STUDY GUIDE
ACADEMIC YEAR 2015-2016

UNIVERSITY OF WESTERN MACEDONIA
SCHOOL OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

http://www.mech.uowm.gr/

KOZANI 2015

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INTRODUCTION - WELCOME

This study guide that you hold in your hands summarizes the Undergraduate Program of the Department of Mechanical Engineering for the academic year 2015-2016. We hope that the information contained in this manual, makes it a valuable resource for all our students but also for the staff of the Department.

The Department of Mechanical Engineering educates young and active people to mix traditional engineering principles with emerging technologies to create and to propose real innovative solutions, to design new mechanical systems and to analyze technological problems.

The science of Mechanical Engineer is the oldest and broadest engineering science. It emerged as a scientific area during the industrial revolution in Europe in the 18th century, but its development goes back several thousand years, maybe in the first man made cutting stone-tools. The Mechanical Engineering area is constantly evolving, incorporating advances in technology, and today's Mechanical Engineers contribute to cutting-edge developments, such as advanced materials, mechatronics and nanotechnology.

But why would someone study Mechanical Engineering at the University of Western Macedonia in Kozani?

Because today, in this time of over turnings and changes which alter the technological, economic, social and cultural landscape, we, here, at the Department of Mechanical Engineering of the University of Western Macedonia have chosen to walk through the "education – research – innovation" triptych. A triptych, in which we invest with all our forces, as the key that will open the doors of our country's progress, which will help to create new employment and quality jobs in order to reverse today's negative experience. Without innovation we lose the train of competitiveness. Without education we lose our productivity. Without research, we lose the "knowledge society".

Modern engineering requires people who are able to combine a wide range of technological, scientific, creative and management skills for achieving objectives in the areas of engineering, production and energy management, environmental management, construction engineering, technological innovation and development. At the University of Western Macedonia we pride ourselves on using modern systems approaches as a basis for the development of our students skills in applied engineering. We have also invested heavily in important new fields of engineering, such as the rapid prototyping, renewable energy sources and technologies and environmental control design and production processes.

Our Department through continuous and strenuous efforts of fifteen years has managed today to hold an equivalent position between Mechanical Engineering Departments in the country. Many members of the teaching and research staff of the Department are making significant research achievements, leading the Board in international acclaim and recognition. Upon admission at the Department, you are

offered a unique opportunity to obtain a university education leading to a diploma of Mechanical Engineering. The science of Mechanical Engineering requires an understanding of fundamental concepts, such as mechanics, kinematics, thermodynamics, materials science and structural analysis. The Mechanical Engineer uses these concepts along with tools like "computer-aided engineering" and "product lifecycle management", to analyze and design from the most simple devices and facilities including central heating of an apartment building, to the most complex, like artificial hearts, robotic systems, airplanes, cars, satellites and factories producing products and electricity.

In practice, the Mechanical Engineer has a role on most systems with which people work, move, are heated/cooled and entertained. The Mechanical Engineer participates actively in environmental protection with the processing of solid, liquid and gaseous wastes, in the design of more efficient appliances (energy and water savings), capturing greenhouse gas emissions, as well as in the development of renewable energy sources.

The demand for the profession of Mechanical Engineering has been stable over time in the labour market due to its broadness that allows mechanical engineers to work easily in different sectors of the economy, such as industry, energy, building and construction, transportation, consultancy, free profession, etc. According to data that the Department has collected, the employment rate of graduates is very high, even in the midst of economic crisis.

The living space of your professional activity extends beyond the Greek borders, the opportunities are endless, however, competition is very tough. All Professors of the Department are at your disposal and we are doing everything possible to meet the educational needs and to assist you in your quest. Despite the unfavorable economic conditions, we try to make the best possible use of available resources and infrastructure to enhance the quality of education offered.

On behalf of the Professors and staff of the Department, I wish you all the best, good luck and much success in your studies.

The Head of the Department

Professor Ioannis Bakouros

1. BRIEF HISTORICAL OVERVIEW

The Mechanical Engineering Department derives from the Department of Engineering & Management of Energy Resources, which was one of the three new departments that were founded at the Aristotle University of Thessaloniki (AUTH), in 1999, aiming at the enlargement of higher education in Greece. The city of Kozani was selected as the Seat of the Department, on account of its inextricable link to energy production, as in this region about 70% of Greece`s electric power is produced.

The foundation of the Department and its regulations are determined by the Presidential Decree published in the Government Gazette 179/6.1999 t.A.

For the academic year 1999-2000, the Department accepted its first 120 students, and since then it admits about 100 students annually. For the current academic year the number of students has raised again to 120.

It should be noted that the Department which was originally founded at the Aristotle University of Thessaloniki was transferred by Joint Ministerial Decision 134 881 a/ B1/23.12.2003 (Government Gazette 1975/31.12.2003), since 01/01/2004 to the University of Western Macedonia, thus becoming the first Department of the University, which leads to Major in Engineering.

The Department was renamed from DEPARTMENT OF ENGINEERING & MANAGEMENT OF ENERGY RESOURCES to MECHANICAL ENGINEERING DEPARTMENT, according to the Presidential Decree 47 (Government Gazette 61 / 27-04-2009, vol. I).

2. ADMINISTRATION OF UOWM

2.1 GOVERNING BOARD

Rector	**Tourlidakis Antonios,** Professor
School Deans	**Tomboulides Ananias,** Dean of School of Engineering **Kariotoglou Petros,** Dean of Faculty of Education
Departments Presidents	**Andreou Andreas,** Head of the Department of Applied and Visual Arts **Fotiadis Konstantinos,** Head of the Department of Elementary Education **Vamvakidou Ifigeneia,** Head of the Department of Nursery Education **Bakouros Ioannis,** Head of the Department Mechanical Engineering **Theodoulidis Theodoros,** Head of the Department of Engineering Informatics and Telecommunications **George Marnellos**, Head of the Department of Environmental Engineering
Representatives of Special Teaching Staff	**Tolis Evangelos,** Member **Lioukras Sotirios,** Member **Semoglou Kleoniki,** Deputy Member **Konstantas Georgios,** Deputy Member
Representatives of Special Technical and Laboratory Staff	**Semertzidis Georgios,** Member **Gkalfas Nikolaos,** Deputy Member
Representatives of Administrative Staff	**Liakou Maria,** Member **Indos Ilias,** Deputy Member
Representatives of Students	Not assigned
Representatives of Postgraduate Students	Not assigned
Representatives of PhD Candidates	**Stergiou Konstantinos,** Member

3. ADMINISTRATION OF MECHANICAL ENGINEERING DEPARTMENT

3.1 ***Head of the Department***

Professor Bakouros Ioannis

3.2 ***Deputy Head of the Department***

To be appointed

3.3 ***Department General Assembly***

1.	I. Bakouros	*Professor*	Head of the Department
2.	E. Kikkinides	*Professor*	Member
3.	N. Sapidis	*Professor*	Member
4.	Th. Theodoulidis	*Professor*	Member
5.	A. Tomboulides	*Professor*	Member
6.	A. Tourlidakis	*Professor*	Member
7.	E. Konstantinidis	*Associate Professor*	Member
8.	A. Kontogianni	*Associate Professor*	Member (absent)
9.	G. Marnellos	*Associate Professor*	Member
10.	G. Skodras	*Associate Professor*	Member
11.	D. Giagopoulos	*Assistant Professor*	Member
12.	S. Makridis	*Assistant Professor*	Member
13.	G. Nenes	*Assistant Professor*	Member
14.	S. Panagiotidou	*Assistant Professor*	Member
15.	G. Panaras	*Lecturer*	Member
16.	R.E. Sotiropoulou	*Lecturer*	Member

Chairs ad personam of Greek Public Power Corporation (ΔΕΗ)

1.	Souliotis Emmanouil	*Associate Professor*
2.	Mirisidis Ioannis	*Assistant Professor*

Emeritus Professors

1.	Bartzis John
2.	Pilavachis Petros

The General Meeting of the Department is filled in by one (1) student representative, one (1) member of Special Teaching Staff (Ε.ΔΙ.Π) and two (2) representatives of the postgraduate students (that consist 15% of the members of the Permanent Teaching Staff who are members of the General Meeting of the Department). The Special Composition General Meeting of the Department consists of all the Permanent Teaching Staff members of the Department plus the two (2) representatives of the postgraduate students.

3.4 Administration Office

Registrar & Secretary:	Anna V. Tzika
Administration Office telephone numbers	+30 24610 56600, +30 24610 56604, +30 24610 56605 FAX: +30 2461 056601 and +30 24610 56603.
Address	Bakola and Sialvera Str, 50 132, Kozani

3.5 Academic Consultants

First Cycle of Studies			
Semester	Consultants		
1st, 2nd	Th. Theodoulidis	E. Konstantinidis	
3rd, 4th	I. Bakouros	A. Tourlidakis	
5th, 6th	G. Marnellos	G. Skodras	
Second Cycle of Studies			
Semester	**Academic Direction**	Consultant	
7th, 8th	Energy	E. Konstantinidis	
	Industrial Management	I. Bakouros	
	Manufacturing	N. Sapidis	
Third Cycle of Studies			
Semester	**Academic Direction**	**Specialization of Studies**	Consultant
9th, 10th	Energy	Energy Production & Transfer	E. Konstantinidis
	Energy	Environment & Energy Use	G. Marnellos
	Industrial Management	Industrial Management	I. Bakouros
	Manufacturing	Manufacturing & Materials	N. Sapidis

4. DEPARTMENT AIMS AND ORGANIZATION

The Department of Mechanical Engineering aims at fostering and promoting education, scientific research and knowledge on the key items of mechanical engineering.

