, calculation of time response, transfer matrix, canonical forms. Shaping of the closed (feedback) loop. sensors and actuators, performance criteria. Stability of linear systems, frequency domain criteria, Ruth-Hurwitz stability criterion, root locus, Bode stability criterion, Niquist stability criterion. Three-term (PID) controllers, PID parameter tuning. Analysis and synthesis of control systems in state space: stability, controllability, observability, state feedback control, state observers.

d) Teaching and learning methods – Evaluation

Delivery	Face-to-face and in working groups
Use of information and communications technology	1. Commercial and free / open source software (Matlab, Octave, Scilab) 2. MS Teams, eClass 3. Open courses

	Activity	*Semester workload*
Teaching methods	Theoretical lectures	39
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	20
	Individual work	71
	Course total	156
Student performance evaluation	Intermediate assessment and written final examination Individual and group computational exercises.	

e) Suggested bibliography

1. Παρασκευόπουλος Π. (2001). *Εισαγωγή στον Αυτόματο Έλεγχο (Τόμος Α' - Θεωρία)*.
2. Ogata K. (2015). *Modern Control Engineering*. Pearson.
3. Dorf R.C. & Bishop R.H. (2017). *Modern Control Systems*. Pearson.
4. Åström Karl J. & Murray R.M. (2020). *Feedback Systems: An Introduction for Scientists and Engineers*. Princeton University Press, https://fbswiki.org/wiki/index.php/Main_Page.
5. Κρικέλης Ν. (2014). *Εισαγωγή στον Αυτόματο Έλεγχο*. Σ. Αθανασόπουλος κ Σια.
6. Σιέττος Κ., Μπάφας Γ. (2016). *Γραμμικά και Μη-γραμμικά Συστήματα Αυτόματης Ρύθμισης Διεργασιών και Συστημάτων*. ΕΑΗΣΒ-Αποθετήριο "Κάλλιπος".

7.6 6th Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM006Y01	*Semester*	6
Course title	**7.6.1.1 Industrial Automation**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	6.5
Laboratory exercises	-	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://eclass.uniwa.gr/courses/MECH130/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will possess:
- Basic knowledge of modern practices for automation of industrial plants and installations.
- Skills and know-how for the study and assessment of industrial automation solutions based on digital technologies.

Up on successful completion of this course, the student will be able to:
- Establish plans of interconnection between units for implementing industrial control systems.
- Identify and assess the technical means deployed in industrial control applications.
- Develop static and sequential logic automation systems.
- Design and program applications of industrial control applications using Programmable Logic Controllers (PLC) and other digital devices based on micro-controllers.
- Identify the components and assess the performance of industrial automation systems using digital discrete-time controllers.

b2. General competences

- 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.

c) Syllabus

Control system architectures for industrial applications, automation objectives and performance specifications, sensors, actuators. Discrete state automation: combinatorial and sequential automation systems, relay diagrams, automata. Sequential automation systems: layout, input-

output connection tables, hardware and logic. Programmable Logic Controllers, technologies, operation, memory organization, programming languages, Laader and Sequential Function Chart / GRAFCET programming, PLC industrial applications, the 61131 standard. Discrete-time industrial controllers. Three-term (PID) digital controller. Integrated Supervisory Control and Data Acquisition and Digital Control Systems in industry.

d) Teaching and learning methods – Evaluation		
Delivery	Face-to-face	
Use of information and communications technology	1.Commercial and free / open source software 2.Audio-visual material and multimedia applications 3.MS Teams, eClass 4.Open Couurses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	20
	Individual work	71
	Course totalg	156
Student performance evaluation	Intermediate assessment and written final exam. For the lab part of the course, group assignments and written exam or presentation, per case study.	

e) Suggested bibliography

1. Petruzella F. (2018). *Προγραμματιζόμενοι Λογικοί Ελεγκτές*. Α. Τζιόλας κ Υιοί.
2. Κουμπουλής Φ. Ν. (1999). *Βιομηχανικός Έλεγχος.* Εκδόσεις Νέων Τεχνολογιών.
3. Χασάπης Γ. (2016). *Μηχανική Λογισμικού Συστημάτων Βιομηχανικού Ελέγχου*. ΕΑΗΣΒ - Αποθετήριο «Κάλλιππος».
4. BorelbachK. H., KraemerG., MockW. (1996). *Αυτοματισμοί Ψηφιακού Ελέγχου με PLC SIMATIC*. Εκδ. Μ. Παρίκου κ Σια.
5. Σκαρπέτης Μ., Κουμπουλής Φ. Ν. (2016). Αυτόματος Έλεγχος Υδραυλικών κ Πνευματικών Συστημάτων. ΕΑΗΣΒ - Αποθετήριο «Κάλλιππος».

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM006Y02	*Semester*	3
Course title	**7.6.1.2 Operations Research**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	4.0
Laboratory exercises	-	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek /English
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1242 https://ops.mech.uniwa.gr/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Familiarise with operational research (OR) methods and tools.
- Understand the characteristics of different types of decision-making environments and select the appropriate OR methods and tools to be used in each type.
- Design new simple mathematical models identifying the variables, parameters, the optimization criteria of a.
- Build and solve linear and integer programming problems via the use of appropriate software (i.e. EXCEL, LINDO)

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Generation of new research ideas.
- Potential for model development and identification of alternative solutions in engineering problems
- Complete problem perception
- Working in an interdisciplinary environment.

c) Syllabus

The aim of the course is to provide the state of the art of operational research (OR) methods and tools in the optimal design and implementation of a wide range of synchronous problems. The usefulness of OR applies on the modelling of many managerial and/or technological decisions requiring an optimal decision (max or min). For this purpose, the fundamental decision-making tools (LP, MILP, IP) are analysed, employed and solved with appropriate software applications (i.e. office EXCEL SOLVER, LINDO etc). Specific operations in business research i.e. network analysis, shortest route problem, maximum flow, minimum cost flow, minimum cover tree, transportation problems, transshipment, production planning and allocation problems are also studied in detail. Various case studies and applications conclude the course syllabus.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	130
Student performance evaluation	Intermediate assessment and final written exam.	

e) Suggested bibliography

1. Hillier S. Frederick and Lieberman J. Gerald, 2000, "INTRODUCTION TO OPERATIONS RESEARCH", ISBN: 0071267670, Ed. McGraw-Hill Education, Europe.
2. Taha A. Hamdy, 2011, "INTRODUCTION TO OPERATIONS RESEARCH [Εισαγωγή στην ΕΠΙΧΕΙΡΗΣΙΑΚΗ ΕΡΕΥΝΑ", 9th Edition/ 9η Έκδοση, ISBN: 978960418327, Ed. Tziola, Greece.
3. Kostoglou Vasileios, 2002, "OPERATIONS RESEARCH [ΕΠΙΧΕΙΡΗΣΙΑΚΗ ΕΡΕΥΝΑ]" ISBN: 9608050847, Ed. Tziola, Greece.
4. Fragkos Christos, 2006, "INTRODUCTION TO OPERATIONS RESEARCH [ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΕΠΙΧΕΙΡΗΣΙΑΚΗ ΈΡΕΥΝΑ]", ISBN: 9789603516552, Ed. Stamoulis, Greece.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM006Y03	*Semester*	6
Course title	**7.6.1.3 Heating, Cooling & Air-Conditioning I**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.5
Laboratory exercises	2	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH237/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Know the various technologies for achieving cooling and air conditioning.
- Apply thermodynamic laws to solve refrigeration devices.
- Evaluate the properties of atmospheric air and the efficiency of refrigeration devices.
- Analyze and calculate the cooling loads of refrigeration chambers and air-conditioning spaces.
- Understand the importance of insulation
- Appreciate the importance of the greenhouse effect and the ozone hole.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision-making.
- Working independently.
- Team work.
- Respect for the natural environment.

c) Syllabus

Basic concepts of refrigeration technology, Vapor-compression refrigeration systems (Elementary refrigeration cycle - Actual refrigeration cycle - Multi-stage refrigeration cycle - Cascade vapor-compression system), Refrigerants, The "Ozone Hole" and refrigerants, The "Greenhouse Phenomenon" and refrigerants, Gas refrigeration systems (Cooling with Stirling-Philips Engine and Brayton reverse cycle), Liquefaction by the method of Linde and Claude, Cooling with two working media (Cooling with absorption), Dealing with Environmental Impacts, Cooling with steam injection, Cooling without working media (Thermoelectric cooling - Refrigeration by demagnetization), Refrigeration and freezing of foods, Freeze chambers, Thermal insulation of mechanical installations, Psychrometric (thermodynamic properties of moist air, humidity parameters, psychrometric charts, typical air-conditioning processes).

Laboratory exercises.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face (classroom and lab)	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Theory: Written final examination. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Αλέξης, Γ. (2007). Η Τεχνολογία της Ψύξης. Εκδόσεις Σταμούλης.
2. Βραχόπουλος, Μ. (2000). Ψυκτικές Διατάξεις. Εκδόσεις ΙΩΝ.
3. Stoecher, W., F., & Jones, J., K. (1987). Refrigeration & Air Conditioning. McGraw-Hill.
4. Incropera, F.,P., & DeWitt, D., P. (1996). Introduction to Heat Transfer. J. Wiley & Sons.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM006Y04	*Semester*	6
Course title	**7.6.1.4 Advanced Materials Technology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.5
Laboratory exercises	2	
Course type	Special background	
Course category	Compulsory	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://eclass.uniwa.gr/courses/MECH132/ http://triblab.mech.uniwa.gr/gr/pg021.html	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the fundamental mechanisms and the scientific principles that govern the microstructure and the resulting properties (physical, chemical and mechanical) of the three non-metallic materials' families, namely polymers, ceramics and composites.
- Determine the crucial parameters that define the feasibility of materials synthesis and the fabrication of final products.
- Distinguish the discrete application fields of materials' families and evaluate the materials' advantages and drawbacks for a given application, taking into account their performance level within a given operation environment.
- Classify crucial constraints per application that should be taken into account in evaluating the criteria for proper materials selection.

b2. General competences

Upon completion of the course, the students would develop, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making on the particular item of materials selection.
- Understanding the requirements for generic approaches in a worldwide environment.
- Capability of performing individual- and team-working case studies.
- Ability to approach the trans-scientific and multi-disciplinary character of various engineering applications.

c) Syllabus

The course is focused on the technology of non-metallic engineering materials, with emphasis on microstructure, physical properties and mechanical performance of (a) polymers, (b) ceramics and (c) composites. Special attention is given to the performance of these material families under real operation conditions. The course is completed with the analysis of specific advanced materials (nanostructured, porous and carbon-based materials among others) for environmental, energetical and optical applications.

Within the laboratory part, the materials and shape selection methodologies are analysed for targeted engineering components designed to operate under given mechanical and/or thermal loading.		
d) Teaching and learning methods - Evaluation		
Delivery	Lectures of theory and laboratory exercises face-to-face, within the classroom.	
Use of information and communications technology	- Audio-visual material and multimedia applications	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	52
	Tutorials	0
	Laboratory exercises	13
	Computational exercises	0
	Individual work	91
	Course total	156
Student performance evaluation	Theory: Intermediate assessment (50%) and written final examination (50%). Both based on multiple-choice tests, questions and mathematical problems. Laboratory: bibliographic case study analysis in teams of at maximum five (5) persons and open-doors presentation.	
e) Suggested bibliography		

1. Askeland, D. and Wright, W. (2015). *Science and Engineering of Materials, SI Edition*. Cengage Learning Editions.
2. Ashby, M., Shercliff, H. and Cebon, D. (2007). *Materials: Engineering, Science, Processing and Design*. Elsevier Ltd.
3. Callister, W. D. and Rethwisch, D.G. (2014). *Materials Science and Engineering*. John Wiley & Sons Inc.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM006Y05	*Semester*	6
Course title	**7.6.1.5 Engineering Economics**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	6.5
Laboratory exercises		2	

Course type	Special background
Course category	Compulsory
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=249 https://ops.mech.uniwa.gr/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Assess the feasibility and the profitability of enterprises and projects.
- Familiarise with economic evaluation criteria, like Simple PayBack Period, Rate-on-Return, Net Present Value, Break Even Analysis.
- Understand balance sheets and financial indicators.
- Utilise the basic network design principles, CPM - PERT method.
- Develop skills on organising, planning and controlling a wide variety of technical plans.

b2. General competences

- 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.
- Generation of new research ideas.
- Project planning and management.
- Working in an interdisciplinary environment.

c) Syllabus

The course emphasizes on the systematic, techno-economic evaluation of projects, aspiring to provide the students with a wide range of useful tools and methods both in the field of economic analysis and of Project Management as well. Therefore, in the engineering economics part of the course concepts like cash-flows, interests' rates as well as additional evaluation criteria, like Simple PayBack Period, Rate-on-Return, Net Present Value, Break Even Analysis are analysed in theory and practice. Furthermore, the basic points for an integrated engineering feasibility assessment are addressed, by reading and explaining balance sheets and Profit and Loss Accounts. In the part of Project Management, the basic network design principles, CPM - PERT method are analysed and implemented in projects' case studies, providing the students with special skills on organising, planning and controlling a wide variety of technical projects.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Software Labs, Workshops	
Use of information and communications technology	- Commercial/free/open source software - MS Teams/Moodle - Audio-visual material and multimedia applications - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	13
	Individual work	78
	Course total	156
Student performance evaluation	Written examination, micro-projects elaboration, team-work assignment.	

e) Suggested bibliography

1. Peters S. Max, Timmerhaus D. Klaus, West E. Roland, [Δημήτριος Μαρίνος - Κουρής, Μαγδαληνή Κροκίδα, Ζαχαρίας Μαρούλης], 2017, "DESIGN of CHEMICAL INDUSTRIES and PROCESSES [ΣΧΕΔΙΑΣΜΟΣ και ΟΙΚΟΝΟΜΙΚΗ ΜΕΛΕΤΗ ΕΓΚΑΤΑΣΤΑΣΕΩΝ για ΜΗΧΑΝΙΚΟΥΣ]", ISBN: 9789604188611, Ed. Tziola, Greece
2. Pepall L., Richards D., Norman G. 2016, "INDUSTRIAL ORGANIZATION [ΒΙΟΜΗΧΑΝΙΚΗ ΟΡΓΑΝΩΣΗ]", ISBN: 9789604185054, Ed. Tziola, Greece.
3. Harvey Maylor, [Κώστας Καρανικολός, Παναγιώτης Σταυρόπουλος], 2005, "PROJECT MANAGEMENT [ΔΙΑΧΕΙΡΙΣΗ ΕΡΓΩΝ]", ISBN: 9602098538, Ed. Klidarithmos, Greece.
4. Burke Rory, 1993, "PROJECT MANAGEMENT PLANNING and CONTROL", ISBN:9781118561256, Ed. J. Wiley.
5. Lewis James, 2002, "FUNDAMENTALS on PROJECT MANAGEMENT", 2nd Edition, ISBN: 0814471323, Ed. AMACOM.
6. Burton V. Dean, 1985 "PROJECT MANAGEMENT: METHODS and STUDIES". ISBN: 0444877428, Ed. Elsevier.
7. Kerzner Harold, 1989, "PROJECT MANAGEMENT: a SYSTEMS APPROACH to PLANNING, SCHEDULING and CONTROL". Ed. Van Norstrand Reinhold, N. York.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM006Y06	*Semester*	6
Course title	**7.6.1.6 English Language & Technical Terminology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	4.0
Laboratory exercises	-	

Course type	Special background
Course category	Compulsory (Not taken into account in the final grade of the Diploma – ECTS included in the Annex of the Diploma)
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- To comprehend mechanincal engineering scientific texts in English (global understanding or scanning-thorough comprehension)
- To own the terminology and syntactic structure of scientific texts through various tecniques and methods.
- To analyse the structure and elements of scientific speech and texts in multiple levels (sentence, paragraph, text)
- To generate oral speech and structure written word of various forms (guidelines, component description, functions and processes, essays, professional correspondence, etc.)

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Adapting to new situations.
- Working independently.
- Team work.
- Working in an international environment.
- Respect for difference and multiculturalism.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.

c) Syllabus

Energy, Heat and Work, Material Properties, Stress analysis, Boiler operation, Stationary/Moving Parts of an Engine, Principles of an Internal Combustion Engine, Tribology, Lubricating Systems, Fluid Heat Transfer, Thermodynamics, Computer-aided Manufacturing – Computer Numerical Control, Mechatronics, Control Systems, DC Generators, Clean Coal Technology, Alternative Sources of Energy, Flat Plate Collectors-Collecting the heat, Solar Radiation-Solar Radiation Measurement, Engineering and the Earth's Resource, Air conditioning systems, Refrigeration systems.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning, etc.	
Use of information and communications technology	- Audio visual material and multimedia applications - Eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	39
	Tutorials	-
	Laboratory exercises	-
	Computational exercises	-
	Individual work	65
	Course total	104
Student performance evaluation	Intermittent assessment and final written examination.	

e) Suggested bibliography

1. E.A. Avallone and T. Baumeister, 1987, Mark's standard handbook for Mechanical Engineers, 9th edition.
2. M.W. Zemansky, 1981, Heat and Thermodynamics, 6th edition.
3. Robert L. Norton, 1998, Machine design, Ed. Prentice Hall.
4. CM and Johnson, 1989, General Engineering, Ed. Cassell.
5. Authentic Reading Texts.