Mechanical engineering covers a wide range of areas such as energy, environment, materials science and technology, engine design and control systems engineering. The activities of mechanical engineering include, amongst others, research and development, design, testing and manufacturing of products and systems, organization of production processes and business administration. Our Department is preparing young engineers in order to contribute to the continuous technological development and distinguish themselves both nationally and internationally.

The **aims** of the Department regarding the education of students are:

- To provide students with a profound knowledge of the principles related to the subject of Mechanical Engineering, at the end of their studies.
- To educate students and to provide them with the necessary skills to implement their knowledge and knowhow.
- To provide them with high quality knowledge, reflecting both the requirements of industry and in general the needs of our country
- To develop teaching methods as well as student assessment methods in the Department`s fields of Study.
- To encourage students to perform as well as possible in their studies and to make sure that they make the best use of the possibilities and opportunities provided to them.
- To provide facilities and laboratories, that keep up with the progress and the needs of technology and
- To strengthen scientific cooperation amongst students and enable them to study independently and to deepen their knowledge.

Thus, upon completion of five years of studies the students should be able

- To apply their knowledge to contemporary problems of industry on their scientific field
- To be aware of the modern methods and techniques throughout the range of all the technologies they have been specialized in.
- To use modern tools to solve technical and scientific problems, such as the

use of IT systems, computer use, use of software packages

- To communicate effectively both orally and in writing and to be able to collaborate in a group.
- To design, execute and manage a specific project.
- To track individually the development in their scientific field and to improve their knowledge continuously and
- To provide their services to industry as well as to society immediately.

The Department of Mechanical Engineering, except for its educational function, is involved in developing and operating high-tech research laboratories, which participate successfully in a number of national and international competitive research projects having publishing outcomes in international journals and presentations at international or national conferences. Also, the Department places special emphasis on linking academic research to industrial production, research and development. The knowledge and skills provided to the students of the Department, prepare them to staff the production and development departments of industries and businesses appropriately. In addition, the Department hopes that some of its graduates will become reputable researchers who will become faculty members in Universities and research centers.

4.1 STUDIES ORGANIZATION

Directions of Studies

1. Academic Direction of Energy

1st Cycle of Studies: Energy production & transfer

2nd Cycle of Studies: Environment and Energy Use

2. Academic Direction of Industrial Management

1st Cycle of Studies: Industrial Management

3. Academic Direction of Manufacturing

1st Cycle of Studies: Manufacturing & Materials

Divisions and Laboratories

1. Division of Energy Production & Transfer
   Director: Prof. A. Tomboulides

- Laboratory of Thermodynamics and Thermal Engines
- Laboratory of Fluid Mechanics and Turbomachinery
- Laboratory of Alternative Forms of Energy

2. Division of Environment and Energy Use
   Director: Prof. E. Kikkinides

- Laboratory of Energy Use Technologies
- Environmental Technology Laboratory

3. Division of Industrial Management
   Director: Prof. I. Bakouros

- Laboratory of Quantitative Methods of Operations Research and Statistics in Engineering
- Laboratory of Technology Management
- Laboratory of Energy Systems Management and Energy Policy

4. Division of Manufacturing and Materials
   Director: Prof. N. Sapidis

- Laboratory of Mechanical Engineering Systems
- Materials Laboratory

5. CALENDAR OF COURSES, EXAMS, NATIONAL & LOCAL HOLIDAYS, STUDENTS VACATIONS

5.1 Courses and Exams

Freshmen registration (The dates are determined by the Ministry of Education)	
Courses statement submission of Winter semester courses	28/09/2015 - 12/10/2015
Winter semester courses	28/09/2015 - 22/01/2016
Winter semester exams	25/01/2016 - 12/02/2016
Courses statement submission of Spring semester courses	22/02/2016 - 11/03/2016
Spring semester courses	22/02/2015 - 03/06/2016
Spring semester exams	06/06/2016 - 01/07/2016

5.2 National & Local Holidays and Student Vacations of Winter Semester

October, the 11th	Liberation of Kozani City
October, the 28th	National Day of "OXI" (NO)
November, the 17th	National Day of "Polytechneio" (Engineering School)
December, the 6th	Ag. Nikolaos-St. Nicholas Day- patron saint of Kozani
January, the 30th	Three Hierarchs Holiday (Religion Holiday)

5.3 National & Local Holidays and Student Vacations of Spring Semester

February the 20th –February the 23rd the Friday before the Great Carnival until the day after the "Kathara Deftera"

March, the 25th	National Day of the 1821 Revolution
April the 25th – May the 8th	Easter Holidays
May, the 1st	1st May/Labor Day
June, the 1st	Holy Spirit Day (Religion Holiday)

6. INFORMATION ABOUT THE ORGANIZATION OF STUDIES

6.1 Duration of Studies

The **minimum possible duration** of studies is **10 semesters**

Every semester consists of at least 13 full teaching weeks

6.2. Maximum duration of studies - Part-time Studies - Deletion of students - Interruption of studies (application of provisions in article 33, par. 2, 3.4, 11a and 11b and article 80 par. 9a, 9b, 9c Law 4009/2011)

n = number of standard studies duration, in semesters (in our Department ten (10) semesters).

a) Students who **do not register** (**do not state any courses**) **for two consecutive semesters, are automatically deleted by the Department**, with declaratory act by the Chairman of the Department. (Article 33, par. 2, Law 4009 / 2011.

b) Students who were admitted in the academic year 2011-2012 and onwards, automatically lose their student membership and are deleted once they complete duration of studies **equal to n + 4** (Article 33, par. 11[a], Law. 4009/11).

c) Those students who until the end of the academic year 2011-2012 (31-8-2012) have completed a duration of studies **equal to or greater than 2n + 4** should conclude their studies by the end of the academic year **2013-2014 (31- 8-2014)** so that they do not automatically lose their student membership (Article 80, par. 9, Law. 4009/11).

d) Those students who until the end of the academic year 2011-2012 (31-8-2012) have completed a duration of studies **equal to or greater than n + 4** should conclude their studies by the end of the academic year **2014-2015 (31- 8-2015)** so that they do not automatically lose their student membership (Article 80, par. 9b, Law. 4009/11).

e) Those students who until the end of the academic year 2011-2012 (31-8-2012) have completed a duration of studies **less than n + 4**, they automatically lose

their student membership as soon as their duration of studies **equals 2n** (Article 80, par. 9c, Law. 4009/11).

f) In the case of **part-time students**, the maximum time of studies leading to a diploma **equals to 2n.**

g) Students have the right to interrupt, upon written request to the Administration Office of the Department and approval by the General Meeting of the Department, their studies for as many semesters, consecutive or not, as they desire, and certainly no more than the minimum number of semesters required to receive a diploma according to the indicative curriculum. **These semesters are not calculated in the maximum studies duration as indicated above**. Students who interrupt as aforesaid their studies, do not maintain their student membership throughout the whole period of their studies interruption. After the end of the studies interruption, students return automatically to the Department. **The application for interruption of studies, is submitted twice a year and exclusively during the submission time of courses statement. (winter and spring semester)**

6.3 Cycles and Directions of Studies- Specialization of Studies

The studies in Mechanical Engineering at the University of Western Macedonia consist of three Cycles.

- The **First Cycle of Studies** lasts six semesters (1st to 6th) and includes **35** mandatory courses (including the Engineering Design Project), which are common to all directions of studies.

- **The Second Cycle of Studies** lasts two semesters (7th and 8th) and includes twelve (12) courses, six (6) joint Mandatory Direction (MD) courses for all Academic Directions, two (2) Elective Direction (ED) courses for each Academic Direction and four (4) Elective (E) courses for each Academic Direction. In the second cycle students are given the opportunity, based on their interests, to choose one of the following Directions of Study.

  1. Academic Direction of Energy
  2. Academic Direction of Industrial Management
  3. Academic Direction of Manufacturing

The academic direction opted by each student, is determined with a corresponding **statement for inclusion in Direction of Studies**, which is made by the student himself and addressed to the Departments Administration Office at the beginning of the **Second Cycle of Studies** (7^{th} semester).

- **The Third Cycle of Studies** (9^{th} and 10^{th} semester) includes three (3) Mandatory Direction courses and five (5) Elective courses from those offered.

Specialization of Studies per Academic Direction are the following:

1. **Academic Direction of Energy**

1^{st} Cycle of Studies: Production and Transport of Energy

2^{nd} Cycle of Studies: Environment and Energy Use

2. **Academic Direction of Industrial Management**

1^{st} Cycle of Studies: Industrial Management

3. **Academic Direction of Manufacturing**

1^{st} Cycle of Studies: Manufacturing & Materials

The Specialization of Studies opted for attendance by each student is determined with a corresponding **statement for inclusion in Specialization of Studies** (included in the academic direction chosen at the second cycle of studies), which is made by the student himself and addressed to the Departments Administration Office at the beginning of the **Third Cycle of Studies** (9^{th} semester).

For the students convenience, a summary table follows with the number of courses that must be completed in order to obtain the Diploma

STUDENTS OBLIGATIONS FOR OBTAINING THE DIPLOMA

CAUTION: In completing the statement make sure to cover the following number of courses per category i.e. (M), (DM), (DE), (E).

Admission year	Number of Courses in 1st Cycle of Studies (1st-2nd -3rd year)	Number of Courses in 2nd Cycle of Studies (4th year)	Number of Courses in 3rd Cycle of Studies (5th year)	Total Number of Courses, inc. Design Paper	Overview
1999-2001	31 MANDATORY (M)	6 DIRECTION MANDATORY (DM) 4 ELECTIVE (E) + Engineering Design Project	8 CYCLE MANDATORY(CM) + DIPLOMA THESIS	50+ DIPLOMA THESIS	**31 M, 14 DM 4 E EDP**
2002-2004	32 MANDATORY (M) + Engineering Design Project	6 DIRECTION MANDATORY (DM) 4 ELECTIVE (E)	8 CYCLE MANDATORY(CM) + DIPLOMA THESIS	51 + DIPLOMA THESIS	**32 M, 14 DM 4 E EDP**
2005-2009	37 MANDATORY (M) + Engineering Design Project	6 DIRECTION MANDATORY (DM) 4 DIRECTION ELECTIVE (DE) 2 ELECTIVE (E)	8 CYCLE MANDATORY (CM) + DIPLOMA THESIS	58 + DIPLOMA THESIS	**37 M, 14 DM 4 DE, 2 E EDP**
2010-2012	37 MANDATORY (M) + Engineering Design Project	6 DIRECTION MANDATORY (DM) 2 DIRECTION ELECTIVE (DE) 4 ELECTIVE (E)	3 CYCLE MANDATORY(CM) 5 CYCLE ELECTIVE (CE) + DIPLOMA THESIS	58 + DIPLOMA THESIS	**37 M, 9 DM 7 DE, 4 E EDP**
2012-2013	34 MANDATORY (M) + Engineering Design Project	6 DIRECTION MANDATORY (DM) 2 DIRECTION ELECTIVE (DE) 4 ELECTIVE (E)	3 CYCLE MANDATORY(CM) 5 CYCLE ELECTIVE (CE) + DIPLOMA THESIS	55+ DIPLOMA THESIS	**34 M, 9 DM 7 DE, 4 E EDP**

Note: EDP = Engineering Design Project

6.4 Freshmen admission documents

Based on the results of the "Panhelladikes" University Entrance exams, the registration deadline of the successful candidates is determined by the Ministry of Education.

The successful candidate or a legally authorized person should submit for his/her registration to the Administration Office of the Department the following documents:

1. **Application** for registration (the form is issued by the Administration Office of the Department).

2. **Graduation certificate**, diploma or degree or other certificate of the school he/she has graduated or legally certified translated copy of such documents.

3. **Solemn statement** in which the new entrant affirms that he/she is not registered in another School or Department of Higher Education in Greece (the form is issued by the Administration Office of the Department).

4. Four (4) ID type **photos**.

5. When registering a new entrant demonstrates to the Administration Office of the Department his/her **ID card** or another official document which certifies his/her personal details and he/she also has to leave a plain photocopy of this document.

6. **A copy of the access certificate** (issued by the Greek Senior High School).

6.5. Statement of attendance of semester courses

At the beginning of each semester and on specified dates, each student **must** submit to the Administration Office of the Department a statement including those courses he decides to attend in the specific semester. This can be accomplished through a special application form, available from the Administration Office. **The course statement is essentially equivalent to the student`s enrollment per semester in the Department.**

After the deadline no statement will be accepted as any course change will not be allowed.

By this statement every student gains access to:

1. **receive academic material** through **EYDOXOS** program (books, textbooks etc.) available for these courses at the beginning of this semester.
2. **participate in examinations of the courses stated** at the end of that semester and at the following additional examination period of September.

The statement above can be submitted **in person** by the student concerned or by anyone who has **legal authorization** for this purpose, or by registered mail.

If a student does not submit a statement at the beginning of the semester, then he is considered not to attend any courses, he is not entitled to acquire any academic material, nor to participate in the exams of this semester.

The freshman may state for attendance only the corresponding courses to the semester he is attending.

The students of higher semesters have the right to state courses according to the following priority: first they have to state the courses they have failed starting from the courses of the smallest semester and then they may state the new courses (they have not the right to state courses of higher semesters from the semester they attend). The number of the courses they can state is limitless.

Students who attend the winter semester may only state those courses, that are offered during winter semesters (1st, 3rd, 5th, 7th and 9th) according to the indicative curriculum. For a summer semester only summer semesters courses may be stated (2nd, 4th, 6th, 8th and 10th) according to the indicative curriculum. **The winter semester courses are not taught during the summer semester and vice versa**.

6.6. Students evaluation. Exams

The Students` performance evaluation in each course takes place during the whole academic year. The final grade in each course consists of two parts. The first part, which forms 30% of the final grade assesses the student's performance during the semester and the grade results from grading exercises, questions, or at least one mid-semester written test, lying to the discretion of the tutor. The second part, which forms 70% of the final grade evaluates the student's performance in the final exams of the course.

There are **two (2) examination periods** for the courses taught in each semester. The first period is set immediately after the end of that semester, winter or summer. The second is set in September, before the beginning of the next winter semester.

Each student is entitled **to participate in the exams, only of those semester courses, that he/she alone has determined through the courses statement, which he/she submitted at the beginning of this semester**.

The January-February exam period lasts three weeks, the June period lasts three weeks and the September period lasts four weeks, but they can be lengthened if necessary.

If a student does not participate in the course exams or he participates but still has not got a definite grade that is greater or equal to five even after the second final exam of the course in September, then:

1. If the course is **Mandatory, Direction Mandatory or Direction Elective**, the

student **is obliged to restate this course again a following semester**. Through this statement he has the opportunity to repeat the educational process in this course and to acquire the right to participate in the corresponding exams.

2. If the course is **Elective**, the student **has the opportunity to restate this course again in a following semester** in order to repeat the educational process in this course and to acquire the right to participate in the corresponding exams. But he has also the possibility not to restate this course anymore, but **to choose and state another Elective course** available in his academic direction **in a following semester** instead.

6.7 Educational material

The educational procedure is complemented with the use of textbooks and other educational aids which are provided to students for free, as well as by ensuring their information and access to the relevant Greek and foreign bibliography (Art. 23 § 2 Law 1268/82).

6.8 Changeability of Studies Direction

If a student, after having stated that he is going to follow a certain Studies Direction, considers that for some reason he wants to change that Direction, he may do so within the submitting statement deadline for inclusion in Studies Direction **at the beginning of the following next semester,** thus stating the Direction of his new preference.

The Studies Direction change takes place through the submission of courses statement in the summer semester of the 4th year and provided that the student has successfully completed the exams in the courses (common mandatory and elective) corresponding to the new Studies Direction that he will choose, no matter how many successful exams he/she has already taken until the time of change.

6.9 Engineering Design Project - Diploma Thesis

The studies in Mechanical Engineering, in addition to the courses offered, include two papers.

a) Engineering Design Project

The Engineering Design Project is a mandatory subject of detailed analysis and study for the design or construction of any device or process, based on acquired knowledge and it aims to demonstrate the synthesis potential of the acquired

knowledge but also to show that the student is able to face the problems that he/she will be confronted with in the real world. Depending on the manner of conducting it, the project helps the students to develop a spirit of collaboration with other specialists that is essential in today's society.

This paper takes place at the end of the First Cycle of Studies, can be performed in collaboration with other students under the guidance of their supervisor and is graded successfully or unsuccessfully (pass / fail) as a semester mandatory course.

b) Diploma Thesis

The studies in Mechanical Engineering are completed with the Diploma Thesis. This thesis is an extended study in a scientific area of the Department. The Diploma Thesis, aims to demonstrate the student`s ability to work and deepen scientifically in a narrow academic field.

Every student may choose the scientific area in which he/she wants to work out his/her Diploma Thesis. The only limitation to this option is that **the Diploma Thesis should correspond to the knowledge faculty of one (at least) of the courses of the Studies Direction, he has attended.**

6.10 Diploma

All graduates of the Department of Mechanical Engineering of UoWM without any exception get the title of Licentiate Mechanical Engineer.
In the **grades transcript certificate**, that any graduate can receive, all the courses, that the student has attended, appear in detail. In this certificate, that shows the personal curriculum of every graduate, the Direction and Specialization of Studies appear.

6.11. Calculating the Diploma Grade

Details on calculating the diploma score are provided in Chapter 8.5 (Diploma acquisition prerequisites).

7. RESPONSIBILITIES AND DUTIES OF THE ADMINISTRATION OFFICE

The Administration Office of the Department is responsible for student and administrative issues. More specifically student affairs include:

1. The registration of students.
2. The keeping of the student archive, which includes the grades, information concerning scholarships and granting degrees.
3. The drafting of student catalogues in accordance with their selection statement of courses they wish to attend.
4. The issuing of certificates.