7.7 7th Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM107Y01	*Semester*	7
Course title	**7.7.1.1 Heating, Cooling & Air conditioning II**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	5.5
Laboratory exercises		2	
Course type		Knowledge deepening/consolidation	
Course category		Compulsory for Direction 1	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH223/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course the student will be able to:

- Understand the basics and individual characteristics of heating systems - air conditioning.
- Acquire the knowledge related to the methods and techniques of the study and the management of air conditioning systems - heating and how they are used to ensure techno-economic results.
- Distinguish the main roles in a real case, or a case study and assess the role of stakeholders in implementing the system.
- Use and apply the laws of thermodynamics, mechanics of fluids and heat transfer in order to identify key elements for an efficient system.
- Evaluate by comparing heating and air conditioning systems.
- Analyze and calculate the main and sub-system components.
- Co-operate with fellow students to create and present a plan in a case study involving the design and heating-air conditioning system study.

b2. General competences

- Autonomous work.
- Decision making.
- Team work.
- Respect the natural environment.

c) Syllabus

Comfort conditions - design. Description, study and calculations of basic heating systems. Calculation of thermal needs with standard EN 12831. Cooling Load Calculation method CLTD / SCL / CLF. Dimensioning of pipes and ducts. Networks airway orifices. Central air conditioning and dispensing systems. Design hydronic heating systems - cooling. Control systems. Fan coils and calculation. Energy saving in air conditioning systems - heating. Report to the modern sophisticated systems of these facilities with application examples. Solution of numerical problems for part or for entire actual installations. Laboratory exercises.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, laboratory.	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written final exam. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Μ.Γ. Βραχόπουλος , Αναλυτική Προσέγγιση Κεντρικών Θερμάνσεων, ISBN:9789603514879, Εκδόσεις: Σταμούλη Α.Ε. (2004).
2. Β.Δ. Μπιτζιώνης, Θέρμανση- Ψύξη - Κλιματισμός ISBN 978-960-418-541-2, Εκδόσεις Τζιόλα (2021).
3. Β.Η. Σελλούντος , Θέρμανση – Κλιματισμός τόμος Α΄& Β΄. ISBN: 9789608257054. Εκδόσεις: Σέλκα - 4Μ (2002).
4. Recknagel-Sprenger-Schramek:ΘΕΡΜΑΝΣΗ-ΚΛΙΜΑΤΙΣΜΟΣ 1997. ISBN 3-486-26213-0.
5. McQuiston, Faye C. *Θέρμανση, αερισμός και κλιματισμός,* Σχεδιασμός και ανάλυση ISBN: 9789604114207, Εκδόσεις Ιων.
6. Ronald H. Howell, Harry J. Sauer, Willima J. Coad: Principles of Heating, Ventilating and Air Conditioning. ASHRAE Inc, 1998, ISBN 1-883413-56-7C.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM107Y02	*Semester*	7
Course title	**7.7.1.2 Fluid Mechanics II**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	5.5
Laboratory exercises	1	

Course type	Knowledge deepening/consolidation
Course category	Compulsory for Direction 1
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH109/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Identify the fundamental equations of conservation of mass, momentum and energy in differential form and explain the physical significance of their individual terms.
- Calculate the aerodynamic forces exerted on bodies.
- Calculate the coefficient of friction and the integral sizes of the boundary layer on surfaces that interact with the flow field.
- Implement the mass, momentum and energy conservation equations to analyze one-dimensional compressible flow problems.
- Solve unsteady flow problems.
- Implement the required procedures for conducting laboratory activities and submit a technical report on them.
- Collaborate with his classmates to analyze and present a study that may include a computational and / or experimental part using computational and experimental fluid dynamics tools, combining information and communication technologies.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.

c) Syllabus

Differential analysis of fluid flow, Incompressible-inviscid flows, Boundary layers, One-dimensional compressible flows, Unsteady flows, Experimental and computational fluid dynamics. Laboratory and computational exercises.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab / distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	39
	Tutorials	10
	Laboratory exercises	10
	Computational exercises	5
	Individual work	92
	Course total	156
Student performance evaluation	Intermediate assessment (individual and / or group work and / or written examination) and written final examination. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Παπαϊωάννου, Α. (2002). *Μηχανική των Ρευστών*. Εκδ. Γ. Γκέλμπεσης.
2. Cengel, Y. and Cimbala, J. (2013). *Fluid Mechanics: Fundamentals and Applications*. McGraw Hill.
3. Elger F.D., Williams C.B., Crowe T.C. and Roberson A.J. (2018). *Μηχανική Ρευστών για Μηχανικούς*. Α. Τζιόλα & Υιοί Α.Ε.
4. Munson B.R., Rothmayer A.P., Okiishi T.H. and Huebsch W.W. (2016). *Μηχανική Ρευστών*. Α. Τζιόλα & Υιοί Α.Ε.
5. White, F. (2010). *Fluid Mechanics*. McGraw-Hill.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM207Y01	*Semester*	7
Course title	**7.7.1.3 Elevating & Transporting Machines**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	5.5
Laboratory exercises	-	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH134/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon completion of the course, students will be able to:

- Select the appropriate transport or lifting machine for each application.
- Select and design the proper components that make up this device.
- Analyze the stress-strain state of each machine element under loading.
- Calculate the strength of each case study.

- Select materials and processing method of non-standard elements. - To specify the conditions and operating parameters of each device. - Make kinematic and dynamic calculations of the machines' components. - Predict potential failure conditions. - Study the safety of operation. - Design and analyze Mechanical multiple-element arrangements. - Predict potential failure conditions. - Specify maintenance program. - Make damage assessment.
b2. General competences
- Search, Analysis and Synthesis of data and information with the use of new technologies. - Decision Making. - Generation of new research ideas.
c) Syllabus
Introduction, Wire ropes, Sheaves and Drums, Typical elevators, Wheels – Wheel tracks, Typical transporting machines, Cranes, Brakes - Braking Systems, Conveyors.
d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Audio-visual material and multimedia applications - eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written examination	

e) Suggested bibliography
1. Στεργίου, Ι. Στεργίου, Κ. (2006). Ανυψωτικές και Μεταφορικές Μηχανές. Σύγχρονη Εκδοτική.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM207Y02	*Semester*	7
Course title	**7.7.1.4 Manufacturing Processes**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	5.5
Laboratory exercises		2	

Course type	Knowledge deepening/consolidation
Course category	Compulsory for Direction 2
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH184/ http://triblab.mech.uniwa.gr/gr/pg023.html

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe the main processes for shaping mechanical components and their joining to integrated assemblies.
- Distinguish among the physical mechanisms that take place during shaping via (a) forming, (b) casting and (c) powder metallurgy techniques.
- Recognize the crucial manufacturing parameters for shaping via (a) plastic deformation (rolling, extrusion, drawing), (b) melting and solidification (casting, welding) and (c) pressing, firing and sintering.
- Design/calculate components to be shaped in accordance to specific technical requirements and evaluate the quality of the final product.
- Suggest the most appropriate shaping technique per material.
- Evaluate/classify multiple proper solutions based on techno-economic criteria.

b2. General competences

Upon completion of the course, the students will have developed, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making capabilities on the particular item of manufacturing technique selection.
- Understanding the requirements for generic approaches in a worldwide environment.
- Project planning and management.
- Capability of performing individual- and team-working case studies.
- Ability to approach the multi-disciplinary character of various engineering applications.

c) Syllabus

Based on the distinct fundamental mechanisms that are activated during shaping/joining of components, sub-assemblies and assemblies, the theoretical part of the course deals with techniques including: (a) forming at ambient or medium temperature, via plastic deformation of bulk material or sheet metal-working (rolling, extrusion, drawing, shearing, deep drawing, etc.), (b) melting and re-solidification (casting and welding) and (c) compression, shaping and firing of final products via sintering.

The laboratory part of the course per shaping process family is focused on: (a) hands-on experience of students with a range of relevant equipment and devices and familiarization with their peculiarities , (b) the protocols/ technical specifications to be followed for assuring products quality and (c) the general guidelines and particular directions imposed by the health and safety regulations at international level.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face lectures of theory and laboratory exercises, within the classroom.	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	39
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Multiple-choice test and questions. Semestrial written home-work and oral presentation on process design and selection issues.	

e) Suggested bibliography

1. Kalpakjian, S. and Schmid, S. (2014). Manufacturing Engineering & Technology (7th edition). Pearson Editions.
2. Schey, J.A. (2000). Introduction to Manufacturing Processes. McGraw-Hill Education.
3. Handbook of Workability and Process Design (2003). G.E. Dieter, H.A. Kuhn, S.L. Semiatin (editors), ASM International.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM907Y01	*Semester*	7
Course title	**7.7.1.5 Renewable (Soft) Energy Sources**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	5.5
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 1 & 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=185	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Identify the main parts of a wind turbine as well as their functionality.
- Measure wind speed and wind direction for a given location.
- Assess the quality and main characteristics of wind potential.
- Determine the wind energy generated by a wind turbine.
- Measure solar irradiance for a given location.
- Assess the quality and main characteristics of solar potential.
- Select a solar water heater or an array of solar collectors for covering consumer thermal needs.
- Determine the main dimension of a photovoltaic installation.

- Design and size a farming greenhouse.
- Assess the quality of energy potential associated with different types of biomass.
- Determine the main dimensions of an anaerobic bioreactor.
- Identify the main characteristics of biofuels.
- Assess the quality of hydro potential.
- Determine the dimensions of a small hydroelectric plant.
- Assess the geothermal energy potential for a given location.
- Suggest appropriate applications for the exploitation of available geothermal energy.
- Identify the main characteristics of marine energy potential.
- Undertake techno-economic evaluation of renewable (soft) energy sources applications.
- Determine the social and environmental impacts from the use of renewable (soft) energy sources.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.
- Working in an interdisciplinary environment.
- Respect for the natural environment.
- Project planning and management.

c) Syllabus

Theory: Wind turbines, types of turbines, subsystems of turbines, operational performance, wind potential measuring instruments, wind potential assessment, energy generation of wind turbines, wind parks, solar energy, theoretical and experimental determination of solar irradiance, solar collectors, solar energy applications for the coverage of thermal loads, photovoltaic phenomenon, photovoltaic energy generation, introduction to farming greenhouses, systems of biomass exploitation – energy from biomass, biofuels, assessment of hydro potential, small and large hydropower plants, introduction to geothermal energy, tidal and wave energy.
Lab: Study of wind turbine operation, wind potential measurements, energy efficiency of wind turbines, solar irradiance measurements, energy performance analysis of flat plate-concentrating solar collectors, photovoltaic panels' connections and energy efficiency, recording of operational data of photovoltaic cells, simulation of solar-based farming greenhouses' energy performance, study of operational parameters of a small hydropower plant, simulation of a bioreactor energy performance, design of geothermal energy applications.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face (classroom, working groups, lab)	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Site visits	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	15
	Laboratory exercises	20
	Computational exercises	6
	Individual work	76
	Course total	156
Student performance evaluation	For the theoretical part of the module: a) Evaluation by means of short, follow-up "tests", at the end of the lectures – 20%, b) Participation in individual and/or group assignments and site visits – 20%, c) Two-hour written exam (60% or up to 100% for the students that have not participated in a) and b)). Written exams include: Short-answer questions	

	(not limited to multiple choice) (40%), and solving application problems (60%). For the lab part of the module, individual and/or group assignment for each lab exercise and exam (written or oral) on the subject of each lab exercise or unit. Final exam covering all taught material. The theoretical part of the module holds 60% of the final grade weight, and the lab part holds 40%, while in any case, the theory final grade should be greater or equal to three (3) and the lab final grade should greater or equal to four (4).

e) Suggested bibliography

1. Καλδέλλης Ι.Κ., 2005, *Διαχείριση της Αιολικής Ενέργειας*. 2η Έκδοση, Αθ. Σταμούλης ISBN: 9603515760.
2. Καλδέλλης Ι.Κ., Καββαδίας Κ.Α., 2001. *Εργαστηριακές Εφαρμογές Ήπιων Μορφών Ενέργειας,* Αθ. Σταμούλης ISBN: 9603513458.
3. Kaldellis J.K., 2012. "*Comprehensive Renewable Energy/Volume II: Wind Energy*", Elsevier B.V., ISBN 978-008-087-872-0.
4. Buresch M., 1983. *Photovoltaic Energy Systems*. Mc-Graw Hill New York /0070089523
5. Παπαντώνης Δ., 2001, *Μικρά Υδροηλεκτρικά Έργα*. Συμεών/9607888235.
6. Owen W.F., 1982, *Energy in Waste Water Treatment*, Prentice Hall Englewood Clifss NJ /0132776650.
7. U.S. Department of Energy, 1998, *Strategic Plan for the Geothermal Energy Program*. DOE National Laboratory/GO-10098572.
8. Ross D., 1995, *Power from the Waves*. Oxford University Press/0198565119

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM907Y02	*Semester*	7
Course title	**7.7.1.6 Engineering Design**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	5	5.5
Laboratory exercises	-	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 1 & 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=225	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Methodically approach the design problem in specific predefined steps.
- Analyze the engineering problem in individual subsystems.
- Identify the main and sub-functions establishing the Function Structure.
- Determine solution principles based on intuitive methods.
- Extend the solutions range, based on systematic methods of combining solutions.

- Evaluate the principles of solutions according to technical and economic criteria.
- Conduct a project-study to develop the principle solution into a final construction solution.
- Use the basic embodiment design principles for the design, optimization and control of the final construction solution.
- Collaborate with his fellow students to implement the steps of the engineering design methodology in a structured approach to solve engineering problems of mechanical constructions in a collaborative teamwork environment.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.
- Working in an interdisciplinary environment.
- Project planning and management.
- Respect for the natural environment.

c) Syllabus

Concepts of mechanical systems – conversion of energy, material, signal. Methodological steps in Engineering Design. Conceptual Design. Compiling the Requirements List. Abstracting to identify the essential problems. Establishing Function Structures. Natural phenomena investigation to find solution principles. Intuitive methods of finding solutions. Innovative design methodology. Methodical search for solutions for individual functions using classification matrices. Methodical combination of individual into overall solutions. Technical and economic evaluation of solutions. Search for weak spots. Optimize solutions. Conducting the design study. Basic configuration rules. Transmission path of force. Work allocation to individual parts. Manufacture according to standardization, production and assembly rules. Identifying errors. Evaluation of design studies. Design of the final solution (individual parts and assembly) by using a 3D-CAD system. Practical exercises: Application of the Engineering Design methodology on a complex mechanical system as an assignment during the semester. Implementation and presentation of the methodology steps.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab / Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	39
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Final exam (70%), Engineering design group-project (30%).	

e) Suggested bibliography

1. Στεργίου Κ.: *Σχεδιασμός των Κατασκευών*. Σύγχρονη Εκδοτική.
2. Pahl, G., Beitz, W., Feldhusen, J., Grote, K.H. (2014). *Engineering Design. A Systematic Approach*. Springer Verlag, 3rd ed.
3. Blessing, Lucienne, Chakrabarti, Amaresh. *DRM, a Design Research Methodology.* Springer.
4. Ernst Eder W., Hubka V., Hosnedl S.: *Design Engineering: A Manual for Enhanced Creativity*. CRC Press.

5. Roth, K.: *Konstruieren mit Konstruktionskatalogen: Band 1: Konstruktionslehre*. Springer.
6. Ehrlenspiel, K.: Cost-Efficient Design, Springer.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM107E01	*Semester*	7
Course title	**7.7.1.7 Environmental Engineering**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.0
Laboratory exercises		2	
Course type		Knowledge deepening/consolidation	
Course category		Compulsory Elective for Direction 1	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		No	
Course website (url)		https://moodle.uniwa.gr/course/view.php?id=248 https://ops.mech.uniwa.gr/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Acquire an integrated knowledge for the waste sources (liquid and solid) and their impacts in the natural resources in the context of modern concepts and technologies of circular economy.
- Familiarise with the waste impacts mitigation measures and, more specifically with the waste treatment and waste management technologies.
- Get a better understanding of contemporary water supply resources and methods and the respective plants.
- Study in detail the operation and technological advancements of desalination plants.
- Acquire knowledge and, as much as possible, practical experience in the construction and operation of waste and water treatment processes and plants.
- Get to know the professional prospects emerging from their involvement with the environmental engineering aspects.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Decision-making.
- Working in an interdisciplinary environment.
- Respect for the natural environment.
- Project planning and management.

c) Syllabus

The aim of the course is to provide the state of the art in technological developments in environmental engineering and circular economy systems. For this purpose, the key areas of environmental engineering

namely water supply resources, plants and infrastructures solid and liquid waste streams and mitigation technologies are in detail analysed in the course context. More precisely the type of water resources, the respective infrastructures, and the role of technological advancements in desalination plants are analysed in the framework of water resources management. In the liquid waste section, water pollution resources, key differences between municipal and industrial wastewater as well as the stages and the treatment principles of waste-water treatment plants are studied.

The important issue of circular economy has recently been included in the Module contents, dealing with reuse, remanufacturing and the second life of products and materials.

In the solid waste section, the principles/steps applying to integrated waste management, from the prevention of the production to recycling, energy recovery and finally end disposal are analysed via also special case studies.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	13
	Individual work	65
	Course total	130
Student performance evaluation	Written examinations, laboratory work, individual and team assignments.	

e) Suggested bibliography

1. Kaldellis K., Ioannis and Kondili M. Emilia, 2005 "ENVIRONMENT AND INDUSTRIAL DEVELOPMENT - Volume B'- [ΠΕΡΙΒΑΛΛΟΝ ΚΑΙ ΒΙΟΜΗΧΑΝΙΚΗ ΑΝΑΠΤΥΞΗ-Τόμος Β] " ISBN: 9603516015, Ed. Stamoulis, Greece.
2. Metcalf & Eddy, 2006, "WASTWATER ENGINEERING TREATMENT AND REUSE- Volume A', [ΜΗΧΑΝΙΚΗ ΥΓΡΩΝ ΑΠΟΒΛΗΤΩΝ, ΤΟΜΟΣ Α΄]", ISBN: 9789604181094, Ed. Tziola, Greece.
3. Mackenzie Davis and Masten Susan, 2019, "PRINCIPLES OF ENVIRONMENTAL ENGINEERING & SCIENCE", 4th Edition, ISBN: 1260548023, Ed. McGraw-Hill, Europe.
4. Lymperatos Gerassimos and Vagenas Dimitris, 2011, "LIQUID WASTE MANAGEMENT [ΔΙΑΧΕΙΡΙΣΗ ΥΓΡΩΝ ΑΠΟΒΛΗΤΩΝ]", ISBN: 9789604183463, Ed. Tziola, Greece.
5. Tchobanoglou G., Kreith Frank, 2010, " HANDBOOK OF SOLID WASTE MANAGEMENT [ΕΓΧΕΙΡΙΔΙΟ ΔΙΑΧΕΙΡΙΣΗΣ ΣΤΕΡΕΩΝ ΑΠΟΒΛΗΤΩΝ] ", ISBN: 960418247, Ed. Tziola, Greece.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM207E01	*Semester*	7
Course title	**7.7.1.8 Surface Engineering**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH186/ http://triblab.mech.uniwa.gr/gr/pg016.html	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the parts of engineering assemblies that are subjected to surface mechanical loading, in order to calculate and re-design them for optimizing the performance of the integrated mechanical system.
- Select the suitable surface modification technique per bearing type, in order to assure its safe and long operation.
- Use knowledge from the field of fluid mechanics in order to reliably solve problems of lubrication.
- Make good use of knowledge from the fields of mathematics, statistics and numerical analysis, in order to develop algorithms for the prediction of safe operation of tribo-systems.

b2. General competences

Upon completion of the course, the students will have developed, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making capabilities on the suitable lubricant and surface modification technique selection for a given engineering application.
- Understanding the requirements for generic approaches in a worldwide environment.
- Project planning and management.
- Capability of performing individual- and team-working case studies.
- Ability to conceive the multi-disciplinary character of various engineering applications.

c) Syllabus

The knowledge offered in the course concerns:

- Clarification of basic concepts, like the tribo-system's definition, its main operating parameters and the critical materials' volumetric and surface properties affecting its operation.
- Surface micro-geometry (roughness) analysis and measurement.
- Assessment of the mechanical loading effects on surface and sub-surface layers of conjugated, non-moving bodies (Elasto-static theory).
- Movement deceleration mechanisms of bodies in contact (Friction) that increase energy requirements.