The students service takes place on all working days from **11:00** to **13:00** in the Administration Office.

For **registration of freshmen** the following apply more specifically:

After the lists of the successful candidates are sent by the Ministry of Education, the Executive Committee of UoWM states the deadline within which the registration should be completed. This deadline is crucial, meaning that whoever is overdue, loses the right to register. The registration deadline is communicated on the Department's notice board immediately after it is determined.

Finally, the Administration Office informs students about the European student exchange programs, as well as the **written exams regulation**.

8. SEMESTER PROGRAMME

ECTS Credits: Course Credits according to European Credit Transfer System (E.C.T.S.)

1st Study Cycle

The First Study Cycle includes 6 Semesters (1st to 6th). All courses are mandatory.

1st Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	101	Mathematical Analysis I	K. Balassas		Mandatory	4	5
2	103	Physics	E. Souliotis		Mandatory	4	5
3	104	Chemistry	G. Marnellos	E.Tolis	Mandatory	4	5
4	105	Introduction to Computing	M. Politis		Mandatory	5	5
5	113	Mechanical Drawing I	N. Sapidis		Mandatory	4	5.5
6	144	Linear Algebra	K. Balassas		Mandatory	3	3.5
7	141	English I	S. Christidou		Mandatory	2	2

2nd Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	102	Mathematical Analysis II	K. Balassas		Mandatory	4	5
2	109	Materials Science and Technology I	S. Makridis		Mandatory	5	6
3	111	Engineering Statics	N. Sapidis		Mandatory	5	6
4	146	Mechanical Drawing II	N. Sapidis		Mandatory	4	6
5	149	Technology and Innovation, Introduction to Economics	E. Samara		Mandatory	3	4
6	142	English II	S. Christidou		Mandatory	2	2

3rd Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	110	Strength of Materials	I. Mirisidis		Mandatory	5	6.5
2	107	Statistics	S. Panagiotidou		Mandatory	5	6
3	119	Thermodynamics I	A. Tomboulides		Mandatory	5	6.5
4	132	Mathematical Analysis III	Th. Zigiridis		Mandatory	4	5
5	135	Materials Science and Technology II	S. Makridis		Mandatory	5	6

4th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	112	Dynamics	D. Giagopoulos		Mandatory	5	6.5
2	108	Machine Elements I (and Mechanical Engineering Laboratory)	I. Mirisidis		Mandatory	5	6.5
3	120	Fluid Mechanics I	E. Kikkinides		Mandatory	5	6
4	137	Mathematical Analysis IV	Th. Zigiridis		Mandatory	4	5
5	114	Fundamentals of Machining	I. Mirisidis		Mandatory	5	6

5th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	118	Heat Transfer	E. Konstantinidis		Mandatory	5	5.5
2	140	Mechanical Vibration and Machine Dynamics	D. Giagopoulos		Mandatory	5	5.5
3	147	Operations Research I	G. Nenes		Mandatory	5	5.5
4	116	Electrotechnics	Th. Theodoulidis		Mandatory	5	5
5	138	Machine Elements II	I. Mirisidis		Mandatory	5	5.5
6	199	Mechanical Engineering Capstone Project	A. Tourlidakis		Mandatory	4	4

6th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	117	Electrical Machines	Th. Theodoulidis	K. Rallis	Mandatory	5	5
2	127	Alternative Energy Systems	G. Skodras		Mandatory	4	4.5
3	123	Industrial Management	S.Panagiotidou		Mandatory	5	5.5
4	106	Numarical Analysis & Simulation	R. Sotiropoulou	M. Politis	Mandatory	5	5
5	131	Environmental Technology	G. Marnellos	E. Papista	Mandatory	4	4.5
6	133	Thermodynamics II	A. Tomboulides		Mandatory	5	5.5

2nd Study Cycle

The 2nd Study Cycle includes two semesters (7o and 8o).

a) Concentration: Energy

7th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	204	Steam Generators I	A. Tomboulides		Concentration Mandatory	5	5.5
2	207	Heating- Ventilation - Air-Conditioning	G. Panaras		Concentration Mandatory	5	5.5
3	219	Automatic Control Systems	N. Fachantidis		Concentration Mandatory	5	5.5
4	372	Numerical methods in design of mechanical structures	D. Giagopoulos		Elective	5	4.5
5	206	Internal Combustion Engines	A. Tomboulides	D. Kolokotronis	Elective Concentration	5	4.5
6	228	Computational Mechanics I	E. Kikkinides	M. Politis	Elective	4	4.5
7	250	Experimental Methods and Measurement Technology	E. Konstantinidis		Elective	4	4.5
8	230	Quality Control	G. Nenes		Elective	4	4.5
9	254	Power Systems	Th. Theodoulidis		Elective	4	4,5

8th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	205	Turbomachinery	A. Tourlidakis		Concentration Mandatory	5	5.5
2	241	Systems Reliability, Maintenance and Safety	I. Bakouros		Concentration Mandatory	5	5.5
3	249	Fluid Mechanics II	E. Konstantinidis		Concentration Mandatory	4	5.5
4	224	Strategic Management	Not Available		Elective	4	4.5
5	252	Computer Aided Manufacturing for Industrial Production	A. Tsouknidas		Elective	4	4.5
6	251	Energy design of buildings I	G. Panaras		Elective Concentration	4	4.5
7	246	Inventory and Supply Chain Management	G. Nenes		Elective	4	4.5
8	240	Electromechanical Applications	Th. Theodoulidis		Elective	4	4.5
9	253	Multivariate Statistics	S. Panagiotidou		Elective	4	4.5
10	210	Unit Operations	E.Kikkinides	M. Politis	Elective	4	4.5

Choose 3 common Concentration Mandatory courses and 1 Concentration Elective. You have to choose 2 more Elective Courses from those available.

b) Concentration: Industrial Management

7th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	204	Steam Generators I	A. Tomboulides		Concentration Mandatory	5	5.5
2	207	Heating-Ventilation - Air-Conditioning	G. Panaras		Concentration Mandatory	5	5.5
3	219	Automatic Control Systems	K. Rallis		Concentration Mandatory	5	5.5
4	372	Numerical methods in design of mechanical structures	D.Giagopoulos		Elective	5	4.5
5	206	Internal Combustion Engines	A. Tomboulides	D.Kolokotronis	Elective	5	4.5
6	228	Computational Engineering I	E. Kikkinides	M. Politis	Elective	4	4.5
7	250	Experimental Methods and Measurement Technology	E.Konstantinidis		Elective	4	4.5
8	230	Quality Control	G. Nenes		Elective Concentration	4	4.5
9	254	Power Systems	Th. Theodoulidis		Elective	4	4.5

8th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	205	Turbomachinery	A. Tourlidakis		Concentration Mandatory	5	5.5
2	241	Systems Reliability, Maintenance and Safety	I. Bakouros		Concentration Mandatory	5	5.5
3	249	Fluid Mechanics II	E. Konstantinidis		Concentration Mandatory	4	5.5
4	224	Strategic Management	Not Available		Elective	4	4.5
5	252	Computer Aided Manufacturing for Industrial Production	A. Tsouknidas		Elective	4	4.5
6	251	Energy design of buildings I	G. Panaras		Elective	4	4.5
7	246	Inventory and Supply Chain Management	G. Nenes		Elective	4	4.5
8	240	Electromechanical Applications	Th. Theodoulidis		Elective	4	4.5
9	253	Multivariate Statistics	S. Panagiotidou		Elective Concentration	4	4.5
10	210	Unit Operations	E.Kikkinides	M. Politis	Elective	4	4.5

Choose 3 common Concentration Mandatory courses and 1 Concentration Elective. You have to choose 2 more Elective Courses from those available.

c) Concentration: Manufacturing

7th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	204	Steam Generators I	A. Tomboulides		Concentration Mandatory	5	5.5
2	207	Heating- Ventilation and Air-Conditioning	G. Panaras		Concentration Mandatory	5	5.5
3	219	Automatic Control Systems	K. Rallis		Concentration Mandatory	5	5.5
4	372	Numerical methods in design of mechanical structures	D.Giagopoulos		Elective Concentration	5	4.5
5	206	Internal Combustion Engines	A. Tomboulides	D. Kolokotronis	Elective	5	4.5
6	228	Computational Engineering I	E. Kikkinides	M. Politis	Elective	4	4.5
7	250	Experimental Methods and Measurement Technology	E.Konstantinidis		Elective	4	4.5
8	230	Quality Control	G. Nenes		Elective	4	4.5
9	254	Power Systems	Th. Theodoulidis		Elective	4	4,5

8th Semester

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	205	Turbomachinery	A. Tourlidakis		Concentration Mandatory	5	5.5
2	241	Systems Reliability, Maintenance and Safety	I. Bakouros		Concentration Mandatory	5	5.5
3	249	Fluid Mechanics II	E. Konstantinidis		Concentration Mandatory	4	5.5
4	224	Strategic Management	Not Available		Elective	4	4.5
5	252	Computer Aided Manufacturing for Industrial Production	A. Tsouknidas		Elective	4	4.5
6	251	Energy design of buildings I	G. Panaras		Elective	4	4.5
7	246	Inventory and Supply Chain Management	G. Nenes		Elective	4	4.5
8	240	Electromechanical Applications	Th. Theodoulidis		Elective Concentration	4	4.5
9	253	Multivariate Statistics	S. Panagiotidou		Elective	4	4.5
10	210	Unit Operations	E.Kikkinides	M. Politis	Elective	4	4.5

Choose 3 common Concentration Mandatory courses and 1 Concentration Elective. You have to choose 2 more Elective Courses from those available.

8.3 Third Study Cycle

The 3rd Study Cycle includes two semesters (9o and 10o).
Courses per Concentration and Study cycle follow:

a) Concentration: Energy

9th Semester

Cycle: Production, Transport and Distribution of Energy

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	327	Energy design of buildings II	G. Panaras		Elective Concentration	4	4
2	386	Emissions and transport of Air pollutants	R. Sotiropoulou		Elective Concentration	4	4
3	318	Wind and water turbines, hydroelectric plants	A. Tourlidakis		Mandatory Concentration	4	4
4	350	Special topics on pollution control technologies	G. Marnellos		Elective Concentration	4	4
5	380	Computer Aided Design	A. Tsouknidas		Elective Concentration	4	4
6	371	Vehicle Design Methods	Not Available		Elective Concentration	4	4
7	356	Technology, Research, Innovation Policies and Entrepreneurship	E. Samara		Elective Concentration	5	4
8	352	Techno-economic assessment	G. Skodras		Elective Concentration	4	4
9	389	Risk Management and Safety of Large Industrial Systems	I. Bakouros		Elective Concentration	4	4
10	377	Operations Research II	S. Panagiotidou		Elective Concentration	4	4
11	376	Technical and Energy Legislature	G. Skodras		Elective Concentration	3	4
12	226	Gas Turbine Technology	Not Available		Elective Concentration	4	4
13	387	Environmental Management	Not Available		Elective Concentration	4	4

10th Semester

Cycle: Production, Transport and Distribution of Energy

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	309	Pipeline Hydraulics	E.Konstantinidis		Elective Concentration	4	4
2	348	Combustion Phenomena	D.Kolokotronis		Elective Concentration	4	4
3	381	Computational Mechanics II	R. Sotiropoulou		Elective Concentration	4	4
4	382	Rotordynamics	D. Giagopoulos		Elective Concentration	4	4
5	379	Applications of Materials for Energy and Environmental Technologies	S. Makridis		Elective Concentration	4	4
6	349	Special topics on energy conversion technologies	G. Marnellos		Mandatory Concentration	4	4
7	367	Simulation and System Dynamics	G. Nenes		Elective Concentration	4	4
8	316	Solar Technique/Photovoltaic systems	E. Souliotis		Mandatory Concentration	4	4
9	388	Economic Valuation of Energy and Industrial Externalities	Not Available		Elective Concentration	4	4
10	383	Energy saving technologies and Industrial Systems Optimization	G. Skodras		Elective Concentration	4	4
11	390	Renewable Energy Sources Laboratory	E Souliotis - G. Panaras		Elective Concentration	4	4

Choose 3 common Concentration Mandatory courses. You have to choose 5 more Elective Courses from those available.

9th Semester

Cycle: Environmental Engineering and Energy Use

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	327	Energy design of buildings II	G. Panaras		Elective Concentration	4	4
2	386	Emissions and transport of Air pollutants	R.Sotiropolou		Mandatory Concentration	4	4
3	318	Wind and water turbines, hydroelectric plants	A.Tourlidakis		Elective Concentration	4	4
4	350	Special topics on pollution control technologies	G. Marnellos		Mandatory Concentration	4	4
5	380	Computer Aided Design	N. Sapidis		Elective Concentration	4	4
6	371	Vehicle Design Methods	Not Available		Elective Concentration	4	4
7	356	Technology, Research, Innovation Policies and Entrepreneurship	E. Samara		Elective Concentration	5	4
8	352	Techno-economic assessment	G. Skodras		Elective Concentration	4	4
9	389	Risk Management and Safety of Large Industrial Systems	I. Bakouros		Elective Concentration	4	4
10	377	Operations Research II	S.Panagiotidou		Elective Concentration	4	4
11	376	Technical and Energy Legislature	G. Skodras		Elective Concentration	3	4
12	226	Gas Turbine Technology	Not Available		Elective Concentration	4	4
13	387	Environmental Management	Not Available		Elective Concentration	4	4

10th Semester

Cycle: Environmental Engineering and Energy Use

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	309	Pipeline Hydraulics	E. Konstantinidis		Elective Concentration	4	4
2	348	Combustion Phenomena	D. Kolokotronis		Elective Concentration	4	4
3	381	Computational Mechanics II	R. Sotiropoulou		Elective Concentration	3	4
4	382	Rotordynamics	D.Giagopoulos		Elective Concentration	4	4
5	379	Applications of Materials for Energy and Environmental Technologies	S. Makridis		Elective Concentration	4	4
6	349	Special topics on energy conversion technologies	G. Marnellos		Mandatory Concentration	4	4
7	367	Simulation and System Dynamics	G. Nenes		Elective Concentration	4	4
8	316	Solar Technique/Photovoltaic systems	E. Souliotis		Elective Concentration	4	4
9	388	Economic Valuation of Energy and Industrial Externalities	Not Available		Elective Concentration	4	4
10	383	Energy saving technologies and Industrial Systems Optimization	G. Skodras		Elective Concentration	4	4
10	390	Renewable Energy Sources Laboratory	E Souliotis - G. Panaras		Elective Concentration	4	4

Choose 3 common Concentration Mandatory courses. You have to choose 5 more Elective Courses from those available.

9th Semester

b) Concentration Industrial Management

Cycle: Industrial Management

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	327	Energy design of buildings II	G. Panaras		Elective Concentration	4	4
2	386	Emissions and transport of Air pollutants	R. Sotiropoulou		Elective Concentration	4	4
3	318	Wind and water turbines, hydroelectric plants	A. Tourlidakis		Elective Concentration	4	4
4	350	Special Issues to Control Pollution Technologies	G. Marnellos		Elective Concentration	4	4
5	380	Computer Aided Design	N. Sapidis		Elective Concentration	4	4
6	371	Vehicle Design Methods	Not Available		Elective Concentration	4	4
7	356	Technology, Research, Innovation Policies and Entrepreneurship	E. Samara		Mandatory Concentration	5	4
8	352	Techno-economic assessment	G. Skodras		Mandatory Concentration	4	4
9	389	Risk Management and Safety of Large Industrial Systems	I. Bakouros		Elective Concentration	4	4
10	377	Operations Research II	S. Panagiotidou		Mandatory Concentration	4	4
11	376	Technical and Energy Legislature	G. Skodras		Elective Concentration	3	4
12	226	Gas Turbine Technology	Not Available		Elective Concentration	4	4
13	387	Environmental Management	Not Available		Elective Concentration	4	4

10th Semester

Cycle: Industrial Management

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	309	Pipeline Hydraulics	E.Konstantinidis		Elective Concentration	4	4
2	348	Combustion Phenomena	D.Kolokotronis		Elective Concentration	4	4
3	381	Computational Mechanics II	R. Sotiropoulou		Elective Concentration	4	4
4	382	Rotordynamics	D.Giagopoulos		Elective Concentration	4	4
5	379	Applications of Materials for Energy and Environmental Technologies	S. Makridis		Elective Concentration	4	4
6	349	Special topics on energy conversion technologies	G. Marnellos		Elective Concentration	4	4
7	367	Simulation and System Dynamics	G. Nenes		Elective Concentration	4	4
8	316	Solar Technique / Photovoltaic systems	E. Souliotis		Elective Concentration	4	4
9	388	Economic Valuation of Energy and Industrial Externalities	Not Available		Elective Concentration	4	4
10	383	Energy saving technologies and Industrial Systems Optimization	G. Skodras		Elective Concentration	4	4
11	390	Renewable Energy Sources Laboratory	E Souliotis - G. Panaras		Elective Concentration	4	4

Choose 3 common Concentration Mandatory courses. You have to choose 5 more Elective Courses from those available.