- Surface degradation mechanisms during relative motion of conjugate bodies (Wear) that cause mass losses. - Special topics on the action of solid, liquid and hybrid lubricants targeted to facilitate motion, without crucial dimensional change of bodies, leading to minimization of energy and mass loss. - Special topics on technological applications of bearing journals and their calculation. - Surface modification techniques for enhancing the surface properties of tribo-elements.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	26
	Individual work	52
	Course total	130
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: evaluation of practical skills and multiple-choice exams.	

e) Suggested bibliography

1. Ψυλλάκη Π., Νικολακόπουλος Π. (2020). "ΜΗΧΑΝΙΚΗ ΕΠΙΦΑΝΕΙΩΝ ΚΑΙ ΕΦΑΡΜΟΓΕΣ – ΤΡΙΒΟΛΟΓΙΑ, ΣΤΟΙΧΕΙΑ ΜΗΧΑΝΩΝ ΚΑΙ ΕΠΙΦΑΝΕΙΑΚΕΣ ΚΑΤΕΡΓΑΣΙΕΣ", Εκδ. ΤΖΙΟΛΑ (in Greek).
2. *Engineering Tribology*. Cambridge University Press.
3. Zum Gahr, K.-H. (1987). *Microstructure and Wear of Materials*. Elsevier Ltd.
4. Holmberg, K. and Matthews A. (1998). *Coatings Tribology*. Elsevier Ltd.
5. Basu, B. and Kalin, M. (2011). *Tribology of Ceramics and Composites*. John Wiley & Sons Inc.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM207E02	*Semester*	7
Course title	**7.7.1.9 Advanced Machining Technology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.0
Laboratory exercises	2	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective for Direction 2
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH230/ http://triblab.mech.uniwa.gr/gr/pg020.html

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize and select cutting tools and fluids, suitable for different machining processes and materials' grades.
- Predict the cutting surface quality based on machining parameters, via advanced statistics techniques (Taguchi, Artificial Neural Networks).
- Evaluate per material grade, the morphology and characteristics of the removed material, in order to propose optimisation actions (e.g. chemical composition differentiation) that could lead to machinability amelioration.

b2. General competences

Upon completion of the course, the students would develop, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making capabilities on the particular items of cutting tools and fluids, as well as process parameters selection.
- Understanding the requirements for generic approaches in a worldwide environment.
- Project planning and management.
- Capability of performing individual- and team-working case studies.
- Ability to conceive the multi-disciplinary character of various engineering applications.

c) Syllabus

This course is focused on providing deeper knowledge on conventional material removal techniques, based on the use of cutting tools of specific geometry that operate under simple or multiple contact with the workpiece. In this perspective, special emphasis is given in the Merchant theory for the calculation of the forces developed at the cutting neighbourhood, the techniques for direct and indirect evaluation of the machining process, as well as the effects of primary and secondary motion on the process stability. Finally, the morphology and the characteristics of the removed material are used for the optimisation of the cutting tools lifetime per machined material grade.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Audio-visual material and multimedia applications	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	0
	Laboratory exercises	26
	Computational exercises	0
	Individual work	78
	Course total	130
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: evaluation of practical skills and multiple-choice exams.	

e) Suggested bibliography

1. Kalpakjian, S. and Schmid, S. (2014). *Manufacturing Engineering & Technology* (7th edition). Pearson Editions.
2. Schey, J.A. (2000). *Introduction to Manufacturing Processes*. McGraw-Hill Education.
3. *Handbook of Workability and Process Design* (2003). G.E. Dieter, H.A. Kuhn, S.L. Semiatin (editors), ASM International.
4. Αντωνιάδης, Α. (2015). *Μηχανουργική Τεχνολογία, Κατεργασίες Κοπής, Τόμος Β'*, Εκδόσεις Τζιόλας.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM907E01	*Semester*	7
Course title	**7.7.1.10 Numerical Methods of Partial Differential Equations**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.0
Laboratory exercises	-	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 1 & 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH115/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize and describe the practical engineering applications where the usage of numerical methods of differential equations and computational techniques can be helpful to obtain solutions.
- Distinguish between various computational fluid mechanics and continuous mechanics methodologies and apply the most suitable for each case.
- Apply the most suitable numerical procedures to solve project of differential equations and to write a complete technical report.
- Evaluate the numerical results in the solution of various practical fluid flow or structural problems and suggest possible optimal treatment.

b2. General competences
- Search for, analysis and synthesis of data and information with the use of the necessary technology. - Working independently. - Team work. - Working in an international environment.
c) Syllabus
Ordinary and partial differential equations, Finite differences, meshing, body fitted boundary conditions, equations discretization, errors, consistency, stability and convergence conditions, direct and indirect numerical methods of one and multidimensional parabolic, hyperbolic and elliptic equations, FTCS, Crank-Nicolson, Upwind, Lax-Wendroff, MacCormack methods, ADI algorithm, numerical stability and von Neumann analysis, conservative equations, linearization of non-linear differential equations, Berger equation, Flux Vector Splitting method.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, Laboratory and/or Distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	13
	Individual work	65
	Course total	130
Student performance evaluation	Intermediate and final exams.	

e) Suggested bibliography
1. Hofmann, J.D. (1992). Numerical methods for engineers and scientists. CRC Press. 2. Anderson, D.A., Tannehill, J.C. & Pletcher, R.H. (1997). *Numerical Heat Transfer & Fluid Flow*. Taylor & Francis. 3. Versteeg, H.K. & Malalasekera, W. (1995). *An introduction to computational fluid dynamics: The finite volume method*, Longman. 4. Chung, T.J. (1978). *Finite Element Analysis in Fluid Dynamics*, McGraw-Hill, New York. 5. Peyret, R. & Taylor, T.D. (1983). *Computational Methods for Fluid Flow*, Springer, New York.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM907E02	*Semester*	7
Course title	**7.7.1.11 Electrical, Hydraulic and Pneumatic |Motion Systems**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	4.0
Laboratory exercises		-	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective Directions 1 & 2
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	Yes
Course website (url)	https://eclass.uniwa.gr/courses/MECH158/

b) Learning outcomes and general competences

b1. Learning outcomes

At successful completion of the course, the student will be able to:

- Enumerate and describe the componenets and building blocks of an Electrical, Hydraulic or Pneumatic (EHP) motion system.
- Solve computational problems relating to the management of forces and power in EHP motion systems, and problem of sizing hardware and components.
- Identify the technical specifications and describe the design requirements for simple and complex applications in the filed of EHP motion systems.
- Design and compose integrated motion systems.
- Guide the process of specification, set-up and operation of EHP motin systems, in the context of industrial applications.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision making.
- Working independently.
- Team work.
- Working in an international environment.
- Working in an interdisciplinary environment.

c) Syllabus

Static and dynamic features of mechanical motion, characteristic curves and efficiency profiles of motor systems. Motor and load coupling, power transmission, gearboxes and transmission systems. Control methods for EHP motion. Electrical, Hydraulic and Pneumatic motion systems and applications. Structure and operation of typical EHP motors. Power supply and control systems, electrical power management. Components and sub-systems for hydraulic motion, hydraulic power management. Components and sub-systems for pneumatic motion, pneumatic power management. Basic hydraulic and pneumatic components and circuits. Mixed-technology systems and applications in modern industrial installations.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	20
	Individual work	58
	Course total	130
Student performance evaluation	Written final examination: 100%. Optional intermediate written progress exam: 20%. Optional intermediate assessment in computational problems: 20%. Possible distance oral examination if necessary.	

e) Suggested bibliography

1. Ρούτουλας Αθ. (2008). *Υδραυλικά - Πνευματικά Συστήματα και Εφαρμογές*. Εκδόσεις Σύγχρονη Εκδοτική.
2. Μαλατέστας Παντελής (2010). *Ηλεκτρική κίνηση*. Εκδόσεις Τζιόλα.
3. Παπουτσιδάκης, Μ. (2011). Σημειώσεις Θεωρίας «Έλεγχος Κίνησης».
4. Παπουτσιδάκης, Μ. (2011). Σημειώσεις Θεωρίας «Υδραυλικά & Πνευματικά ΣΑΕ».
5. Σκαρπέτης Μ., Κουμπουλής Φ. Ν. (2016). Αυτόματος Έλεγχος Υδραυλικών & Πνευματικών Συστημάτων. ΕΑΗΣΒ - Αποθετήριο «Κάλλιππος».
6. W. Bolton. Pneumatic and Hydraulic Systems. Butterworth-Heinemann 1997.
7. Harry L Stewart. Hydraulic and Pneumatic Power for Production. Indust P. 1970.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM907E03	*Semester*	7
Course title	**7.7.1.12 Production and Maintenance Management**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 1 & 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=2225 https://ops.mech.uniwa.gr/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Gain an understanding of the principles relevant to production planning, organization and operation of manufacturing firms.

- Understand how Manufacturing Resources Planning (MRP II) systems, Enterprise Resources Planning (ERP) systems and Just-In-Time (JIT) systems, are used in managing operations.
- Develop skills necessary to effectively analyze and control Material and Stock Management.
- Increase the knowledge in the field of mechanical engineering systems maintenance.
- Analyse modern maintenance management systems.

b2. General competences

- Decision-making.
- Working independently.
- Team work.
- Working in an international environment.
- Project planning and management.

c) Syllabus

The objectives of the production and maintenance management is to provide to the students the necessary knowledge and experience in order to recognise the production management and planning problems as well as to be able to select and use the most appropriate methods and tools for the solution of production management problems, such as planning and control methods, inventory and stock control etc. as well as the most modern production planning and management systems such as ERPs. Concerning the maintenance management, the module includes the basic concepts of maintenance, the parameters affecting the maintenance cost identification, the concepts of preventive and predictive maintenance, the most widely applied maintenance management software tools.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	13
	Individual work	65
	Course total	130
Student performance evaluation	Written examination, case studies and teamwork assignment.	

e) Suggested bibliography

1. Roberta S. Russell [Τατσόπουλος Ηλίας], 2018, "PRODUCTION ORGANIZATION and SUPPLY MANAGEMENT [ΟΡΓΑΝΩΣΗ ΠΑΡΑΓΩΓΗΣ και ΔΙΟΙΚΗΣΗ ΕΦΟΔΙΑΣΜΟΥ]", ISBN: 9604185578, Ed. Tziola, Greece
2. Kiener, Maier et al,. [Σακκά Ιωάννα], 2011, "PRODUCTION MANAGEMENT [ΔΙΟΙΚΗΣΗ ΠΑΡΑΓΩΓΗΣ]", ISBN: 9789607860880, Ed. Propompos, Greece
3. Slack Nigel, Chambers Stuart, Johnston Robert [Αδαμίδης Εμμανουήλ], 2010, "PRODUCT AND SERVICES PRODUCTION MANAGEMENT [ΔΙΟΙΚΗΣΗ ΠΑΡΑΓΩΓΗΣ ΠΡΟΪΟΝΤΩΝ ΚΑΙ ΥΠΗΡΕΣΙΩΝ]", ISBN: 9789604613151, Ed. Klidarithmos, Greece
4. Gaither Norman, 1995, "Production and Operations Management" ISBN: 0534510000, Ed. Duxbury Press
5. Pappis Costas, 2008, "PRODUCTION MANAGEMENT - DESIGN of PRODUCTION SYSTEMS [ΔΙΟΙΚΗΣΗ ΠΑΡΑΓΩΓΗΣ- Ο ΣΧΕΔΙΑΣΜΟΣ ΠΑΡΑΓΩΓΙΚΩΝ ΣΥΣΤΗΜΑΤΩΝ" 2nd Edition/ 2η Έκδοση, ISBN: 9789603517467, Ed. Stamoulis, Greece

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM907E04	*Semester*	7
Course title	**7.7.1.13 Physical Methods of Analysis**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.0
Laboratory exercises	-	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Directions 1&2	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH144/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand essential concepts, principles and theories related to the various techniques for the characterization of materials.
- Separate the various materials characterization techniques based on their operating principle.
- Select the required characterization technique depending on the problem.
- Combine more than one material characterization techniques to maximize extraction of substantial information depending on the problem.
- Recognize the required laboratory equipment for each technique.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision-making.
- Working independently.
- Team work.
- Working in an interdisciplinary environment.
- Production of new research ideas.

c) Syllabus

Wave and Optics, Interaction of Electromagnetic Radiation with matter. Introduction in optical and electron microscopy techniques. Spectroscopic methods of analysis. Scatter-based physical methods of analysis. Nuclear and radiation physics. X-Rays materials characterization techniques. Ionizing radiation measurements. Laser Physics. Material properties study techniques using Laser. Mechanical properties studies. Infrared Thermography, Ultrasound Control.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face
Use of information and communications technology	- Multimedia applications - Eclass

	Activity	*Semester workload*
Teaching methods	Theoretical lectures	52
	Tutorials	-
	Laboratory exercises	-
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Course work of 40% and Written final exam of 60%, or Written final exam of 100%.	

e) Suggested bibliography

1. Όξενκιουν – Πετροπούλου, Μ. (2020). Φυσικές Μέθοδοι Ανάλυσης, Φασματομετρικές Μέθοδοι. Αθήνα: Σ. Αθανασόπουλος & ΣΙΑ Ι.Κ.Ε.
2. Κουή, Μ., Αβδελίδης, Ν., Θεοδωρακέας, Π., Χειλάκου, Ε. 2015. *Μη καταστρεπτικές και φασματοσκοπικές μέθοδοι εξέτασης των υλικών.* [ηλεκτρ. βιβλ.] Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
3. Καλοβρέκτης, Κ. & Κατέβας, Ν. (2018). *Αισθητήρες Μέτρησης Και Ελέγχου*. Αθήνα: Α. Τζιόλα & Υιοί Α.Ε.

7.8 8th Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM108Y01	*Semester*	8
Course title	**7.8.1.1 Smart Energy Buildings**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 1	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1239	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Identify the main characteristics of smart energy buildings.
- Identify the basic mechanisms of building energy consumption.
- Identify building elements that require energy upgrade.
- Apply techniques and technologies that determine a building to be smart-energy.
- Evaluate different options for the energy upgrade of buildings.
- Apply the legislation in force concerning building energy consumption.

b2. General competences

- Data collection, synthesis, analysis and evaluation.
- Decision-making.
- Teamwork.
- Environmental responsibility.
- Production of free, creative and inductive thinking.

c) Syllabus

Theory: Legislation and regulation on building energy performance; energy audit instruments and devices; electrical/thermal energy consumption audit; audit of building's electromechanical installations' performance; bioclimatic design; operation principles of passive solar systems; interventions for improving building energy performance; natural ventilation principles; buildings' thermal comfort conditions estimation indices; methodology for the assessment of comfort conditions in the interior of buildings; building energy audit with the use of appropriate devices and software; energy audit technical reporting; energy design of new buildings.

Lab: Building energy audit equipment; energy audits' legislative framework; measuring energy parameters of building operation; energy audit of building envelope; energy audit of the central heating system; air conditioning energy audit; recording of energy parameters; application of energy-saving measures; energy performance software applications.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face (classroom lectures, lab)	
Use of information and communications technology	- Commercial/free/open-source software - Audio-visual material and multimedia applications - MS Teams/Moodle/e-class	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	13
	Individual work	78
	Course total	156
Student performance evaluation	For the theoretical part of the module, individual and/or group assignments and presentation of the assignments. A written final exam that includes short-answer questions and solving of numerical problems. For the lab part of the module, individual and/or group assignments and written or oral exam or presentation, for each assignment and case study.	

e) Suggested bibliography

1. Lewis, J.O., Goulding, J., Steemers, T., (1992). *Energy in architecture: European Passive Solar Handbook*, ed. Batsford Ltd, London.
2. Kavadias, K. A. (2010). Integration of stand-alone and hybrid wind energy systems into buildings. In J. K. Kaldellis (Ed.), *Stand-alone and hybrid wind energy systems. Technology, energy storage and applications* (pp. 475–505). Woodhead Publishing.
3. Monge-Barrio, A., Gutiérrez, A. S.-O. (2018). *Passive Energy Strategies for Mediterranean Residential Buildings: Facing the Challenges of Climate Change and Vulnerable Populations*. Springer International Publishing.
4. Philips, D., (2004). *Daylighting: Natural Light in Architecture*, ed. Architectural Press, Oxford.
5. Hestnes A., Hastings S. R., Saxhof B. (1996). *Solar Energy Houses*. James & James London, ISBN 1873936699.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM108Y02	*Semester*	8
Course title	**7.8.1.2 Thermal Turbomachines**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	6.0
Laboratory exercises		-	

Course type	Knowledge deepening/consolidation
Course category	Compulsory for Direction 1
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Identify the main components of a thermal turbomachine and their functions.
- Analyse the thermal operation cycle of a turbomahine.
- Address effectively problems of compressibility, even under supersonic flow.
- Comprehend the entire operational span of a gas turbine.
- Determine, on the basis of available manufacturers' maps, the operational points of thermal turbomachines.
- Select the appropriate components for the installation of a thermal turbomachine.
- Analyse the flow field within a thermal turbomachine.
- Investigate the environmental impacts of thermal turbomachines.
- Understand issues of damage prevention and maintenance of thermal turbomachines.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.
- Working in an interdisciplinary environment.
- Respect for the natural environment.

c) Syllabus

Gas turbines' thermodynamic cycles, Laws of compressible flow, Ideal and real gases, Basic types of gas turbines, Main uses of gas turbines, Analysis of gas turbine cycles, Open-cycle and closed-cycle gas turbines, Power generation installations with combined-cycle gas turbines, aircraft gas turbines – types and operational principles, Propulsion theory and relevant efficiency rates, Basic types of compressors, Combustion chambers – combustion equations, Basic types of turbines, Special aspects of gas turbines' design, Environmental performance of gas turbines, Economic assessment of gas turbines' operation (specific fuel consumption/maintenance), Elements of strength and manufacturing elements, Gas turbine diagnostics (faults), Flow field analysis within gas turbines.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face (classroom)	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	39
	Tutorials	15
	Laboratory exercises	-
	Computational exercises	26
	Individual work	85
	Course total	165
Student performance evaluation	Intermediate assessment and final written exam.	

e) Suggested bibliography

1. Bathie, W. W. (1996). *Fundamentals of gas turbines*. J. Wiley.
2. Saravanamuttoo, H. I .H. , Rogers, G. F. C., Cohen, H. (2001). *Gas turbine theory*. Pearson Education.
3. Hodge, J. (1955). *Cycles and performance estimation*. Butterworths.
4. Horlock, J. H. (2013). *Advanced Gas Turbine Cycles*. Elsevier.
5. Mattingly, J. D. (2005). *Elements of Gas Turbine Propulsion*. American Institute of Aeronautics and Astronautics.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM108Y03	*Semester*	8
Course title	**7.8.1.3 Internal Combustion Engines II**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		5	6.0
Laboratory exercises		-	
Course type		Knowledge deepening/consolidation	
Course category		Compulsory for Direction 1	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH175/ http://icelab.uniwa.gr	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand the operational characteristics of reciprocal internal combustion engines (ICE).
- Understand the dynamics of the reciprocating mechanism (crank – connecting rod – piston).
- Understand the balancing of the inertial forces in single and multi-cylinder engines (for various crank and cylinder arrangements).
- Get familiar with the current technological developments of ICEs.
- Understand the physical mechanisms that lead to pollutants production and how those can be reduced.