9th Semester

c) Manufacturing Concentration (Cycle: Manufacturing & Materials)

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	327	Energy design of buildings II	G. Panaras		Elective Concentration	4	4
2	386	Emissions and transport of Air pollutants	R. Sotiropoulou		Elective Concentration	4	4
3	318	Wind and water turbines, hydroelectric plants	A.Tourlidakis		Mandatory Concentration	4	4
4	350	Special topics on pollution control technologies	G. Marnellos		Elective Concentration	4	4
5	380	Computer Aided Design	N. Sapidis		Mandatory Concentration	4	4
6	371	Vehicle Design Methods	Not Available		Elective Concentration	4	4
7	356	Technology, Research, Innovation Policies and Entrepreneurship	I. Bakouros		Elective Concentration	5	4
8	352	Techno-economic assessment	G. Skodras		Elective Concentration	4	4
9	389	Risk Management and Safety of Large Industrial Systems	I. Bakouros		Elective Concentration	4	4
10	377	Operations Research II	S. Panagiotidou		Elective Concentration	4	4
11	376	Technical and Energy Legislature	G. Skodras		Elective Concentration	3	4
12	226	Gas Turbine Technology	Not Available		Elective Concentration	4	4
13	387	Environmental Management	Not Available		Elective Concentration	4	4

10th Semester

Cycle: Manufacturing & Materials

s/n	Code	Course	Instructor	Assisting	Course Designation	Hours	ECTS Credits
1	309	Pipeline Hydraulics	E.Konstantinidis		Elective Concentration	4	4
2	348	Combustion Phenomena	D.Kolokotronis		Elective Concentration	4	4
3	381	Computational Mechanics II	R. Sotiropoulou		Elective Concentration	4	4
4	382	Rotordynamics	D. Giagopoulos		Mandatory Concentration	4	4
5	379	Applications of Materials for Energy and Environmental Technologies	S. Makridis		Elective Concentration	4	4
6	349	Special topics on energy conversion technologies	G. Marnellos		Elective Concentration	4	4
7	367	Simulation and System Dynamics	G. Nenes		Elective Concentration	4	4
8	316	Solar Technique/Photovoltaic systems	E. Souliotis		Elective Concentration	4	4
9	388	Economic Valuation of Energy and Industrial Externalities	Not Available		Elective Concentration	4	4
10	383	Energy saving technologies and Industrial Systems Optimization	G. Skodras		Elective Concentration	4	4
11	390	Renewable Energy Sources Laboratory	E Souliotis - G. Panaras		Elective Concentration	4	4

Choose 3 common Concentration Mandatory courses. You have to choose 5 more Elective Courses from those available.

8.4 Degree Grade Calculation

The degree is calculated using the following algorithm:

α) all 35 first cycle courses (excluding the Engineering Design Project), the 12 second cycle courses (Concentration Mandatory, Concentration Elective and Elective) along with the eight third cycles courses (Cycle Mandatory) as per the indicative Curriculum Guide are required for obtaining a Degree and carry a weight of W_i=1.

β) Diploma thesis weight is W_δ=6.

Degree grade is then (D.G.) given by:

$$\text{D.G.} = \frac{W_\delta B_\delta + \sum_{i=1}^{M} W_i B_i}{W_\delta + \sum_{i=1}^{M} W_i}$$

where M is the number of courses passed successfully in exams, B_i is the successful examination grade of course i and B_δ is the Diploma Thesis grade.

COURSE CONTENTS

9. COURSE CONTENTS

*Detailed Course description of **available** courses*

Abbreviations:

Sm.: Course Semester

C.H.: Weekly Course Lecture hours

ECTS: Course Credits according to European Credit Transfer System (E.C.T.S.)

Semester duration is 13 full weeks

Lecture language is Greek

101 Mathematical Analysis I		Sm.	C.H.	ECTS
		1	4	5
Course title	Mathematical Analysis I			
Course code	101			
Course type	Compulsory			
Course level	Undergraduate (first cycle)			
Year of studies	1			
Semester	1			
ECTS Credits	5			
URL				
Hours per week	4			
Instructor(s)	K. Balassas			

Course content: Sets, Real numbers, Sequences of real numbers, Series of real numbers, Real functions of a single variables, Limits and continuity, Derivatives, Application of derivatives, Indefinite and definite integrals, improper integrals, Applications of integration, Power series.

Expected learning outcomes and competences to be acquired:
Upon successful completion of this course, students will be able:

- to examine the convergence of real sequences, series, as well as power series,
- to calculate infinite sums,
- to study real functions of one variable,
- to differentiate parametrically-defined and implicit functions,
- to determine lines tangent to plane curves that are described in different ways,
- to calculate indefinite, definite, and improper integrals,

- to use polar coordinates,
- to calculate the area between curves, and the length of plane curves,
- to approximate functions with polynomials.

Prerequisites	-
Teaching methods	Lectures, exercises
Assessment methods	Written intermediate exam (25%), written final exam (75%)
Language of instruction	Greek

Recommended bibliography

[1]R. L. Finney, M. D. Weir, F. R. Giordano, Απειροστικός Λογισμός, Πανεπιστημιακές Εκδόσεις Κρήτης, 2012.
[2]F. Ayres, Διαφορικός και Ολοκληρωτικός Λογισμός, Κλειδάριθμος, 2008.
[3]Θ. Ρασσιάς, Μαθηματική ανάλυση I, ΣΥΜΕΩΝ, 2011.
[4]Brand, Louis Μαθηματική ανάλυση, Εκδόσεις I. Συμεών , 1984
[5]Ghorpade, Sudhir R.Limaye, Balmohan V., A Course in Calculus and Real Analysis [electronic resource], Heal-Link / Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
[6]H. Anton, I. Bivens, S. Davis, Calculus – Early Transcendentals (9th ed), John Wiley & Sons, 2009.

102 Mathematical Analysis II	Sm.	C.H.	ECTS
	2	4	5

Course title	Mathematical Analysis II
Course code	102
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	1
Semester	2
ECTS Credits	5
URL	
Hours per week	4
Instructor(s)	K. Balassas

Course content The ℝn space, Quadratic surfaces, Real functions of several variables, Partial derivatives, Chain differentiation, Directional derivative, Extreme values, Taylor series, Double integrals, Triple integrals, Vector functions, Curves, Line integrals, Differentiation of scalar and vector fields, Conservative fields, Green's theorem, Surface integrals, Gauss και Stokes theorems.

Expected learning outcomes and competences to be acquired:

Upon successful completion of this course, students will be able:

- to differentiate variables of several functions,
- to use cylindrical and spherical coordinates,
- to find extreme values (free/constraint) and saddle points,
- to linearize functions and find tangent planes,
- to perform double and triple integration,
- to manipulate vectors,
- to differentiate vector functions,
- to detect irrotational and solenoidal fields,
- to determine potentials for conservative fields,
- to parametrically describe curves and surfaces,
- to calculate line integrals and fluxes through surfaces of vector fields,
- to use Green's, Gauss, και Stokes theorems.

Prerequisites:	Mathematical Analysis I
Teaching methods	Lectures, exercises
Assessment methods	Written final exam (100%)
Language of instruction	Greek

Recommended bibliography

[1]R. L. Finney, M. D. Weir, F. R. Giordano, Απειροστικός Λογισμός, Πανεπιστημιακές Εκδόσεις Κρήτης, 2012.
[2]F. Ayres, Διαφορικός και Ολοκληρωτικός Λογισμός, Κλειδάριθμος, 2008.
[3]Θ. Ρασσιάς, Μαθηματική ανάλυση I, ΣΥΜΕΩΝ, 2011.
[4]Brand, Louis Μαθηματική ανάλυση, Εκδόσεις I. Συμεών , 1984
[5]Ghorpade, Sudhir R.Limaye, Balmohan V., A Course in Calculus and Real Analysis [electronic resource], Heal-Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
[6]H. Anton, I. Bivens, S. Davis, Calculus – Early Transcendentals (9th ed), John Wiley & Sons, 2009.

103 Physics		Sm.	C.H.	ECTS
		1	4	5
Course title	Physics			
Course code	103			
Course type	Compulsory Course			
Course level	Undergraduate			
Year of studies	1			
Semester	1			
ECTS Credits	5			
URL	http://eclass.uowm.gr/courses/MECH201/			
Hours per week	4			
Instructor(s)	M. Souliotis			

Course content: Electric charge and Electric Field, Electric Potential, Electric Currents, DC Circuits, Magnetism, Electromagnetic Induction and Faraday's Law, Electromagnetic Waves.

Expected learning outcomes and competences to be acquired : The course presents systematically basic knowledge of Electromagnetism. After the completion of the course the students should be able to handle and solve simple and / or complicated problems related to Electrics and Magnetism.

Prerequisites	-
Teaching methods	Hours of Instruction 52
Assessment methods:	Final written exam (compulsory), Intermediate written exam (optional)
Language of instruction	Greek

Recommended bibliography
[1] Physics, Volume B, HALLIDAY-RESNICK
[2] Physics, Volume B, Young Hugh D.

104 Chemistry	Sm.	C.H.	ECTS
	1	4	5

Course title	Chemistry
Course code	104
Course type	Mandatory
Course level	Undergraduate (first cycle)
Year of studies	1
Semester	1
ECTS Credits	5
URL	http://eclass.uowm.gr/courses/MECH118/
Hours per week	4
Instructor(s)	George Marnellos and Evangelos Tolis

Course content: Introduction to the basic principles of the structure of atoms, Quantum mechanical approach of atoms, Electronic configuration of atoms, Periodic system of elements, Ionic and co-valent bonds, Molecular geometry, Hybridization, Molecular orbital theory, Metallic bonds, Intermolecular forces, Chemical kinetics, Chemical equilibrium, Chemical solutions, Acids – Bases - Salts, Redox processes & electrochemistry, Spectroscopic techniques.

Expected learning outcomes and competences to be acquired: The course introduces the students to the basic principles of chemistry with special emphasis on inorganic and physico-chemical issues. Through lectures and exercises, students are

introduced to the basic principles and applications of Chemistry that are related to the science of Mechanical Engineering (i.e., Materials, Kinetics, Thermodynamic Equilibrium, Electrochemistry, etc).