- Know the current emission regulations concerning ICEs and the modern aftertreatment technologies for gasoline and diesel engine exhaust gases
- Understand the factors and parameters that affect the efficiency of ICEs.
- Have a first insight with relevant computational models and how those can be used.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.

c) Syllabus

Dynamics of the reciprocating mechanism of internal combustion engines (crank – connecting rod – piston). Calculation of the inertia forces and their balancing. Crankshaft arrangement, firing sequence and intervals of various types' multicylinder engines. Review of the current technology, regarding modern gasoline direct injection engines (GDI), common rail direct injection diesel engines (CRDI) and their exhaust gas aftertreatment systems. Current emission regulations and testing procedures.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	52
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Final written exam (100%) including short answer questions (50%) and problem solving (50%).	

e) Suggested bibliography

1. Heywood, J.B. (2018). Internal Combustion Engine Fundamentals. McGraw-Hill Education.
2. Ρακόπουλος, Κ.Δ. (2013). Μηχανές Εσωτερικής Καύσης ΙΙ. Εκδόσεις Φούντας.
3. Pulkrabek, W. (2016). Τεχνικές Αρχές Μηχανών Εσωτερικής Καύσης. Εκδόσεις Τζιόλα.
4. Ferguson, C., Kirkpatrick A. (2008). Μηχανές Εσωτερικής Καύσης. Εκδόσεις Γιαπούλης Σ. & Α. - Κάιζερ Χ. Ο.Ε.
5. Robert Bosch GmbH. (2018). Bosch Automotive Handbook - 10th Edition, John Wiley & Sons Ltd.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM208Y01	*Semester*	8
Course title	**7.8.1.4 CNC-CAM**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek/English	
Is the course offered to Erasmus students	No	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1244	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe how CNC machines work.
- Select the appropriate CNC machine for the corresponding job.
- Solve subtractive processing problems.
- Apply path tool optimization methodologies by using CAM software.
- Develop EIA/ISO (G/M), CAM programs.

b2. General competences

- Decision-making.
- Working independently.
- Team work.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.

c) Syllabus

Definition and historical development of numerical control (NC). Types and structure of modern machine tools, fields of use of CNC machine tools, Multi-axis machines, Methods and interpolation types, Calculation of cutting conditions (cutting speed, feedrate, cutting depth), Accuracy, repeatability & errors. Programming using ISO G / M code, Creating CAM model based on the corresponding CAD, Post-Processors Operation, Programming using CAM systems, Selecting appropriate cutting tools based on machine tools, Simulation and verification of produced program. Flexible Manufacturing System (FMS) - concept, evaluation, key elements and their functions, applications. Complete production with Computer Integrated Manufacturing (CIM) concept, definition, applications and benefits.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab / Distance learning
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses

	Activity	*Semester workload*
Teaching methods	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	39
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Intermediate assessment (40%) and written final examination (60%), which include short answer questions (40%) and problem solving (60%). For the laboratory, individual and/or group assignments and written examination or presentation of case studies.	

e) Suggested bibliography

1. Fitzpatrick, M. (2014). Machining and CNC technology. Dubuque IA: McGraw-Hill.
2. McMahon, C., Browne, J. (1998). CAD/CAM: principles, practice and manufacturing management. Harlow: Addison-Wesley.
3. Skittides Phil. (2000). Basic Principles of Numerical Control and programming CNC machine tools (In Greek) Athens: Synchroni Ekdotiki.
4. Suh S.H., Kang S.K., Chung D.H., Stroud I. (2008). Theory and Design of CNC Systems. Springer.
5. Kunwoo L. (1999). Principles of CAD/CAM/CAE Systems. Prentice Hall.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM208Y02	*Semester*	8
Course title	**7.8.1.5 Heat Treatment of Metallic Materials**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH145/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Distinguish the basic techniques of metallic materials heat treatment.
- Identify the properties of heat treated metallic materials.
- Implement quenching and tempering of steels.
- Evaluate the results of a quenching and tempering heat treatment sequence of steels.

- Analyze and recognize microstructure and mechanical properties of metallic materials before and after specific heat treatment sequences.
- Propose corrective actions to avoid heat treatment failures.
- Design based on requirements / technical specifications the heat treatment sequence of metallic materials, in order to improve their mechanical properties.
- Select tool steel for a given mechanical application and suggest appropriate heat treatment sequence.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the appropriate technology.
- Autonomous work.
- Decision making.
- Team work.
- Design and assessment of a given project.
- Ability to critize and self-criticism.

c) Syllabus

Introduction to heat treatment of metallic materials, Atoms diffusion, Diffusion mechanisms, Steels, Equilibrium phase diagram of steels, Steel Microstructure, Microstructure transformation during steels heating and cooling, Effect of alloying elements on steels properties, Heat treatment sequences based on atoms diffusion (Annealing), Quenching and tempering, Isothermal Transformation (IT Diagrams), Continuous cooling transformation (CCT Diagrams), Superficial heat treatments, Technical facts of tool steels/ Steelmaking prospects, Heat treatment of nonferrous alloys.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Calculating exercises	-
	Individual work	91
	Total activity	156
Student performance evaluation	- Theory (50%): Open book written exam - Lab (50%): Open book written exam (25%) and technical report based on implemented heat treatment sequence (25%).	

e) Suggested bibliography

1. Callister D. W.Jr., Rethwisch G. D., 5th Ed. (2015). *Fundamentals of Materials Science and Engineering. An Integrated Approach*, Wiley.
2. Roberts A. G., Kennedy Richard, Krauss G., 5th Ed. (1998). *Tool Steels*, ASM.
3. Boyer E. Howard, (1984), *Practical Heat Treating*, ASM.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM208Y03	*Semester*	8
Course title	**7.8.1.6 Vibrations - Machine Dynamics**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	6.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH161/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon completion of the course, students will be able to:

- Study the Kinetics fundamentals.
- Recognize the normal mechanical dynamic systems.
- Understand the structure.
- Analyze and model dynamic mechanical systems.
- Model dynamic mechanical devices with elements of concentrated properties.
- Evaluate and improve dynamic systems.
- Have introductory knowledge in Mechanical Vibrations.

b2. General competences

- Search, Analysis and Synthesis of data and information with the use of new technologies.
- Decision Making.
- Team work.
- Generation of new research ideas
- Production of free, creative and inductive thinking.

c) Syllabus

Introduction, Kinetics of absolutely solid body, Dynamic system with one degree of freedom, Dynamic system with multiple degrees of freedom, Mechanical Vibrations, Mathematical modeling of dynamic systems, Applications of Machine dynamics

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	39
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written final exam. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Κανάραχος, Α.Ε., Αντωνιάδης, Ι. (1998). *Δυναμική Μηχανών*. Αθήνα: Εκδ. Παπασωτηρίου.
2. Νατσιάβας, Σ. (2001). *Ταλαντώσεις Μηχανικών Συστημάτων*.
3. Beer, F.P., Johnston, E.R., Cornwell, P.J. (2013). *Ταλαντώσεις και Δυναμική Μηχανών*. Εκδ. Τζιόλα.
4. Μπουζάκης, Κ. (2011). *Ταλαντώσεις και Δυναμική Μηχανών*. Θεσσαλονίκη: Εκδ. Ζήτη.
5. Νατσιάβας, Σ. (1999). *Εφαρμοσμένη Δυναμική*. Θεσσαλονίκη: Εκδ. Ζήτη.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM108E01	*Semester*	8
Course title	**7.8.1.7 Thermodynamics II**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.0
Laboratory exercises	-	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 1	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)		

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Apply thermodynamic laws to solve energy problems.
- Evaluate the efficiency of energy systems.
- Analyze and calculates how to improve energy systems.
- Calculate various thermodynamic and physicochemical properties of mixtures.
- Know the methods of separating two-dimensional mixtures.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision making.

- Working independently. - Team work.
c) Syllabus
Exergy analysis, Irreversible work, Principle of reducing and destroying the exergy of a system, Exergy rate balance, Balance of thermodynamic systems, Gibbs and Helmholtz Functions, Thermodynamic properties of systems of variable composition (ideal behavior), Equilibrium of ideal behavior of ideal solutions, Raoult Law, Thermodynamic properties of systems of variable composition (non-ideal behavior), Fugacity - fugacity coefficient, Activity factor, Fractional distillation.
d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	13
	Individual work	78
	Course total	130
Student performance evaluation	Intermediate assessment and written final examination. Individual and/or groups assignments.	

e) Suggested bibliography

1. Cengel & Boles. (2011). Θερμοδυναμική για Μηχανικούς (Μετάφραση). Εκδόσεις Τζιόλας.
2. Παπαϊωάννου, Α. (2007). Θερμοδυναμική (Βασικές αρχές και νόμοι-Καθαρές ουσίες). Τόμοι 1, 2 & 3. Εκδόσεις Κοράλι.
3. Smith, J.M. and Van Ness, H. C. (1990). Εισαγωγή στη θερμοδυναμική. Τόμος Β. Εκδόσεις Τζιόλας.
4. Reid, R.C., Prausnitz, J.M. and Poling, B.E. (1987). The Properties of Gases and Liquids. NY. McGraw Hill Co.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM108E02	*Semester*	8
Course title	**7.8.1.8 Transport Phenomena**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.0
Laboratory exercises	-	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective for Direction 1
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH233/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe the way in which the basic phenomena of heat and mass transfer take place in basic flows and draws up the methodology for solving these flows.
- Solve practical problems of Newtonian and non- Newtonian, single-phase and multi-phase heat transfer / mass transfer flows.
- Implement the necessary procedures for conducting detailed and computational solutions to the problems under study and submit a technical report on them.
- Evaluate the computational results of practical mechanical applications of fluid mechanics and heat / mass transfer and suggest optimal solutions.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.

c) Syllabus

Introduction to transport phenomena. Molecular and convective transport - similarities and differences. Interphase transport and momentum, heat and mass transfer coefficients. Dependence of the transfer coefficients from pressure and temperature. Kinetic theory of gases and simple models. Introduction to mass transport. Definitions (concentrations, velocities and mass fluxes). Fick's law of diffusion. Diffusional mass transfer. Combined heat and mass transfer. The equations of change. Non-Newtonian fluid flows. Multiphase flows.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams and eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Intermediate assessment and written final examination.	

e) Suggested bibliography
1. Ασημακόπουλος Δ., Λυγερού Β., Αραμπατζής Γ. (2012). *Μεταφορά Μάζας και Θερμότητας*. Εκδ. Παπασωτηρίου. 2. R.B. Bird, R.B., Stewart, W.E., Lightfoot, E.N. and Klingenberg, D.J. (2018). *Εισαγωγή στα Φαινόμενα Μεταφοράς*. Εκδ. Τζιόλα. 3. R.S. Brodkey & H.C. Hershey (2012). *Φαινόμενα Μεταφοράς- Μια ενοποιημένη προσέγγιση*. Εκδ. Τζιόλα. 4. Anderson, D.A., Tannehill, J.C. & Pletcher R.H. (1997). *Numerical Heat Transfer & Fluid Flow*. London: Taylor & Francis. 5. Tosun, I. (2007). *Modeling in transport phenomena – A conceptual approach*. Elsevier Science & Technology Books.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM208E01	*Semester*	8
Course title	**7.8.1.9 Engineering Failure Analysis**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.0
Laboratory exercises		2	
Course type		Knowledge deepening/consolidation	
Course category		Compulsory Elective for Direction 2	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH129/	

b) Learning outcomes and general competences
b1. Learning outcomes
Upon successful completion of this course, the student will be able to: - Distinguish terminology related to the efficiency of an engineering assembly such as life span, service life, failures attributed to material or to design causes. - Describe the main stages of the life span of a part (design, construction, operation). - Recognize components' failure modes. - Categorize the available methodologies to run a failure investigation. - Understand the basic principles related to fractured surfaces. - Compose a failure analysis technical report including selected corrective actions.
b2. General competences
- Search for, analysis and synthesis of data and information with the use of the necessary technology. - Adaptation in different circumstances. - Working individually - Decision making. - Team work. - Design and assessement of a failure analysis procedure. - Ability to critize and self-criticism.

c) Syllabus		
Introduction to failure analysis, life span and service life of an engineering part, scope and procedure of a failure investigation, failure mechanisms, failure modes, means and techniques used in order to carry out a failure investigation, tools for identifying a failure mechanism, nondestructive testing, fracture mechanics, fractographic examination, optical and electronic analysis of microstructure, fatigue, mechanical testing, chemical analysis test, simulating working conditions, environmental degradation of materials, corrosion, erosion, hydrogen embrittlement, results and discussion of a failure investigation, recommendations, analysis report, corrective actions, case studies.		
d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab, visiting industrial sites/ distance learning	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/ Eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	50
	Course total	102
Student performance evaluation	- Theory (50%): written final exam. - Lab (50%): technical reports in teams and presentation per exercise as well as per case study.	
e) Suggested bibliography		
1. Stein K., Μακρής Π. (1993). *Ανάλυση Μηχανολογικών Καταστροφών*. Αθήνα, Εκδόσεις Παπασωτηρίου (Κωδικός Ευδόξου 77119649). 2. Callister D. W.Jr. (2015). *Επιστήμη και Τεχνολογία των Υλικών*. Θεσσαλονίκη, Εκδόσεις Τζιόλα, (Κωδικός Εύδοξου 18548824). 3. Λεκάτου Α. (2022). *Διάβρωση και Προστασία των Μετάλλων και των Κραμάτων τους*, 2η Έκδοση, Θεσσαλονίκη, Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε. 4. Becker W.T. Shipley R.J. (2002). *Failure Analysis and Prevention*. ASM Handbook Vol. 11, ASM. 5. Wulpi D. (2000). *Understanding how components fail*, ASM.		

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM208E02	*Semester*	8
Course title	**7.8.1.10 Computer Aided Engineering (CAE)**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.0
Laboratory exercises		2	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective for Direction 2
Prerequisite courses	-
Language of instruction and examinations	Greek / English
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1245

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand computational analysis of mechanical structures using analytical methods and the Finite Elements Method.
- Understand the fundamental operating principles of modern Computer Aided Engineering Systems.
- Identify and correctly apply the constraints and loading conditions of the problem.
- Select the meshing technique for the simulation study.
- Analyze and evaluate in-depth the calculation results.
- Understand the capabilities and range of information offered by modern engineering software using the finite data method.

b2. General competences

- Adaptation of perception in the design methodology and modeling of mechanical components with the use of CAE systems.
- Production of free, creative and inductive thinking.
- Decision-making on component and assembly modeling
- Working independently.
- Team work.

c) Syllabus

Theoretical background of the Finite Elements Method. Engineering problems applications and the potential offered by the FEM method. Study of mechanical parts and assemblies strength problems under static loading. Eigen frequency analysis of mechanical components for the control and avoidance of vibration. Buckling. Drop test analysis. Thermal stress analysis. Study of heat transmission problems to mechanical and electronic components. Laboratory exercises in CAE system.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab / Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Theoretical part: Final Exam.	

	Laboratory assessment: Final exam based on laboratory exercises / Optional Assessment on individual and group-based industrial case-studies. Results discussion and in-class presentation.

e) Suggested bibliography

1. Προβατίδης, Χ. (2017). *Πεπερασμένα Στοιχεία στην Ανάλυση Μηχανολογικών Κατασκευών*. Εκδόσεις Τζιόλα.
2. Adams, V., Askenazi, *A. Building better Products with Finite Element Analysis*. Onward Press.
3. Schäfer, Michael. *Computational Engineering - Introduction to Numerical Methods*. Springer.
4. Kuang-Hua Chang (2014*). Product Design Modeling using CAD/CAE*. Academic Press.
5. Συναφή επιστημονικά περιοδικά: *Integrated Computer-Aided Engineering*. IOS Press.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM208E03	*Semester*	8
Course title	**7.8.1.11 Advanced Welding Technology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH232/ http://triblab.mech.uniwa.gr/gr/pg017.html	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Solve thermal problems occurring during welding.
- Suggest suitable welding procedures leading to minimization of distortion and tensile residual stresses, for given structure geometry and material grade.
- Predict the microstructure of both the weld and the heat-affected zone, using scientific knowledge from the field of physical metallurgy.

b2. General competences

Upon completion of the course, the students will have developed, also, general competences, concerning:

- Search, extraction, analysis and synthesis of scientific data and knowledge, using screening of large scientific databases.
- Decision making capabilities on the selection of the appropriate welding technique.
- Understanding the requirements for generic approaches in a worldwide environment.
- Project planning and management.
- Capability of performing individual- and team-working case studies.
- Ability to conceive the multi-disciplinary character of various engineering applications.

c) Syllabus

Within the framework of the course the principles of fusion weld techniques and of non-destructive testing of the structure's quality are taught. Special emphasis is given to:

- Heat transfer phenomena in semi-infinite solids and finite sheets due to moving point heat sources.
- Metallurgical transformations during solidification of liquid metals and cooling of alloys.
- Internal stress fields developed within metallic materials under given boundary conditions.
- Post-welding treatments aiming to avoid catastrophic failure of welded structures.