Prerequisites	-
Teaching methods	Hours of Instruction 52 (Theory: 26 h, Exercises: 26 h)
Assessment methods:	Final written exam (compulsory, 70%), Midterm written exam (compulsory, 30%)
Language of instruction	Greek

Recommended bibliography

[1] “General Chemistry. Theory and Applications”, M. Konsolakis
[2] “General Chemistry”, Ebbing-Gammon
[3] “Introduction to Inorganic and General Chemistry”, N. Chatziliadis
[4] “Basic Principles in Inorganic Chemistry”, N.D. Klouras

105 Introduction to Computing	Sm.	C.H.	ECTS
	1	5	5

Course title	Introduction to Computing
Course code	105
Course type	Mandatory
Course level	Undergraduate
Year of studies	1
Semester	1
ECTS Credits	5
URL	http://eclass.uowm.gr/courses/MECH154/
Hours per week	5
Instructor(s)	Mavrikios Politis

Course content: General computing literacy, hardware design and operation, basic problem solving techniques. Basic principles of programming using the MATLAB environment and language: the command prompt, scripts, tables, graphics and data visualization, flowcharts, selection and repetition structures, data input-output.

Expected learning outcomes and competences to be acquired: Acquire the fundamental skills in computer programming using Matlab. Upon successful completion of this course, the student will be able to formulate ways of solving simple algorithmic problems and demonstrate their solution using a high level programming language (Matlab). Another objective is to engage students in collaborative problem-solving of more complex problems by engaging them in the final group programming project.

Prerequisites -

Teaching methods	Lectures (13 weeks x 3 hours lectures and 2 hours practice problems)
Assessment methods	Written final examination, compulsory mid-term and programming project
Language of instruction	Greek

Recommended bibliography

[1] "Computer programming using Matlab", I. Kalatzis (in Greek only). Freely distributed ebook.

[2] Introduction to MATLAB for Engineers, W. Palm III, McGraw Hill, 2010

[3] Online material in eclass: lecture notes, worked examples and similar.

106 Numerical Analysis and Simulation	Sm.	C.H.	ECTS
	6	5	5

Course title	Numerical Analysis
Course code	106
Course type	Mandatory
Course level	Undergraduate (first cycle)
Year of studies	3
Semester	6
ECTS Credits	5
URL	http://eclass.uowm.gr/courses/MECH172/
Hours per week	5
Instructor(s)	R. Sotiropoulou

Course content: Introduction to numerical analysis methods using MATLAB. Basic concepts of analysis. Representation of numbers and numerical solutions errors. Linear systems. Roots of equations. Nonlinear systems. Optimization. Curve fitting. Numerical interpolation and polynomial approximation. Numerical Differentiation and Integration. Ordinary Differential Equations

Expected learning outcomes and competences to be acquired: The aim of this course is to teach the student the approximate solving of complex problems that are not amenable to exact solution by applying numerical methods and implementation of these solutions with computer programs. After completing this course the student should be able to approach engineering problems using basic principles and classical numerical analysis methods and to deepen into the development and improvement of such methods.

Prerequisites	Mathematical Analysis I, II, III, Introduction to Computing
Teaching methods	Hours of Instruction 65 (Theory: 39, Exercises: 26)

Assessment methods: Final written exam (compulsory), Fifteen minutes tests during the lectures, Weekly exercises (compulsory).
Language of instruction Greek
Recommended bibliography
[1] Αριθμητική ανάλυση με εφαρμογές σε Matlab και Mathematica, Παπαγεωργίου, Γεώργιος Σ., Εκδόσεις Συμεών.

107 Statistics	Sm.	C.H.	ECTS
	3	5	6

Course title	Statistics
Course code	107
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	2
Semester	3
ECTS Credits	6
URL	http://eclass.uowm.gr/courses/MECH164/
Hours per week	5
Instructor(s)	S. Panagiotidou

Course content Descriptive statistics: data summary and presentation, frequency distribution, histogram, characteristic values (mean, median, mode, range, variance, standard deviation). Probability theory: basic concepts, events, conditional probability, addition and multiplication law of probabilities, Bayes theorem. Probability distributions, discrete and continuous random variables, expected value, variance and standard deviation. Important distributions: Bernoulli, binomial, geometric, Poisson, uniform, exponential, gamma, normal distribution and the central limit theorem, Student, X^2 and F distributions. Statistical estimation: sampling distributions, point estimation, properties of estimators, confidence intervals. Statistical hypotheses: hypothesis testing, type I and type II errors, required sample size, goodness of fit tests.

Expected learning outcomes and competences to be acquired: After the completion of the course the students should be able to apply the basic concepts and techniques of probability theory and statistical inference.

Prerequisites Mathematics
Teaching methods Hours of Instruction 65 (Theory: 39, Exercises: 26)
Assessment methods: Final written exam (compulsory), Intermediate written exam and/or assignments (optional)
Language of instruction Greek
Recommended bibliography
[1] Statistics, D. P. Psoinos. Zitis Publ., 1999.

[2] Probability and Statistics for Engineers, G. Ch. Zioutas, Zitis Publ., 2013.

108 Machine Elements I – Mechanical Engineering Laboratory

	Sm.	C.H.	ECTS
	4	5	6.5

Course title	Machine Elements I – Mechanical Laboratory
Course code	108
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	2
Semester	4
ECTS Credits	6.5
URL	
Hours per week	5
Instructor(s)	J. Mirisidis

Course content Introduction to engineering analysis, Load, stress and strain, Normal, torsional, bending and transverse shear stresses and strains, Failure prediction for static and dynamic loading, Operating stresses, Calculation of static and dynamic strength, Combined stresses and equivalent stresses, Permissible stresses, Strength safety factors, Fasteners and screws. Welded joints.

Expected learning outcomes and competences to be acquired: Presentation, understanding and application of principles and rules in machine elements and mechanical designing, through the analysis of simple machine elements.

Prerequisites	Statics, Strength of Materials, Mechanical Drawing
Teaching methods	Hours of Instruction 65 (Theory: 39, Exercises: 26) and 1 semester exercise (optional)
Assessment methods:	Final written exam (compulsory), Intermediate written exam and exercise (optional)
Language of instruction	Greek

Recommended bibliography

[1] Machine Elements, Graikousis R., 2nd volume, Giapoulis S. & SIA O.E. Publ., 2013.
[2] Machine Elements, Niemann G., Fountas G.C. Publ., 2013.

109 Materials Science and Technology I

	Sm.	C.H.	ECTS
	2	5	6

Course title	Materials Science and Technology I

Course code	109
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	1
Semester	2
ECTS Credits	6
URL	https://eclass.uowm.gr/courses/MECH200/
Hours per week	5
Instructor(s)	S. Makridis

Course content: Atomic structure, chemical bonds, Crystallography and Crystal Stucture (crystalline systems, Bravais lattices, elementary cells, directions, levels, measuring density, single- and poly-crystalline materials), structure verification diffraction X-ray crystal structure imperfections (point, linear, flat, three-dimensional). Granules, grain microstructure limits, microscopy, particle size. Mobility of atoms and Diffusion in solid state (mechanisms, laws of Fick). equilibrium phase diagram (solid solutions, thermodynamic interpretation of Gibbs law, binary diagrams). Physical Properties (Electrical, Thermal, Magnetic, Optical). Oxidation, Corrosion and Protection.

Expected learning outcomes and competences to be acquired : Introduction to basic concepts of crystal structure, materials properties as a function of the microstructure and processing. Standard materials are metallic materials, but also considered are non-metallic (ceramic, polymer for which are developed the relationships governing the physical properties.

Prerequisites:	Physics, Chemistry
Teaching Methods:	Lectures and tutorials, Materials and XRD lab
Assessment Methods:	80% written exam, 20% project
Language of instruction	Greek

Recommended bibliography

[1] Επιστήμη και Τεχνολογία των Μεταλλικών Υλικών, Χρυσουλάκης Γιάννης Δ.,Παντελής Δημήτρης Ι.
[2] Επιστήμη και Τεχνολογία Υλικών, 9η Έκδοση, Callister Wıllıam D.