Successful attendance of earlier semester courses that cover basic knowledge is not formally required. However, given the topic's interdisciplinary nature, comprehension of phenomena governing the relevant mechanical applications requires knowledge of the controlling mechanisms on:

- Steady and non-steady state heat transfer.
- Influence of temperature distribution on the microstructure of metals and alloys.
- Materials behavior under mechanical loading.

d) Teaching and learning methods - Evaluation

Delivery	Lectures of theory and laboratory exercises face-to-face, within the classroom.	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: evaluation of practical skills and multiple-choice exams.	

e) Suggested bibliography

1. Παντελής Δ.Ι., Παπάζογλου Β.Ι., Χαϊδεμενόπουλος Γρ. (2017). "ΕΠΙΣΤΗΜΗ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑ ΤΩΝ ΣΥΓΚΟΛΛΗΣΕΩΝ". Εκδ. ΤΖΙΟΛΑ (In Greek).
2. Welding Handbook, 5 Volumes (1984). American Welding Society (AWS).
3. Cary H.B. (1979). Modern Welding Technology. Prentice-Hall Inc.
4. Davies A.C. (1984). The Science and Practice of Welding, 2 Volumes. Cambridge University Press.
5. Masubuchi K. (1980). Analysis of Welded Structures: Residual stresses, Distortion and their Consequences. Pergamon Press Ltd.
6. Kou S. (2003). Welding Metallurgy. John Wiley & Sons Inc.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM908E01	*Semester*	8
Course title	**7.8.1.12 Production Systems Optimisation**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 1 & 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	No	
Course website (url)	https://ops.mech.uniwa.gr/ https://moodle.uniwa.gr/course/view.php?id=1243	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand the fundamentals of modeling and solving various types of optimization problems.
- Study, design and optimise energy systems.
- Familiarise with the characteristics of multicriteria analysis.
- Formulate and develop mathematical models for engineering problems building on the knowledge acquired in the Operations Research Module.
- Use the most suitable tools for the solution of important mechanical engineering problems such as siting of projects, energy systems optimisation, water resources management, production planning, technology selection, job scheduling etc.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Generation of new research ideas.
- Potential to develop models and identify alternative solutions in engineering problems.
- Decision-making.
- Integrated problem perception.
- Working in an interdisciplinary environment.

c) Syllabus

The aim of this course is to provide the foundations for studying, designing and optimising of production systems in general. The introduction of optimisation models and algorithms provides a framework for a wide range of issues that arise in manufacturing systems. The optimisation of energy systems is one of the core subjects of the module, for example the Pinch Analysis. The module also focuses in Multicriteria Analysis, Scenario Analysis and the implementation of mathematical optimisation in various manufacturing systems. Furthermore, modeling of simple and more complicated energy systems and the optimisation of

energy systems in terms of integrated efficiency and profitability are also analysed in detail. Various case studies for the optimisation of a wide range of production systems are also included in the module syllabus.	
d) Teaching and learning methods - Evaluation	
Delivery	Face-to-face, in working groups and in the lab
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses
Teaching methods	*Activity* / *Semester workload* Theoretical lectures: 26 Tutorials: 13 Laboratory exercises: 26 Computational exercises: 13 Individual work: 52 Course total: 130
Student performance evaluation	Final exam, Course Work and Written Assignments.
e) Suggested bibliography	

1. Koukos Ioannis, 2007, "INTRODUCTION TO THE DESIGN OF CHEMICAL PLANTS [ΕΙΣΑΓΩΓΗ ΣΤΟ ΣΧΕΔΙΑΣΜΟ ΧΗΜΙΚΩΝ ΕΡΓΟΣΤΑΣΙΩΝ", ISBN: 9789604181735, Ed. Tziola, Greece.
2. Edgar, T.F., Himmelblau, D.M, 1987, "OPTIMIZATION OF CHEMICAL PROCESSES", ISBN: 9780070189911, Ed. McGraw Hill.
3. Ossenbruggen J. Paul, 1994, "FUNDAMENTAL PRINCIPLES OF SYSTEMS ANALYSIS AND DECISION-MAKING", ISBN: 9780471521563, Ed. John Wiley @ Sons, Inc.
4. Ravindran A., Ragsdell K. M., Reklaitis G.V., 2006, "ENGINEERING OPTIMISATION. METHODS AND APPLICATIONS", 2nd Edition, ISBN: 9780471558149, Ed.Wiley.
5. Sieniutycz Stanisław and Jeżowski Jacek, 2009, "ENERGY OPTIMISATION IN PROCESS SYSTEMS", eBook ISBN: 9780080914428, Ed. Elsevier.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM908E02	*Semester*	8
Course title	**7.8.1.13 Scientific Research Methodology**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.0
Laboratory exercises	-	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective for Directions 1 & 2
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=558

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Describe the characteristics and stages of scientific research.
- Describe various types of research, by drawing on examples from the science of mechanical engineering.
- Search, point out and evaluate literature material relevant to a subject of research.
- Apply basic criteria in order to select and establish a research problem and its sub-questions.
- Suggest a specific strategy-methodology concerning a research problem of his/her interest.
- Comprehend -in general- and review a published scientific study.
- Use software for the management of bibliographic sources.
- Develop a technical report or study in accordance with formalistic guidelines.
- Apply good presentation practices on a scientific study.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.

c) Syllabus

Types of scientific research, Framework and problems in scientific research, Examples of research in engineering sciences, Selecting a subject and forming a title, Establishing research questions or hypotheses, Literature review, Search of sources and literature, Compilation of literature and references, Software for the management of references, Recording and tracking bibliographical sources, Method selection for data collection: Quantitative and qualitative research, Data collection and analysis, Designing and addressing questionnaires, Calendars, Plagiarism, Writing and presentation of a research study, Examples.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face (classroom, working groups)	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	12
	Laboratory exercises	26
	Computational exercises	-
	Individual work	66
	Course total	130
Student performance evaluation	Individual and group assignments and final written exam.	

e) Suggested bibliography
1. Creswell, J.W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). SAGEPublications, Inc. 2. Keith, H. &Sharp, J,A. (1998). *Η επιστημονική μελέτη - Οδηγός σχεδιασμού και διαχείρισης* 3. *πανεπιστημιακών ερευνητικών εργασιών.* Gutenberg - Γιώργος & Κώστας Δαρδανός, 4. Locharoenrat, K. (2017). *Research Methodologies for Beginners.* CRC Press. 5. Thiel, D.V. (2017). *Research Methods for Engineers.* Cambridge University Press.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM908E03	*Semester*	8
Course title	**7.8.1.14 Mechanical Facilities**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		4	4.0
Laboratory exercises		-	
Course type		Knowledge deepening / consolidation	
Course category		Compulsory Elective for Directions 1 & 2	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		No	
Course website (url)		https://eclass.uniwa.gr/courses/MECH148/	

b) Learning outcomes and general competences
b1. Learning outcomes
Upon successful completion of this course the student will be able to: - Understand the basic and individual characteristics of Buildings mechanical installations. - Acquire the knowledge based on methods and techniques of the study and management of mechanical installations and systems that are used to ensure techno-economic results. - Use and apply the laws of thermodynamics, mechanics of fluids and heat transfer in order to identify key elements for an efficient system. - Evaluate and compare different systems applicable to mechanical installations. - Analyze and calculate the basics and components of the plant. - Co-operate with fellow students to create and present a plan in a case study involving the design and study of Building mechanical installations.
b2. General competences
- Autonomous work. - Decision making. - Team work. - Respect the natural environment.
c) Syllabus
Plumbing installations for buildings (water - sewage). Facilities of natural gas and gaseous fuels. Heating, refrigeration and air conditioning. Fire protection, material behavior, fire detection, fire extinguishing systems and devices, automatic extinguishing systems, fire protection in boilers, tanks and industrial

buildings. Regulations and internal installations of buildings standards. Studies on internal mechanical facilities of buildings using national technical directives and computer packages.		
d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face	
Use of information and communications technology	MS Teams and eclass.	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Final Written examination. Optional assignment preparation and presentation.	
e) Suggested bibliography		

1. Χαρώνης Παν., Μηχανολογικές εγκαταστάσεις κτιρίων, τόμος Α', Εκδ. Σύγχρονη Εκδοτική, ISBN 9608165-53, 2003.
2. Παπανίκας Δ. Γ., Τεχνολογία φυσικού αερίου, Εκδ. Vortex, 1997.
3. Μαχιά Απ., Ηλεκτρομηχανολογικές εγκαταστάσεις, Εκδ. ιδίου, 1977.
4. Stein B., Reynolds J., Mechanical and electrical equipment for buildings, Εκδ. J. Wiley, 1392 ISBN 0-471-52502-2.
5. Schulz K., οικιακές εγκαταστάσεις υγιεινής, Εκδ. Παπασωτηρίου.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM908E04	*Semester*	8
Course title	**7.8.1.15 Artificial Neural Networks & Machine Learning**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.0
Laboratory exercises		2	
Course type		Knowledge deepening / consolidation	
Course category		Compulsory Elective for Direction 1 & 2	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		No	
Course website (url)			
b) Learning outcomes and general competences			
b1. Learning outcomes			

Upon successful completion of this course, the student will be able to:

- Distinguish, interpret and clearly explain concepts and issues related to Artificial Neural Networks (ANNs) & Machine Learning (ML) techniques.
- Effectively use all the concepts related to ML and the modeling of ANNs.
- Create and manage large data files, which are necessary for ANNs & ML models training and development.
- Make new calculations, correctly classify the issues that cause the various relevant problems and generate new knowledge, while gaining experience in applying ANNs & ML modeling techniques.
- Distinguish and analyze in their potential components the issues that will be modeled with the use and application of ANNs and ML, so that he/she can combine, design, develop and implement both traditional and innovative technologies to deal with these problems/issues.
- Review initial thoughts and views related to the development, use and implementation of ANNs & ML so that he/she can create, as much as possible, new knowledge, compose and organize working groups and propose solutions.
- Have proven judgment, compare and evaluate different situations/proposals regarding the development, use and application of ANNs and ML, concerning the modeling of different magnitudes and parameters.
- Properly plan the development and the training of ANNs and ML models in issues related to modeling/forecasting of parameters related to the science of Mechanical Engineering, such as energy production, buildings energy consumption and saving, indoor and outdoor human thermal comfort/ discomfort, indoor and outdoor air quality, air pollution management, etc.
- Evaluate the accuracy and reliability of a developed ANNs or ML model using appropriate statistical evaluation methods.
- Work with fellow students to create and present, both individually and in groups, a case study from its initial stages to its final evaluation and proposal for solutions.

b2. General competences

- Theoretical background regarding machine learning and ANNs.
- Search, analysis and synthesis of data and information relevant to applications of maqchine learning and especially ANNs, using the potential of new technologies.
- Ability to practically apply machine learning and ANNs
- Ability to assess the potential of developed ANNs
- Decision Making.
- Working independently.
- Team work.

c) Syllabus

Introduction to ML, Introduction to training algorithms of machine learning and artificial intelligence, Introduction to ANNs, Advantages and disadvantages of ANNs, ANNs types and classification, Introduction to the MultiLayer Perceptron-MLP, ANNs training algorithms and methods, Introduction to learning rules, The back error propagation training algorithm, Radial Basis Function-RBF networks and models, Introduction to Support Vector Machine-SVM topology and techniques, Introduction to Self-Organizing Map-SOM topology and techniques, Introduction to genetic algorithms, Methods for improving the generalization ability of ANNs and ML models, ANNs development and training with the use of Matlab ANNs Toolbox, NeuroSolutions ANNs Toolbox and other free ANNs software products, Evaluation of developed ANNs and ML models using appropriate statistical methods and statistical evaluation indices, Applications of ANNs and ML modeling techniques related to the science of Mechanical Engineering.

d) Teaching and learning methods - Evaluation

Delivery	Lectures and exercises, face-to-face
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/Moodle/e-class (under construction) - Open courses

<table>
<tr><td rowspan="7">Teaching methods</td><td>Activity</td><td>Semester workload</td></tr>
<tr><td>Theoretical lectures</td><td>26</td></tr>
<tr><td>Tutorials</td><td>-</td></tr>
<tr><td>Laboratory exercises</td><td>26</td></tr>
<tr><td>Computational exercises</td><td>-</td></tr>
<tr><td>Individual work</td><td>78</td></tr>
<tr><td>Course total</td><td>130</td></tr>
<tr><td>Student performance evaluation</td><td colspan="2">Language of evaluation: Greek for Greek students and English for ERASMUS students.
A. Theory (70%)
I. Written final exam (80%) which includes:
- Theoretical questions, multiple choice questions and judgment questions.
- Computational problems.
II. Short written intermediate test (20%) which takes place at the end of the lectures and includes:
- Computational application problems and answers on judgment questions (takes place at least three times per semester and after completing the lectures of a specific thematic unit of the course).

B. Laboratory (30%)
I. Individual or group (up to a maximum of 4 students) technical report in each laboratory exercise (50%) which includes a description of the laboratory exercise and the aim of its execution, presentation of the results (calculations, diagrams, etc.) and commentary on the results by drawing conclusions and comparing with the international literature.
II. Written or oral examination or presentation (50%) on the subject related to each laboratory exercise.</td></tr>
</table>

e) Suggested bibliography

1. Diamantaras, K. (2007). Artificial Neural Networks. Kleidarithmos Publications, ISBN: 978-960-461-080-8 (In Greek).
2. Vlachavas I., Kefalas P., Vasileiadis N., Kokkoras F., Sakellariou E. (2011). Artificial Intelligence. University of West Macedonia Publications, 3d Edition, ISBN: 978-960-8396-64-7 (In Greek).
3. Haykin, S. (2010). Neural Networks and Machine Learning. Papasotiriou Publications. ISBN: 978-960-7182-64-7 (Translated in Greek).
4. Russell, R. (2018). Neural Networks. Easy Guide to Artificial Neural Networks. CreateSpace Independent Publishing Platform. ISBN-10: 1718898428, ISBN-13: 978-1718898424.
5. Beale, R., & Jackson, T. (1990). Neural Computing: An Introduction. N.Y.: Adam Hilger.

7.9 9th Semester

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM109Y03	*Semester*	9
Course title	**7.9.1.1 Air Pollution**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	7.0
Laboratory exercises		2	
Course type		Knowledge deepening / consolidation	
Course category		Compulsory for Direction 1	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH124/ https://moodle.uniwa.gr/course/view.php?id=186	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Acquire the knowledge and understand issues related to air pollution and the quality of the atmospheric environment in general, describe relevant concepts and identify the causes-sources that cause problem in the quality of the atmospheric environment.
- Perceive, interpret and clearly explain issues related to air pollution, generalize the problem, and correctly appreciate it in order to reach the right conclusions.
- Use all the concepts related to air pollution, provide new calculations, correctly classify the causes of the various problems and generate new knowledge, while gaining implementation experience.
- Analyze the problems of air pollution and degradation of the atmospheric environment in their possible components in order to combine, design, develop and implement both traditional and innovative technologies in order to tackle these problems.
- Revise old views related to air pollution and its treatment in order to create new knowledge. Also, compose and organize working groups and propose solutions.
- Have a proven critical ability in order to compare and evaluate different statements on the quality of the atmospheric environment (for example, high concentrations of particulate matter from anthropogenic activities and dust transport from the Sahara-Sahara Dust event).
- Participate in measuring-experimental procedures, familiarize with suitable measuring devices and evaluate the measurements results in order to judge situations correctly, proposing in each case the appropriate solution.
- Work with fellow students, to create and present both at individual and group level a case study from its initial stages up to the final evaluation and finally propose new ideas and solutions.

b2. General competences

- Search, analysis and synthesis of data and information using and applying the required technologies.
- Decision Making.
- Respect for the natural environment.
- Working independently.

- Team work.
- Criticism and self-criticism.

c) Syllabus

History and classification of air pollution, atmospheric pollution scales, major air pollutants study, composition and structure of the atmosphere, atmospheric boundary layer, correlation between atmospheric pollution and meteorology, pollutants emission and sources, Gaussian model for diffusion and dispersion of air pollution from a point source, industry and air pollution, buildings, central heating, transportation and air pollutants, anti-pollution technologies, emission control technologies, air pollutants measuring-recording technologies, processing, analysis and presentation of atmospheric pollution data, indoor air quality, human thermal comfort-discomfort & microclimate coexistence with atmospheric air pollution and its impact on public health, adverse health effects due to air pollution exposure, public health.

d) Teaching and learning methods - Evaluation

Delivery	Lectures and exercises, face-to-face.	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/e-class - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Intermediate assessment and written final examination. Concerning the Laboratory of the course, individual and/or group assignments and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Lazaridis M. (2010). Atmospheric pollution with meteorological elements. Tziolas publications, ISBN 978-960-418-246-6, Thessaloniki, Greece (in Greek).
2. Triantafillou A.G. (2010). Air Pollution. Thalis Publications. Kozani, Greece(In Greek).
3. Gentekakis J. (2010). Air Pollution: Impacts, control and alternative technologies Klidarithmos publications, ISBN: 978-960-461-394-6, Athens, Greece (in Greek).
4. Burden F.R., Foerstner U. and McKelvie I.D. (2002). Environmental Monitoring Handbook. ISBN: 9780071351768, The McGraw-Hill Companies, Inc.
5. Lodge J.P. (1998). Methods of air sampling and analysis. 3rd Edition, ISBN 0-87371-141-6, Lewis Publisher, New York, USA.
6. Boubel R.W., Fox D.L., Turner B.D. and Stern A.C. (1994). Fundamentals of air pollution. 3rd Edition, ISBN 0-12-118930-9, Academic Press, Elsevier, USA.
7. Wight G.D., 1994. Fundamentals of air sampling. ISBN 0-87371-826-7, Lewis Publisher New York, USA.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM109Y01	*Semester*	9
Course title	**7.9.1.2 Thermal Power Stations**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	7.0
Laboratory exercises	2	
Course type	Knowledge deepening / consolidation	
Course category	Compulsory for Direction 1	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)		

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand global energy needs.
- Know the various energy production technologies.
- Apply thermodynamic laws and equilibrium masses, momentum and energy to solve problems related to steam power plants.
- Analyze and calculate the combustion parameters and the thermal efficiency of power plants
- Recognize the operating characteristics of combined cycle.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Respect for the natural environment
- Decision-making.
- Working independently.

c) Syllabus

Global Energy Needs, General Description of Thermal Stations, Development of Steam Generators - Internal Formulation (Heater, Superheater, Regenarator, Economiser), Thermal calculations for Boilers, Potential to increase efficiency, Power pumps-Condensers-Deaerators, Combustion theory (General - Stoichiometric combustion - Excess air combustion - Fuel types - High & Low calorific value - Theoretical / Actual temperature of the combustion, Combustion diagrams), Flow in steam generators, Rankine cycle (Simple, with superheating, with regeneration), Combined Rankine & Brayton cycle. Laboratory Exercises.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face (classroom and lab)	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Theory: Written final examination. Laboratory: Multiple choice questionnaires, short-answer questions, open-ended questions or written work.	

e) Suggested bibliography

1. Νίκας, Π., Κ. (2011). Εφαρμοσμένη Θερμοδυναμική για Μηχανικούς. Leeder Enterprises.
2. Παπαγεωργίου, Ν., Γ. (1993). Ατμοπαραγωγοί Ι & ΙΙ. Εκδόσεις ΣΥΜΕΩΝ.
3. Κακαράς, Ε. (2000). Θερμοηλεκτρικοί Σταθμοί. Εκδόσεις Φούντα.
4. Πολυζάκης, Α. (2017). Σταθμοί Παραγωγής Ηλεκτρικής Ισχύος. PowerHeatCool.
5. Woodruff, E., Lammers, H. & Lammers, T. (1998). Steam Plant Operation. McGraw-Hill.
6. Anarratone, D. (2008). Steam Generators: description and design. Springer Verlag.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM109Y02	*Semester*	9
Course title	**7.9.1.3 Hybrid Systems of Energy Generation**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	7.0
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 1	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=386	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Comprehend all parameters that should be taken into account with regards to the installation and operation of hybrid systems.
- Analyze the energy needs of a final consumer.
- Apply established methodologies for the design of hybrid systems.
- Determine the optimum dimensions of a hybrid power generation installation.
- Apply methods of thermal energy management by means of combining solar thermal systems and systems for the exploitation of geothermal energy.

- Determine the economic viability of hybrid installations.

b2. General competences

- 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 the natural environment.
- Production of free, creative and inductive thinking.

c) Syllabus

Theory: Energy systems and remote consumers, main components of energy consumption, operation principles of hybrid systems, study of the operation of autonomous electrical hybrid systems, challenges on the cooperation between thermal power stations and wind turbines, advantages and disadvantages of the cooperation between thermal engines and wind turbines, hybrid system sizing on the basis of thermal engines and wind turbines, hybrid thermal-wind-hydro systems, photovoltaic-thermal hybrid systems, photovoltaic-wind-thermal hybrid systems, hybrid installations for space and domestic water heating, hybrid systems for the coverage of heating loads (solar energy, biomass, geothermal energy), environmental-social benefits of hybrid energy installations, new technologies for hybrid systems.

Lab: Sizing of thermal and wind hybrid systems, investigation of cooperation issues between thermal power engines and wind turbines, photovoltaic-thermal hybrid systems, photovoltaic-wind-thermal hybrid systems, techno-economic evaluation of hybrid energy systems.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face (classroom lectures, working groups, lab)	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle - Site visits - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	15
	Laboratory exercises	26
	Computational exercises	13
	Individual work	76
	Course total	156
Student performance evaluation	For the theoretical part of the module: Individual and/or group assignments and presentation of the assignments (10%) and written final exam (60%), that includes short-answer questions and solving of numerical problems. For the lab part of the module: Individual and/or group assignments and presentation of the assignments and written exam or presentation for each assignment and case study (30%). The theoretical part of the module holds 70% of the final grade weight and the lab part holds 30%.	

e) Suggested bibliography
1. Kaldellis J. K. (Ed). (2010). *Stand-alone and hybrid wind energy systems. Technology, energy storage and applications*. Woodhead Publishing, ISBN 978-1-84569-527-9. 2. Zohuri, B. (2018). *Hybrid Renewable Energy Systems*. In: Hybrid Energy Systems (pp. 1–38). Springer, Cham. https://doi.org/10.1007/978-3-319-70721-1_1. 3. Καλδέλλης, Ι. Κ., Καββαδίας, Κ. Α. (2005). *Υπολογιστικές Εφαρμογές Ήπιων Μορφών Ενέργειας (Αιολική Ενέργεια – Μικρά Υδροηλεκτρικά)*. Εκδ. Αθ. Σταμούλης, ISBN: 960-351-631-7. 4. Καλδέλλης, Ι. Κ., Σπυρόπουλος, Γ. Χ., Καββαδίας, Κ. Α. (2007). *Υπολογιστικές Εφαρμογές Ήπιων Μορφών Ενέργειας (Ηλιακή Ακτινοβολία–Φωτοβολταϊκές Εγκαταστάσεις–Ηλιακά Θερμικά Συστήματα)*. Εκδ. Αθ. Σταμούλης, ISBN: 978-960-351-686-6.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM209Y01	*Semester*	9
Course title	**7.9.1.4 Mechatronics**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	7.0
Laboratory exercises		2	
Course type		Knowledge deepening / consolidation	
Course category		Compulsory for Direction 2	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH156/	

b) Learning outcomes and general competences
b1. Learning outcomes
Upon successful completion of this course, the student will possess: - Knowledge and critical understanding of the various aspects of Mechatronics - Know-how and skills to identify, organiza and analyse real-life Mechatronic systems. - Know-how and skills to solve problems of designing, programming and debugging integrated digital systems using micro-controller. In particular, the student will be able to: - Identify and enumerate the sub-systems that make up an integrated mechatronic system. - Develop the functional and information flow architecture of a Mechatronic system in the form of block diagrams. - Enumerate and describe problems of iterfacing between components and methods for developing interfacing solutions. - Interpret the structure of a mechatronic system in terms of blocks and signal flows. - Develop interfaces for common sensors and actuators. - Develop real-time software for mechatronics applications. - Implement simple control systems using mechatronics technologies and methods.

- Prepare and present examples of ingrated systems (hardware, software) incorporating sensors, actuatos and digital control unit.
b2. General competences
- 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.
c) Syllabus
Introduction to Mechatronics, basic structure of a Mechatronic system. Sensors and sensor sub-system: key functions and examples. Actuators and actuator sub-system: key functions and examples. Logic sub-system: real-time operation, role of the micro-controller. Micro-controllers and programming. Communication subsystem: devices and protocols. Composition and programming of Mechatronic System. Mechatronics applications.
d) Teaching and learning methods – Evaluation

Delivery	Face-to-face lectures, in working groups and in the lab	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams, eClass - Commercial and free / open source software	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Written final examination and student project (coursework).	

e) Suggested bibliography
1. Nesculescu D. (2011). Μηχατρονική. Αθήνα: Α. Τζιόλα & Υιοί Α.Ε. 2. D.M. Auslander and C.J. Kempf (μετάφραση: H. Tanner) (1998). Μηχατρονική: Προσαρμοστικά μηχανικών συστημάτων. Αθήνα: Πανεπιστημιακές Εκδόσεις Ε.Μ.Π. 3. Stifler K. (1992). Design with Microprocessors for Mechanical Engineers. McGraw Hill. 4. DeSilva C.W. (2010). Mechatronics: A Foundation Course. CRC Press

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM209Y03	*Semester*	9
Course title	**7.9.1.5 Ground Vehicles**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	7.0
Laboratory exercises	1	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek	
Is the course offered to Erasmus students	No	
Course website (url)	https://eclass.uniwa.gr/courses/MECH141/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the main systems of vehicles.
- Understand the design for each vehicle use orientation.
- Analyze the dynamic behavior of vehicles.
- Calculate basic parameters.
- Design vehicles.
- Improve driving behavior.
- Study the vehicles durability

b2. General competences

- Search, Analysis and Synthesis of data and information with the use of new technologies.
- Decision Making.
- Generation of new research ideas.

c) Syllabus

Main vehicle systems, suspension systems, steering systems, vehicle safety, dynamic vehicle behavior, engines, trucks, special purpose vehicles, electric vehicles, autonomous vehicles, performance vehicles.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	13
	Computational exercises	26
	Individual work	65
	Course total	156
Student performance evaluation	Written final exam. For the laboratory exercises: Individual and / or group assignments and written or oral examination or presentation, per exercise and per case study.	

e) Suggested bibliography

1. Demic, M., Σπέντζας, K.N. (2004). *Θεωρία κινήσεως τροχοφόρων οχημάτων*. Αθήνα: K.N. Σπέντζας.
2. Jazar, N. R. (2019). *Vehicle Dynamics*. Αθήνα:Εκδόσεις Φούντας.
3. Wong, J. Y. (2001). *Theory of Ground Vehicles*. Singapore: John Wiley & Sons.
4. Balkwill, J. (2018). *Performance Vehicle Dynamics*. Cambridge: Butterworth-Heinmann.
5. Gillespie, T.D., (1992). *Fundamentals of Vehicle Dynamics*. USA: Society of Automotive Engineers.
6. Pacejka, H.B., (2002). *Tire and Vehicles Dynamics*. Elsevier.
7. Dixon, J. (1996). *Tires, Suspension and Handling*. USA: Society of Automotive Engineers.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM209Y02	*Semester*	9
Course title	**7.9.1.6 Additive Manufacturing (3D Printing)**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	7.0
Laboratory exercises	2	
Course type	Special background	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek/English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1141	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand and apply principles, practices and tools of additive manufacturing for research, development and product evaluation.
- Evaluate and combine techniques of additive manufacturing in conjunction with used materials for the optimal process of products manufacturing.
- Apply and combine knowledge and good practices to develop skills in the field of AM processing.

- Organize methodologies and state of the art tools for converting CAD to AM (Additive Manufacturing) model, processing point clouds/meshes as well as surface modeling.
- Design for Additive Manufacturing models in order to improve their mechanical properties based on their use.
- Search for bibliography aiming on a comprehensive view of the under consideration problem.
- Analyze social, economic and environmental impacts of AM projects as well as its current trends as a main pillar of construction.

b2. General competences

- Decision-making.
- Working independently.
- Team work.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.
- Demonstrate critical analysis in a concise, clear and objective way.
- Formulate strategies for successful research, using appropriate methods.

c) Syllabus

Definition and historical development of Additive Manufacturing. The effect of AM. Overview of the seven processes in Additive Construction according to ASTM F42 (VAT Photopolymerisation / Material Jetting / Binder Jetting / Material Enemies / Powder Bed Fusion / Sheet Lamination / Directed Energy Deposition). Analysis of the AM technologies, with reference to the benefits and limitations in their use. Materials and mechanical properties of AM objects. Complete process from CAD modeling, costing, to the most suitable selection of AM process for a given application. Modeling of components based on their construction (Design for Additive Manufacturing-DfAM). Commercial and research use of technologies. Analysis of commercial systems in the field of AM (Software & Hardware). Case studies. Future trends and developments.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, in working groups and in the lab / Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	39
	Computational exercises	-
	Individual work	91
	Course total	156
Student performance evaluation	Intermediate assessment (40%) and written final examination (60%), which include short answer questions (40%) and problem solving (60%). For the laboratory, individual and/or group assignments and written examination or presentation of case studies.	

e) Suggested bibliography

1. Gibson I., Rosen D., Stucker B. (2017). Τεχνολογίες Προσθετικής Κατασκευής. Τρισδιάστατη εκτύπωση, ταχεία προτυποποίηση και άμεση ψηφιακή κατασκευή. Κριτική.
2. Andre J.C., (2017). From Additive Manufacturing to 3D/4D Printing 1. John Wiley & Sons, Inc.
3. Singh R., Davim J.P., (2019). Additive Manufacturing. Applications and Innovations. CRC Press.

4. Chua C.K., Wong C.H., Yeong W.Y. (2017). Standards, Quality, Control, and Measurement Sciences in 3D Printing and Additive Manufacturing. Academic Press.
5. Gibson I., Rosen D., Stucker B. (2010). Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing. Springer.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM109E01	*Semester*	9
Course title	**7.9.1.7 Aerodynamics**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		3	4.5
Laboratory exercises		1	
Course type		Knowledge deepening/consolidation	
Course category		Compulsory Elective for Direction 1	
Prerequisite courses		-	
Language of instruction and examinations		Greek	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/MECH194/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand low speed aerodynamics to solve fundamental and practical problems.
- Describe the fundamental aerodynamic and geometrical properties related to external flows over airfoils, wings, and bluff bodies.
- Calculate the aerodynamic forces and moments experienced by airfoils, wings and bluff bodies.
- Determine when to apply basic aerodynamic equations (such as Bernoulli's equation, Laplace's equation, etc.) to solve problems.
- Develop a working knowledge of experimental test facilities, techniques and equipment commonly used in the fields of experimental aerodynamics, as well as, of relevant computer simulation software.
- Present data in an appropriate manner through the use of tables and graphs, compare experimental data to theoretical and numerical predictions, and communicate effectively in written form the results of an engineering experiment.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Production of free, creative and inductive thinking.
- Working independently.
- Team work.

c) Syllabus

Theory: Introductory Concepts, Fundamental Principles and Equations. Basic Principles of inviscid incompressible flows. Elements from the aerodynamics of an airplane (Incompressible flows over airfoils and finite span wings, Aerodynamic forces and moments) Introduction to boundary layers. Experimental Aerodynamics (Wind Tunnel Testing, Measurement Instrumentation, Scaling Effects, Wall Interference).

Elements of vehicle aerodynamics, building aerodynamic, wind energy-wind turbines. aerodynamically induced oscillations. Laboratory: Conducting laboratory exercises to reinforce the concepts of theory and gain practical experience by performing experiments in wind tunnels using state of the art experimental techniques (thermal anemometry, Particle Image Velocimetry (PIV), etc.) and running relevant computer simulations using open access software.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, Distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	-
	Laboratory exercises	13
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: Individual and/or group assignments and written or oral examination or presentation, per exercise and per case of study.	

e) Suggested bibliography

1. Anderson, J.D. (2011). *Fundamentals of Aerodynamics*. (5th Ed.) McGraw-Hill. Μετάφραση Τερτίπη, Δ.Ν. και επιμ. Υάκινθου, Κ. (2017). *Βασικές Αρχές Αεροδυναμικής*. Εκδόσεις Τζιόλα.
2. Bertin, J.J. and Smith, M.L. (2013). *Aerodynamics for Engineers*, (6th Ed.) International Edition Pearson.
3. Shevell, R. (1989). *Fundamentals of Flight*. (2nd Ed.) Prentice Hall, 1989.
4. Barlow, J.B., Rae, W.H. Jr. and Pope, A. (1999). *Low-Speed Wind Tunnel Testing*, (3rd Ed.) Wiley.
5. Goldstein, R.J. (Ed.). (1983). Fluid Mechanics Measurement (2nd Ed.) Hemisphere.
6. Blevins, R.D. (2001). Flow Induced Vibrations. (2nd Ed.) Krieger Pub Co.
7. Hansen, M.O.L. (2015). Aerodynamics of Wind Turbines, (3rd Ed.) Routledge.
8. Hucho, W.H. (ed.). (1998). *Aerodynamics of Road Vehicles: from fluid mechanics to vehicle engineering*, (4th Ed.) SAE International.
9. Lawson, T., (2001). *Building Aerodynamics*. Imperial College Press.
10. Teaching notes in Greek, based on the above mentioned English textbooks.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM109E02	*Semester*	9
Course title	**7.9.1.8 Energy Storage and Energy Saving**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.5
Laboratory exercises		2	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective for Direction 1
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1106

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Become familiar with electrical and thermal energy storage systems.
- Determine the most suitable energy storage configuration for a given energy application.
- Estimate the optimum size of an energy storage system.
- Become familiar with the modern energy saving techniques.
- Develop a complete energy saving study.
- Determine the optimum energy saving solution for a given energy system.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Team work.
- Production of new research ideas.
- Respect for the natural environment.
- Production of free, creative and inductive thinking.

c) Syllabus

Theory: Basic energy storage systems, principles of operation, study of energy storage systems' operation, sizing of energy storage systems, techno-economic evaluation of energy storage systems, environmental-social benefits, novel energy storage technologies, basic principles of energy saving and rational use of energy, energy consumption in production sectors of the Greek economy, energy saving in the residential and building sectors, energy saving in the industrial sector, in agriculture and in transportation, study of combined heat and power systems, cost-benefit analysis for energy saving interventions, environmental benefits of energy saving interventions, legal and financing framework, energy saving contracts financed by third parties.

Lab: Sizing of energy storage systems, evaluation of energy storage systems, techno-economic evaluation of energy storage systems, energy consumption analysis and energy saving recommendations, application of an integrated energy saving plan.

d) Teaching and learning methods – Evaluation

Delivery	Face-to-face (classroom, working groups, lab)	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/Moodle/ - Site visits - Open courses	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	12
	Laboratory exercises	20
	Computational exercises	6
	Individual work	66
	Course total	130
Student performance evaluation	For the theoretical part of the module: Individual and/or group assignments and presentation of assignments (30%) and written final exam (40%), including short-answer questions and computational problems. For the lab part of the module: Individual and/or group assignments and written exam or presentation, per assignment and case study examined (30%). The theoretical part of the module holds 70% of the final grade weight, and the lab part holds 30%.	

e) Suggested bibliography

1. Kaldellis, J. K. (Ed). (2010). *Stand-alone and hybrid wind energy systems. Technology, energy storage and applications*. Woodhead Publishing. ISBN 978-1-84569-527-9.
2. Πέρδιος, Σ. (2010). *Οικονομική αξιολόγηση επεμβάσεων για εξοικονόμηση ενέργειας*. ΣΕΛΚΑ.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM109E03	*Semester*	9
Course title	**7.9.1.9 Introduction to Computational Fluid Dynamics**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.5
Laboratory exercises	-	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 1	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://eclass.uniwa.gr/courses/MECH116/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize and describe the practical engineering applications where the usage of computational fluid mechanics can be helpful to obtain solutions.
- Distinguish between various computational fluid mechanics methodologies and apply the most suitable for each case.
- Apply the most suitable numerical procedures to solve each project and to write a complete technical report.

- Evaluate the numerical results in the solution of various practical fluid flow and heat transfer problems and suggest possible optimal treatment.

b2. General competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an international environment.

c) Syllabus

The course objective is to familiarize the students with the method of computational fluid mechanics and to teach them the basic steps for the solution of simple flows. During the course, a comprehensive mathematical description of the governing equations of the flow and transport properties and the basic numerical methods for their solution is discussed. The basic equation of diffusion, advection-conduction are solved using the finite difference method and the solution is extended to flow equations. Elliptic, parabolic, and hyperbolic type of flows are solved by the suitable numerical techniques. Finally, a comprehensive introduction to other techniques like the finite element and spectral methods is discussed.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face, Laboratory and/or Distance learning.	
Use of information and communications technology	- Commercial/free/open source software - Multimedia applications - MS Teams/Moodle/eclass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	39
	Tutorials	13
	Laboratory exercises	-
	Computational exercises	13
	Individual work	65
	Course total	130
Student performance evaluation	Intermediate and final exams.	

e) Suggested bibliography

1. Anderson, D.A., Tannehill, J.C. & Pletcher, R.H. (1997). *Numerical Heat Transfer & Fluid Flow*. Taylor & Francis.
2. Versteeg, H.K. & Malalasekera, W. (1995). *An introduction to computational fluid dynamics: The finite volume method*. Longman.
3. Chung, T.J. (1978). *Finite Element Analysis in Fluid Dynamics*. McGraw-Hill, New York.
4. Peyret, R. & Taylor, T.D. (1983). *Computational Methods for Fluid Flow*. Springer, New York.
5. Patankar, S.V. (1980). *Numerical Heat Transfer and Fluid Flow*. Taylor and Francis.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM209E01	*Semester*	9
Course title	**7.9.1.10 Reverse Engineering**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.5
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek/English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=2764	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand and apply principles, practices and tools of reverse engineering for product research, development and evaluation.
- Evaluate and combine techniques of reverse engineering and surface CAD modeling for the complete study of reverse engineering.
- Organize methodologies and state of the art tools, 3D scanning, edit cloud points /mesh as well as surface modeling.
- Bibliography search aiming on a comprehensive view of the under consideration problem.
- Apply and combine knowledge and good practices to develop skills in the field of reverse engineering.
- Analyze social, economic and environmental impacts of AM projects as well as its current trends as a main pillar of construction.

b2. General competences

- Decision-making.
- Working independently.
- Team work.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.
- Demonstrate critical analysis in a concise, clear and objective way.
- Formulate strategies for successful research, using appropriate methods.

c) Syllabus

Definition and historical development of Reverse Engineering. Objectives and main uses. Analysis of existing technologies-Differences-Advantages-Disadvantages. Contact and non-contact systems. Data management: Point cloud and mesh. Complete CAD model reconstruction process based on the physical model using a 3D scanner. Reconstruction methodologies of 3D CAD model and comparison. Surface modeling in modern CAD systems. Uses of reverse engineering in Industry. Commercial and research use of technologies. Analysis of commercial systems in the field of reverse engineering (Software & Hardware). Case studies. Future trends and developments.

d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, in working groups and in the lab / Distance learning	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Intermediate assessment and final written examination. For the laboratory, individual and/or group assignments and written or oral examination or presentation of exercises or case studies.	

e) Suggested bibliography

1. Raja V., Fernandes K.J. (2008). Reverse Engineering: An Industrial Perspective. Springer.
2. Hopkinson N., Hague R.J.M., Dickens P.M.. (2006). Rapid Manufacturing: An Industrial Revolution for the Digital Age. John Wiley & Sons, Inc.
3. Ullman D.G. (2010). The Mechanical Design Process. Mc Graw Hill.
4. Vukašinović N., Duhovnik J. (2019). Advanced CAD Modeling: Explicit, Parametric, FreeForm CAD and Re-engineering. Springer.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM209E02	*Semester*	9
Course title	**7.9.1.11 Industrial Robotics**		
Independent teaching activities		*Weekly teaching hours*	*ECTS*
Lectures		2	4.5
Laboratory exercises		2	
Course type		Knowledge deepening / consolidation	
Course category		Compulsory Elective for Direction 2	
Prerequisite courses		-	
Language of instruction and examinations		Greek / English	
Is the course offered to Erasmus students		Yes	
Course website (url)		https://eclass.uniwa.gr/courses/IDPE263/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the parts of a robotic system and, particularly, the sub-systems that make up an industrial robotic installation.
- Describe an industrial robotic system in terms of information flows and functions.
- Describe the main problems relating to the design and programming an industrial robotic system.
- Calculate the kinematic and dynamic response of a simple industrial robotic arm.
- Identify and list the basic parts of a robotics system and, in particular, the sub-systems that make up a complex integrated robotics assembly.
- Formulate a robotics system in the form of a functional and informational connection diagram (architecture) and in the form of a structural diagram.
- Enumerate and describe common design and programming problems of an industrial robotics system.
- Explain, in the form of a short report, the methods and coping techniques for common problems of organizing the robotic work in industrial applications.
- -Articulate, in the form of a short report or suitable timing diagrams or code examples, the control function in a robotics system.
- Construct and present examples of a complete robotic system (hardware, software) with sensors, action instruments, control unit.
- Formulate the mathematical description, and use appropriate mathematical and computing tools for the numerical solution and simulation of the kinematic and dynamic behavior of an industrial robotic arm.
- Formulate mathematical models and systems for the automatic control of the movement of an industrial robotic arm.

b2. General competences

- Ability to search, analyze and synthesize data and information, using also the necessary internet and bibliographic research and networking technologies.
- Ability to make decisions, through the processing of solutions and through the processing of options for the preparation of assigned tasks and exercises.
- Ability to work independently, through the preparation of individually performed tasks and exercises.
- Ability to work in a group, through the preparation of group tasks and exercises.
- Ability to plan and manage projects, through the undertaking and preparation of completed tasks.

c) Syllabus

Introduction to Robotics and industrial application of robotics. Structure of robotic systems, typical geometries, kinematics, direct kinematic problem, inverse kinematics. Technologies for actuators and sensors in robotics. Background of Robotics: subject of Robotics and applications of robots. Structure of robotic systems: structural characteristics of robots, basic concepts. Geometric characteristics of robots. Background of kinematics: geometry of rotational motion, geometry of homogeneous transformation. Denavit-Hartenberg method and solution. Inverse kinetic problem - computational methods of solution. Robot dynamics, control, path design, path tracking.

d) Teaching and learning methods – Evaluation

Delivery	Live lectures, in working groups and in the lab	
Use of information and communications technology	- Commercial and free / open source software - Audio-visual material and multimedia applications - MS Teams, eClass	
Teaching methods	*Activity*	*Semester workload*

	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Intermediate assessment and written final examination. For the laboratory part of the course, group projects and written / oral examination.	

e) Suggested bibliography

1. Graig J.J. (2017). *Introduction to Robotics: Mechanics and Control*. Pearson.
2. Kevin M. Lynch K.M. & Park F.C. (2017). *Modern Robotics: Mechanics, Planning and Control*. Cambridge Univesity Press.
3. Graig J. (2009). *Εισαγωγή στη Ρομποτική*. Εκδ. Τζιόλα.
4. Φ. Κουμπουλής και Β. Μέρτζιος (2002). *Εισαγωγή στη Ρομποτική*. Εκδ. Παπασωτηρίου.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM209E03	*Semester*	9
Course title	**7.9.1.12 Quality Assurance Management**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	2	4.5
Laboratory exercises	2	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Direction 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://eclass.uniwa.gr/courses/MECH229/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Recognize the National, European and International authorities that are responsible and control quality issues in the field of mechanical engineering.
- Distinguish among the terms standardization, certification, accreditation and calibration, -recalling knowledge previously obtained in other courses- in order to deepen in directives and guidelines imposed by the technical specifications.
- Follow the evolution of technical standards and European regulations, in order to use them fluently during their post-graduate professional career.

b2. General competences

In the laboratory part of the course, after developing the main quantitative tools used in Quality Management Systems, students in groups of two will practice the procedures of searching for accredited laboratories, the operation of the latter, as well as the duties and responsibilities of a Quality Manager of a certified company. Ability to conceive the universal character of Quality Assurance Management Systems.
c) Syllabus
Introduction to the concept of Quality. Presentation of modern quality control methods with particular emphasis on the techniques of statistical quality control, acceptance quality control, production process control and quality improvement in the design phase. Application of the Failure Mode and Effects Analysis (FMEA) methodology. Theory is supported by examples of specific applications in the engineering industry. The ISO 9000:2008, ISO 17025 and ISO 22000 series of standards are analysed. The content of the laboratory part of the course involves the analysis of four quality management and metrology "tools" and a "virtual" search/operation application of an ISO 17025 accredited laboratory, with emphasis on activities in the engineering construction industry.
d) Teaching and learning methods - Evaluation

Delivery	Lectures of theory and laboratory exercises face-to-face, within the classroom.	
Use of information and communications technology	- MS Teams, eClass	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	-
	Laboratory exercises	26
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Theory: Intermediate assessment and written final examination. Laboratory: evaluation of practical skills and multiple-choice exams.	

e) Suggested bibliography

1. Στειακάκης, Ε., Κωφίδης, Ν. (2016). Διοίκηση και έλεγχος ποιότητας. Εκδόσεις Τζιόλα.
2. Ταγαράς, Γ. (2001). Στατιστικός έλεγχος ποιότητας. Εκδόσεις Ζήτη.

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM909E01	*Semester*	9
Course title	**7.9.1.13 Occupational Safety – Ergonomics**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	4	4.5
Laboratory exercises	-	

Course type	Knowledge deepening/consolidation
Course category	Compulsory Elective for Directions 1 & 2
Prerequisite courses	-
Language of instruction and examinations	Greek
Is the course offered to Erasmus students	No
Course website (url)	https://eclass.uniwa.gr/courses/MECH225/

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course the student will be able to:

- Understand the basics and individual characteristics of an accident at work.
- Acquire the knowledge related to the methods and techniques of tackling and managing the risk of accidents at work.
- Distinguish the main roles of the technical safety and occupational physician in a business.
- Use and apply the laws and provisions on safety at work.
- Assess and recognize the likelihood, frequency, and addressing the risks of accidents at work.
- Analyze and propose safety measures at work.

b2. General competences

- Autonomous work.
- Team work.
- Decision making.
- Respect the natural environment.

c) Syllabus

Risk Management systems, Safety and Health Management Systems. Hazards and effects at work. Accident, Risk perception, Risk factors. Occupational risk analysis methods. Error protection. Material Safety Data Sheet. First aid. The microclimate at work, Fire and fire protection, Noise, Electricity hazards, Chemical agents as an occupational hazard, Ergonomic models of work analysis, radiation, signage, risk assessment, occupational risk analysis.

d) Teaching and learning methods - Evaluation

Delivery	Face-to-face	
Use of information and communications technology	- Commercial and free / open source software - Audio-visual material and multimedia applications	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	26
	Laboratory exercises	-
	Computational exercises	-
	Individual work	78
	Course total	130
Student performance evaluation	Final Written examination.	

e) Suggested bibliography

1. Κοντογιάννης, Θ. (2016). Εργονομικές προσεγγίσεις στη διοίκηση και διαχείριση της ασφάλειας. Εκδόσεις Τζιόλα.

2. Jeremy Stranks (2017). Επιστημονική επιμέλεια: Κ. Αδάμ –Δ. Ναθαναήλ. Μάνατζμεντ Ασφάλειας και Υγείας των εργαζομένων. Εκδόσεις Rosili.
3. Ζωγόπουλος, Ε. (2004). Υγιεινή και ασφάλεια στην εργασία. Εκδόσεις Κλειδάριθμος.
4. Σαραφόπουλος, Ν. (2001). Οδηγός υγιεινής και ασφάλειας της εργασίας. Εκδόσεις Μεταίχμιο.
5. Μαρχαβίλας, Π., Κ. (2009). Υγιεινή & Ασφάλεια Εργασίας-Διαχείριση του Επαγγελματικού Κινδύνου. Εκδόσεις Τζιόλα.

Web-Sites:
1. http://www.elinyae.gr
2. http://www.osh.gr
3. http://www.fireservice.gr
4. European Agency for Safety and Health at Work: http://osha.eu.int
5. International Labour Organization: http://www.ilo.org
6. European Commission. Employment and Social Affairs: http://www.europa.eu.int/comm/employment_social/index_en.htm

a) General			
School	ENGINEERING		
Academic unit	MECHANICAL ENGINEERING		
Level of studies	Undergraduate		
Course code	MM909E02	*Semester*	9
Course title	**7.9.1.14 Supply Chain Management**		

Independent teaching activities	*Weekly teaching hours*	*ECTS*
Lectures	3	4.5
Laboratory exercises	1	
Course type	Knowledge deepening/consolidation	
Course category	Compulsory Elective for Directions 1 & 2	
Prerequisite courses	-	
Language of instruction and examinations	Greek / English	
Is the course offered to Erasmus students	Yes	
Course website (url)	https://moodle.uniwa.gr/course/view.php?id=1241 https://ops.mech.uniwa.gr/	

b) Learning outcomes and general competences

b1. Learning outcomes

Upon successful completion of this course, the student will be able to:

- Understand fundamental concepts and definitions in supply chain management.
- Understand the foundational role of distribution networks and third-party logistics.
- Apply knowledge to evaluate, manage and optimise the integrated supply chain.
- Familiarise with modern supply chains like energy, water, hydrogen.

b2. General competences

- Decision-making.
- Working independently.
- Teamwork.
- Working in an interdisciplinary environment.
- Generation of new research ideas.
- Project planning and management.

- Respect for the natural environment.		
c) Syllabus		
This course provides an understanding of fundamental concepts and definitions of supply chain management. All functional areas/key components of supply chain management are studied in an integrated way emphasizing on the selection, design, implementation and operation of distribution networks, on optimal storage siting, on the role of third-party logistics. Also newly introduced concepts like reverse logistics and green logistics are analysed in respect to their role in contemporary supply chain management. Furthermore, performance indicators used in evaluation of supply chains are also covered by the course content, with special focus on forms of modern supply chains (i.e.: energy, water, hydrogen). The course concludes with case studies and real-life applications.		
d) Teaching and learning methods - Evaluation		
Delivery	Face-to-face, Workshops, Lab exercises, Software Labs	
Use of information and communications technology	- Commercial/free/open source software - Audio-visual material and multimedia applications - MS Teams/Moodle/eclass - Open courses	
Teaching methods	*Activity*	*Semester workload*
	Theoretical lectures	26
	Tutorials	13
	Laboratory exercises	13
	Computational exercises	13
	Individual work	65
	Course total	130
Student performance evaluation	Written examination, case studies and team work assignment.	
e) Suggested bibliography		
1. Chopra S., Meindl P., [Γκάσσης Παύλος], 2015, "SUPPLY CHAIN MANAGEMENT [ΔΙΟΙΚΗΣΗ ΕΦΟΔΙΑΣΤΙΚΗΣ ΑΛΥΣΙΔΑΣ] ", ISBN: 9789604184651, Ed. Tziola, Greece. 2. Roberta S. Russell [Τατσόπουλος Ηλίας], 2018, "PRODUCTION ORGANIZATION and SUPPLY MANAGEMENT [ΟΡΓΑΝΩΣΗ ΠΑΡΑΓΩΓΗΣ και ΔΙΟΙΚΗΣΗ ΕΦΟΔΙΑΣΜΟΥ]", ISBN: 9604185578, Ed. Tziola, Greece. 3. Aït-Kadi Daoud, Chouinard Marc, Marcotte Suzanne, Riopel Diane, 2012, "SUSTAINABLE REVERSE LOGISTICS NETWORK: ENGINEERING and MANAGEMENT", ISBN: 9604185578, Ed. Wiley -ISTE. 4. Lu, Meng, De Bock, Joost (Eds.), 2016, "SUSTAINABLE LOGISTICS and SUPPLY CHAINS. INNOVATIONS and INTEGRAL APPROACHES", ISBN: 9783319174198, Ed. Springer.		

7.10 10th Semester

In the final semester, it is compulsory to carry out the Diploma Thesis, which contributes with a total of 30 ECTS credits to the total required credit units.

8 Postgraduate Programs

The Department of Mechanical Engineering offers five Postgraduate Programs leading to Master's Degree. Two of them are held in collaboration with British Universities while the rest three are autonomous programs.

8.1 Postgraduate Program "Advanced Product Design Engineering and Manufacturing"

The University of West Attica Mechanical Engineering Department in collaboration with the Faculty of Science Engineering & Computing of Kingston University London, is conducting, since 2003, the recognized by the Ministry of Education program of postgraduate studies entitled: "MSc Advanced Product Design Engineering & Manufacturing". Government Gazette (GG)/B/738/18-5-2004, GG/B/2793/17-10-2014, GG/B/3735/31-8-2018, GG/B/4717/22-10-2018, GG4947/B/26-10-2021).

The subject of the MSc is the postgraduate teaching, research and application of methods from state-of-the-art technologies to the related disciplines of industrial product design and production, in conjunction with construction management.

The purpose of the MSc, aimed at graduates of higher education, is to connect modern methods of the field of construction technology with production. It offers specialization in the field of industrial production systems with the aim to:

- equip engineers with the necessary skills to use modern methods in the construction industry,
- strengthen the rational and effective approach of contemporary techno-economic issues and
- develop and expand the administrative capacities of Engineers for professional success in the private, public and academic fields in the subject of the MSc.

The MSc is a unique combination of deepening in the field of engineering in cutting-edge technologies (CAD/CAM/CAE, 3D printing, reverse engineering, mechatronics, robotics, new materials) which is completed with courses in Total Quality Management and optimization of production lines, modern methods of research and product development as well as methods of conducting feasibility studies.

The program includes courses in industrial product design and management with extensive use of information technology.

The modules offered are the following:

- Engineering Research Techniques, Entrepreneurship and Quality Management
- Advanced CAD/CAM Systems
- Mechatronic Design and Automation
- Computer Integrated Product Development
- Individual Engineering Project

The Dissertation (Thesis) is carried out in cooperation with the industry, generally in the student's employment agency, thus linking the taught scientific methods with the needs of engineering industry. The teaching may be complemented by organized visits to the workplaces of selected organizations. Applications necessary for the consolidation of the lectures theoretical part will be conducted in the laboratories of the Department under the supervision of the responsible professor and the cooperation of the laboratory staff of the Department.

MSc website: https://aims.uniwa.gr/

8.2 Postgraduate Program "Energy Systems"

Building on more than ten years of successful collaboration, Heriot Watt University of Great Britain and the Mechanical Engineering Department of the University of West Attica (former TEI of Piraeus) implement the postgraduate program of studies "MSc in Energy Systems" (Government Gazette 3576/2014, Issue B').

The specific MSc (which advances the established MSc in Energy), offers a set of new, cutting-edge courses, and the ability for its students to adjust the program of studies in accordance with their research and professional interests, selecting between two directions upon completion of the first year courses:

- Energy Systems Design (with emphasis on the optimization of integrated energy solutions), and
- Renewable Energy Technologies (specializing in the study of wind and solar energy applications).

Successful completion of the MSc leads to the award of a Master's degree "MSc in Energy Systems – Master's degree specializing in Energy Systems" from the collaborating institutes of Heriot Watt and the University of West Attica.

The MSc is part-time, with a standard, two-year duration of studies, and with course lectures offered in Campus 2 of the University of West Attica, every Friday afternoon and every Saturday morning. Studies include both attendance of courses and working on a thesis.

MSc website: http://mscenergysystems.uniwa.gr/

8.3 Postgraduate Program "Energy and Environmental Investments"

The MSc "Energy and Environmental Investments", implemented by the Mechanical Engineering Department of the University of West Attica (Government Gazette 1359/2014, Issue B'), introduces innovative features and the competitive advantage of extending to three directions that bring together the topics of energy and the environment, i.e. a) technology, b) techno-economic analysis and assessment and c) business initiatives. The main objective of the program is to provide students with the necessary knowledge composing the above-mentioned directions, and most importantly, to encourage students to embark on their own professional career in the areas of energy and the environment.

The MSc has been designed in a way that responds to modern professional needs in the fields of energy and the environment, capitalizing on the long-term experience of the scientific team that implements the program. For this purpose, on top of its innovative and modern courses, the program also includes specialized seminars, workshops, and case studies based on real-life business problems, in the fields of energy and the environment.

The MSc target groups include:

- Graduate Engineers (graduates of polytechnic schools or technological educational institutes, and graduates of science schools or economics schools).
- Executives from the public administration, ministries, local and regional authorities, energy and environmental bodies, and in general, organizations and companies active in the areas of energy policy and protection of the environment.
- Banking sector and financial bodies' executives in general, involved in the investment financing of development projects.
- Economists, legal practitioners and other professionals active in the areas of energy and the environment.

MSc website: https://mbaenergy.gr/

8.4 Postgraduate Program "Oil and Gas Process Systems Engineering"

The MSc "Oil and Gas Process Systems Engineering" (Government Gazette 598/26.02.2019, Issue B') builds on the one hand on existing and emerging opportunities in the competitive and at the same time dynamic field of hydrocarbons, and on the other, on the scientific and research experience of the members of the Mechanical Engineering Department of the University of West Attica in the fields of energy and production systems, as well as on the existing, fifteen year experience in the organization of successful master programs. The MSc corresponds to 120 ECTS credits in total. Each academic semester includes thirteen (13) weeks. The duration of studies for the successful completion of the program and the award of a Master's degree is between 4 and 8 academic semesters. The courses of the Master are compulsory and are offered in the form of lectures, lab assignments, tutorials in cutting-edge, specialized software, workshops, experimental measurements and tests, and in situ training in control, optimization and operation system units.

The MSc encourages participation of employees. Consequently, the program is structured in a way that facilitates attendance for employed students. The program is officially bilingual, offered in Greek and in English, with courses delivered in Greek and/or in English. Learning material is mainly in English. Courses' assignments and the Master thesis may be delivered either in Greek or in English.

MSc attendees include:

- Graduates from universities, polytechnic schools or technological educational institutes, Greek or foreign higher education institutes, specializing in priority in mechanical engineering, marine engineering, electrical engineering, chemical engineering, oil engineering, mining and metallurgical engineering, as well as in other areas of proven relevance to the field of hydrocarbons.
- Science schools' graduates such as physics, chemists, geologists and computer scientists from Greek or foreign higher education institutes, or other science school graduates specializing in other areas of proven relevance to the field of hydrocarbons.

MSc website: https://oilgasmsc.gr/

8.5 Postgraduate Program "MSc by Research in Thermofluids"

The Postgraduate Program "MSc by Research in Thermofluids" (Government Gazette/B/786/11.03.2020) provides postgraduate students the opportunity to acquire knowledge and specialization in the field of thermofluids, through applied research and teaching courses. The active participation of the students in research activities contributes to the development of their skills and the acquisition of appropriate qualifications for their career evolution, either in a national or international environment. At the same time, the students develop research mentality, ability to conduct and present a comprehensive study, and are exposed to the contemporary research environment that can lead to a path toward a doctoral dissertation.

With the completion of the Postgraduate Program, the students will be able to:

- Focus in special fields of thermo-fluid mechanics, in order to understand, describe and categorize the theoretical knowledge, the methods and tools for applying the proper solutions and to face the challenges involved in research problems in the aforementioned field.
- Analyze problems, compose solutions and evaluate alternative approaches in the research field.
- Describe and present, in a complete and accurate way, their work and results, to cooperate efficiently within a research group, to present accurately their research results in either written or oral form.
- Develop and demonstrate in practice their awareness of the ethics and rules of research, concerning the individual, social, economic and environmental aspects and impact of the research results.

- Enhance their research interests in order to be able to continue their studies.

Eligible candidates for the Postgraduate Program are (upon selection), graduates of mechanical engineering or other relevant departments of technological or physical sciences, from universities and technological institutions (TEI) of the country, or foreign countries equivalent institutions officially recognized by the Hellenic National Academic Recognition and Information Center (Hellenic NARIC, DOATAP). The Program is offered without tuition fees.

The duration for full-time study of the program, leading to a postgraduate diploma (MSc), is three (3) academic semesters, which include the time for the preparation of the diploma thesis. The courses lectures are conducted in classrooms or laboratories of the institution in the Greek language. The writing language of the diploma thesis is Greek or English.

MSc website: http://mscthermofluids.uniwa.gr/

9 Doctoral Studies

The doctoral studies of the Department of Mechanical Engineering of the School of Engineering of the University of West Attica aim at promoting knowledge and original scientific research and lead to the acquisition of a doctoral degree (PhD). The doctoral degree is an academic title, which certifies the realization of an original scientific research and the substantial contribution of the holder to the development of science and knowledge in the respective scientific field. The regulation of doctoral studies of the department has been published in the Government Gazette 4884, vol. B', 1/11/2018.

Candidates eligible to apply for the doctoral program of the department are graduates of universities or technological institutions (TEI) of the country or a recognized as an equivalent foreign institution holding a postgraduate diploma of a domestic university or a recognized as an equivalent foreign institution, and the holders of an integrated master's degree. Applications for the doctoral studies program are submitted to the department secretariat on an ongoing basis, and are evaluated by a designated three-member selection committee.

The minimum duration for obtaining a doctoral degree (PhD) is three (3) full calendar years from the date of appointment of the three-member advisory committee. For candidates who are admitted exceptionally, without holding a postgraduate diploma or master's degree, the minimum duration is four (4) full calendar years. The maximum duration of obtaining the doctoral degree (PhD) is equal to twice the minimum, and can only be exceeded under certain conditions specified in the doctoral studies regulations of the department.

Doctoral studies are offered free of charge. PhD candidates can use the infrastructure of the unit of the department (section, laboratory) in which the realization of the dissertation takes place. In parallel with the realization of their dissertation, PhD candidates can be employed under contracts with the institution or the institution's Special Account for Research Funding (ELKE), either in research / development programs and projects or as academic fellows, according to the current relevant legislation. PhD candidates retain all the rights and benefits provided for the students of postgraduate programs of the department and the institution for a period of up to five (5) full academic years from their first enrollment.

In order to assure the satisfactory progress of their dissertation, PhD candidates must have a sufficient physical presence in the department, during which they will be exclusively involved with the object of their research work. They should also seek active presence in the international academic community and publish the results of their research.

10 Additional Information and Services

10.1 Institution Libraries

The University of West Attica operates two modern academic libraries that aim to offer their services to members of the academic and wider research community.

Library Department	
Egaleo Park Campus Agiou Spyridonos, Egaleo, 12243 tel. +30-210 5385711 URL: http://library1.uniwa.gr/ e-mail: library1@uniwa.gr	**Ancient Olive Grove Campus** 250 Thivon & P. Ralli Str, Egaleo, 12241 tel. +30-210 5381156 URL: http://library2.uniwa.gr/ e-mail: library2@uniwa.gr

10.2 Academic Identity Card

As of 24/09/2012, undergraduate, postgraduate and doctoral students of all Universities and Technological Institutions of the country can apply online for a new academic identity card. The new academic identity card features high mechanical endurance and security standards against tampering. In addition, it is designed to be valid for as long as one is a student and to cover multi-purposes, aside from just being a Student Fare Card (Pass). Identity cards shall be picked up at the delivery point selected by each student when filing his application, free of charge. The new identity card indicates precisely the validity period of the Student Fare entitlement. In case a student is not eligible for a Student Fare, the card shall be valid only as an academic identity card.

All higher education students of the country are eligible to apply for the academic identity card. However, the academic identity card may be also valid as a special fare card, giving access to the discounts provided by applicable law, only in the following cases of students, namely:

1) Full-time undergraduate students, who are not already holders of a university degree, and for as many years as required to obtain a degree in accordance with the indicative curriculum, accrued by two (2) years.
2) Part-time undergraduate students, who are not already holders of a university degree, for double the years required to obtain a degree in accordance with the indicative curriculum.
3) Postgraduate students who are not already holders of a postgraduate degree, for as many years as required to obtain a degree in accordance with the indicative curriculum.
4) Doctoral students who are not already holders of a doctoral degree for four (4) years as from the date of their registration.
5) Students from Member States of the European Union or third countries studying in a Greek University within the framework of the Erasmus mobility programme of the European Union for as long as they pursue their studies in the Greek University.

Should one cease to be a student for any reason, would automatically result in the termination of the right to hold an academic identity card, which in this case, should be returned to the secretariat of the pertinent department.

Academic Identity Card online service: http://academicid.minedu.gov.gr/

10.3 Student Welfare Department

The Student Welfare Department (https://merimna.uniwa.gr/) seeks to improve the quality of life of students during their studies.

Its mission is to provide quality services and the right information on issues of students life, related to benefits concerning catering, housing, health care (European insurance card), housing allowance, and in general anything that facilitates students in their daily lives, considering the current state legislation and the University's administration decisions.

The student welfare department consists of the following departments:

Department of Financial Support, Catering and Housing	
Egaleo Park Campus Agiou Spyridonos, Egaleo, 12243 tel. +30-210 53855191 e-mail: studentserv@uniwa.gr	**Ancient Olive Grove Campus** 250 Thivon & P. Ralli Str, Egaleo, 12241 tel. +30-10 5381358 e-mail: student-support2@uniwa.gr

Department of Care & Social Services	
Egaleo Park Campus Agiou Spyridonos, Egaleo, 12243 tel. +30-210 5385128 e-mail: medie@uniwa.gr	**Ancient Olive Grove Campus** 250 Thivon & P. Ralli Str, Egaleo, 12241 tel. +30-210 5381254 e-mail: edeme@uniwa.gr

Department of Social Welfare, Counseling and Psychological Support
Egaleo Park Campus Agiou Spyridonos, Egaleo, 12243 tel. +30-210 5385129 e-mail: koinyp@uniwa

Liaison and Innovation Office	
	Ancient Olive Grove Campus 250 Thivon & P. Ralli Str, Egaleo, 12241 tel. +30-2105381294-6, +30-2105690613 e-mail: clio@uniwa.gr

Department of Counseling, Career & Vocational Guidance
Egaleo Park Campus Agiou Spyridonos, Egaleo, 12243 tel. +30-210 5385180 e-mail: stadiodromia@uniwa.gr

10.4 Catering

UNIWA campuses host student restaurants, offering breakfast, lunch, and dinner. Student restaurants are open daily, including weekends and public holidays, from September 1st to June 30th of each academic year, excluding Christmas and Easter holidays.

Under current law, students of UNIWA may apply for free meals. Students that are not eligible for free meals are allowed to eat in student restaurants and pay a low daily fee for a full menu (breakfast, lunch and dinner).

More detailed information on free meal provision, the application process and the necessary supporting documents are provided at the beginning of each academic year by the Directorate of Student Welfare Services (https://merimna.uniwa.gr/). Online application for catering can be submitted at the corresponding website http://sitisi.uniwa.gr/.

10.5 Housing

The University of West Attica does not have privately owned student dormitories that would possibly provide free housing to students. However, students have the opportunity to apply for free housing both in the old student residence of the National Technical University of Athens (NTUA) at Zografou, under the terms and conditions that NTUA sets (for information on the accommodation in the dormitories of NTUA, students can refer to the link http://esties.ntua.gr/), as well as in the student residence of the University of Athens (UoA), provided that they have student siblings, who already reside in the residence of UoA (for information on the accommodation of students in UoA student residence, students can refer to the link http://fepa.uoa.gr/).

Particularly, the undergraduate students of UNIWA who are interested for housing in the Athens Student Residence (ASR), should submit an application to the Department of Financial Support, Catering and Housing of UNIWA, accompanied with the necessary supporting documents requested by the ASR, in a period of time that the ASR announces. The applications that meet the terms and conditions applied in accordance with the current legal framework, are approved by the competent bodies of the university.

More information is provided by the student welfare department (https://merimna.uniwa.gr/).

10.6 Healthcare Services

According to the provisions of Law 4452 / 15-02-2017 (A ’17), article 31, paragraph 3, “undergraduate and postgraduate students and doctoral candidates who have no other medical and hospital care shall be entitled to full medical and nursing care in the National Health System (NHS), by covering the relevant costs from the National Health Service Organization (NHSF), in accordance with article 33 of Law 4368 / 2016 (A ’83)” only with the use of their social security number (AMKA).

In the context of providing more effective primary health-care to both the students and staff, there are clinics located at the University’s campuses.

In addition to the clinics that operate on each campus, there are specialized clinics in collaboration with faculty members who belong to the University’s School of Health and Care Sciences. Indicatively, we refer to the operation of the following clinics:

- **Gynecological Clinic**: As part of its operation, complete gynecological ultra-sound and Doppler examinations are performed.
- **Ophthalmic – Ophthalmology Clinic**: As part of its operation, optometrics and general ophthalmology are performed.
- **Ultrasound Office**: As part of its operation, body and vessel ultrasounds are performed.

- **Dermatology Clinic**: As part of its operation, dermatological examinations are performed.

10.7 Student Advocate

The Student Advocate was established by Article 55 of National Law 4009/2011 with the aim of mediating between students and teachers or administrative services of the University so as to address maladministration, to maintain the legality and safeguard its proper functioning. The Student Advocate is not responsible for examinations and student ratings.

As part of its responsibilities, the Student Advocate investigates cases of its own accord or upon a student's request and mediates with the relevant bodies to resolve them. It may ask the University services for any information, document or other evidence in the case, to investigate persons and/or to order an expert opinion. If they find that there is no legality in a particular case, maladministration is observed or the proper functioning of the University is disturbed, they shall notify the professor concerned or the relevant administrative department and the student submitting the report, and strive to find, by any means, a convenient way to solve the problem. The Student Advocate may, by her/his act, file a report which she/he considers manifestly indefinite, unfounded, or unsubstantiated, and if she/he considers that any evidence of a disciplinary offense is present, she/he shall forward the case to the competent disciplinary body.

More information can be found in the Student Advocate's web page (https://advedu.uniwa.gr/).

10.8 Gyms and Sports

There are two gyms operating at the University of West Attica; one is placed at the Egaleo Park Campus and the other at the Ancient Olive Grove Campus, where students and staff of the University can be trained daily with exception of weekends. The rooms are fully equipped with fitness equipment while fitness staff guides and supervises any interested visitors.

The purpose of the gym is to offer a wide range of sports programs and activities that will provide participants with an enhanced quality of life as well as mental and physical health.

In addition to the gym facilities, the University of West Attica offers its students a wide range of sports activities tailored to their different needs and interests.

To coordinate all the sports activities being implemented in our University, the Department of Sports has been set up to organize a variety of team sports' programs as well as sectional indoor leagues (Basketball, Volleyball, Football, Chess, Table Tennis, etc.).

More detailed information on the operation of the gyms and the organization of sporting activities is provided at the beginning of each academic year by the Department of Sports .

Information about the operation of the gyms can be found at:

- Egaleo Park Campus: tel. +30-210 5385148
- Ancient Olive Grove Campus: tel. +30-210 5381139

10.9 Erasmus+ Exchange Program

Erasmus+ is the EU Program in the fields of education, training, youth and sport for the period 2021-2027. The general objective of the program is to support, through lifelong learning, the educational, professional and personal development of people in education, training, youth and sport, in Europe and beyond, thereby contributing to sustainable growth, quality jobs and social cohesion, to driving innovation, and to strengthening European identity and active citizenship.

Specifically, Key Action 1 of the program, which concerns the mobility of individuals, provides, among other things, the opportunity for students, trainees and young people to undertake a learning and/or professional experience in another country. This higher education mobility action supports physical and blended mobility of higher education students in any study fields and cycle (short cycle, bachelor, master and doctoral levels). Students can either study abroad at a partner higher education institution or carry out a traineeship in an enterprise, a research institute, a laboratory, an organization or any other relevant workplace abroad. Students can also combine a study period abroad with a traineeship, further enhancing the learning outcomes and development of transversal skills.

Eligible students of all study cycles (undergraduate, postgraduate or doctoral) are those who have completed at least the first year of university studies and have certified knowledge of the language in which the courses they are going to attend, are delivered (at least B2 level). Students who are interested to join the Erasmus + student exchange program, should submit an application to the International Academic Affairs and Student Exchange Department, which is evaluated based on the criteria and conditions of the program. Students who have been selected to attend courses delivered in English, French, Italian, Spanish, German or Dutch language, are required to take an online assessment test. The student that has attended and was successfully evaluated at the host university, in courses corresponding to courses of her/his enrolled study cycle, is exempted from those courses. The courses attended in the host university, that do not correspond to a course of her/his enrolled study cycle, are listed in the appendix of the diploma awarded to him by the department.

The mobility duration of students for studies at a host university is from 3 to 12 months for each study cycle, while for the traineeship the minimum mobility duration is 2 months.

More information about the program can be found in the UNIWA Erasmus+ website: https://erasmus.uniwa.gr/.