110 Strength of Materials	Sm.	C.H.	ECTS
	3	5	6.5

Course title	Strength of Materials
Course code	110
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	2
Semester	3

ECTS Credits	6.5
URL	http://eclass.uowm.gr/courses/MECH155/
Hours per week	5
Instructor(s)	J. Mirisidis

Course content Axial Loading, Centric & Eccentric Loading, Shearing Stress, Bearing Stress in Connections, Stress Under General Loadings, Rod & Boom Normal Stresses, State of Stress, Factor of Safety, Normal Strain, Hooke's Law: Modulus of Elasticity, Elastic vs. Plastic Behavior, Fatigue, Deformations Under Axial Loading, Static Indeterminacy, Thermal Stresses, Poisson's Ratio, Relation Among E, ν, and G, Composite Materials, Generalized Hooke's Law, Shearing Strain, Saint-Venant's Principle, Stress Concentration, Plastic Deformations, Residual Stresses
Torsion: Torsional Loads on Circular Shafts, Axial Shear Components, Shaft Deformations, Shearing Strain, Stresses in Elastic Range, Angle of Twist in Elastic Range, Statically Indeterminate Shafts, Design of Transmission Shafts, Stress Concentrations, Plastic Deformations, Residual Stresses, Torsion of Noncircular Members, Thin-Walled Hollow Shafts.
Pure Bending: Symmetric Member in Pure Bending, Bending Deformations, Strain Due to Bending, Deformations in a Transverse Cross Section, Bending of Members Made of Several Materials, Stress Concentrations, Eccentric Axial Loading in a Plane of Symmetry, Asymmetric Bending, General Case of Eccentric Axial Loading.
Transverse Loading: Basic distributional assumption of normal stresses, Determination of the Shearing Stress in Common Types of Beams, Further Discussion of the Distribution of Stresses in a Narrow Rectangular Beam, Longitudinal Shear on a Beam Element of Arbitrary Shape, Shearing Stresses in Thin-Walled Members, Plastic Deformations, Multi Loading stresses, Asymmetric Loading of Thin-Walled Members.
Transformations of Stress and Strain: Transformation of Plane Stress, Principal Stresses, Maximum Shearing Stress, Mohr's Circle for Plane Stress, Application of Mohr's Circle to the Three-Dimensional Analysis of Stress, Yield Criteria for Ductile Materials and Fracture Criteria for Brittle Materials Under Plane Stress, Stresses in Thin-Walled Pressure Vessels, Transformation of Plane Strain, Mohr's Circle for Plane Strain, Three-Dimensional Analysis of Strain, Measurements of Strain.

Expected learning outcomes and competences to be acquired : Introduction to the concepts of deformable solid body by applying the principles of the theory of elasticity. Acquisition of knowledge to analyze stresses (strains) in specific components, or machines elements or mechanisms, with specific support, for standard or anticipated external loads applied in certain methods (tension,

compression, torsion, bending, eccentric axial loading), and determination of the expected mechanical behavior, based on accurate design or validation for their safe operation.

Prerequisites	Statics, Science and Technology of Materials I, II
Teaching methods	Hours of Instruction 65 (Theory: 26, Exercises: 39)
Assessment methods:	Final written exam (compulsory), Intermediate written exam (optional)
Language of instruction	Greek

Recommended bibliography

[1] Mechanics of Materials, Beer F. P., Johnston R. E., Tziolas Publ., 2012.

[2] Strength of Materials, Papamixos E., Charalampakis N., Tziolas Publ., 2004.

111 Engineering Statics	Sm.	C.H.	ECTS
	2	5	6

Course title	Engineering Statics
Course code	111
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	1
Semester	2
ECTS Credits	6
URL	http://eclass.uowm.gr/courses/MECH151
Hours per week	5
Instructor(s)	N. Sapidis

Course content Force and moment. Addition and resolution of forces. Free body diagram. Equilibrium conditions. Elementary structures: rods, beams, cables. Advanced structures: frames, trusses. N-Q-M diagrams. Friction: brakes, clutches, couplings, belts. Center of mass. Moments of Inertia.

Expected learning outcomes and competences to be acquired Understanding of basic concepts related to the various types of structures, their supports, and the loads (external and internal) acting on them. Understanding and ability to apply solution methods to static problems.

Prerequisites	Mathematics I, Physics, Linear Algebra
Teaching methods	Lectures (13 weeks x 2,5 hour of Theory and 2,5 hours of Exercises)
Assessment methods:	Final written exam
Language of instruction	Greek

Recommended bibliography

[1] P.A. VOUTHOUNIS, “STATICS”, Publisher: P.A. VOUTHOUNIS, 2008 (in Greek).
[2] W. WAGNER, G. ERLHOF, “APPLIED STATICS”, Publisher: KLEIDARITHMOS, 2012 (in Greek).

112 Dynamics	Sm.	C.H.	ECTS
	4	5	6.5

Course title	Dynamics
Course code	112
Course type	Mandatory
Course level	Undergraduate
Year of studies	2
Semester	4
ECTS Credits	6.5
URL	http://eclass.uowm.gr/courses/MECH127
Hours per week	5
Instructor(s)	D. Giagopoulos

Course content: Kinematics of particles (position vector, velocity, acceleration, rectangular coordinates, cylindrical coordinates, tangential coordinates, relative motion), Kinetics of particles (Newton’s and Euler’s laws of motion, principles of impulse and momentum, principles of work and energy), Kinematics of rigid bodies (translation, pure rotation, plane motion, rotation about a fixed point, spatial motion, relative motion), Kinetics of rigid bodies (inertia tensor, Newton’s and Euler’s laws of motion, principles of impulse and momentum, principles of work and energy, inertia forces), Applications (eccentric impact, balancing of rotating rigid bodies, axisymmetric rigid body rotation).

Expected learning outcomes and competences to be acquired: Understanding the basic principles of dynamics, develop the equations of motion of systems particles and rigid bodies and solves simple examples with analytical and numerical methods.

Prerequisites	Statics
Teaching methods	Lectures (13 weeks x 3 hour of Theory and 2 hours of Exercises) and homeworks.
Assessment methods:	Final written exam
Language of instruction	Greek

Recommended bibliography

[1] Dynamics, S. Natsiavas, Zitis Publ.(in Greek), 1994.
[2] Dynamics, Beer - Johnston, Tziolas Publ.(in Greek), 2010.

113 Mechanical Drawing I		Sm.	C.H.	ECTS
		1	4	5.5
Course title	Mechanical Drawing I			
Course code	113			
Course type	Compulsory			
Course level	Undergraduate (first cycle)			
Year of studies	1			
Semester	1			
ECTS Credits	5.5			
URL	http://eclass.uowm.gr/courses/MECH115			
Hours per week	4			
Instructor(s)	N. Sapidis			

Course content: Fundamental ISO rules for drawing (types of technical drawings, drawing tools and sheets, title block, parts list, drawing scales, types of lines and line widths, lettering), Introduction to Computer-Aided Design/Drafting (CAD), Views and representation of mechanical components (types of views, technical sketch, construction drawing, assembly drawing, rules and basic conventions for views), Dimensions (ISO rules and principles for dimensioning, special symbols for dimensioning, basic methods and paradigms for dimensioning, dimensions for CNC processing), Sections (general principles and rules for drawing sections, special types of sections, sections in multiple cutting planes), Drawing of connection elements (geometric features and categories of threads, standard threads, drawing of thread holes, dimensions and types of screws, standardization of bolts, nuts and tools, bolted joints and related components, rivets, welding methods and drawing of welds).

Expected learning outcomes and competences to be acquired: Understanding and ability to apply basic principles, standards and ISO rules of mechanical drawing. Ability to produce an ISO-compatible drawing for a low-complexity mechanical component.

Prerequisites	-
Teaching methods	Lectures (13 weeks x 2 hour of Theory and 2 hours of Drawing Exercises)
Assessment methods:	70% final written exam, 30% mid-term exam.
Language of instruction	Greek

Recommended bibliography

[1] A. Antoniadis, “Mechanical Drawing”, 2nd Ed., Tziolas Publications, 2013 (in Greek).
[2] K.-D. Bouzakis, “Rules of Mechanical Drawing”, ZHTH Publications, 2003 (in Greek).

114 Fundamentals of Machining	Sm.	C.H.	ECTS
	4	5	6

Course title	Fundamentals of Machining
Course code	114
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	2
Semester	4
ECTS Credits	6
URL	-
Hours per week	5
Instructor(s)	J. Mirisidis

Course content: Introduction to engineering analysis, Load, stress and strain, Normal, torsional, bending and transverse shear stresses and strains, Failure prediction for static and dynamic loading, Operating stresses, Calculation of static and dynamic strength, Combined stresses and equivalent stresses, Permissible stresses, Strength safety factors, Fasteners and screws, Welded joints.

Expected learning outcomes and competences to be acquired: Presentation, understanding and application of principles and rules in machine elements and mechanical designing, through the analysis of simple machine elements.

Prerequisites	Science and Technology of Materials I & II, Strength of Materials
Teaching methods	Hours of Instruction 65
Assessment methods:	Final written exam (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Manufacturing of non-cohesive material. Introduction to machining of solid matter, Bouzakis K.-D., Ziti Publ., 2013.
[2] Machining Technology, Petropoulos, P. G., Ziti Publ., 1992.

116 Electrotechnics	Sm.	C.H.	ECTS
	5	5	5

Course title	Electrotechnics
Course code	116
Course type	Mandatory
Course level	Undergraduate (first cycle)
Year of studies	3
Semester	5

ECTS Credits	5
URL	http://eclass.uowm.gr/courses/ICTE163/
Hours per week	5
Instructor(s)	Th. Theodoulidis

Course content: Current, voltage, power. Kirchhoff's laws and Tellegen's theorem. Electric components. dc and ac circuits. Methods of analysis of electric circuits in the sinusoidal steady state. Theorems of electric circuits. Power and energy in circuits with sinusoidal excitation. Power factor correction. Symmetric and asymmetric three phase circuits. Analysis of circuits with periodical non-sinusoidal excitation. Harmonics and Fourier series. Diodes and rectifying devices.

Expected learning outcomes and competences to be acquired: The student is introduced in the basic knowledge of theory and analysis of electric circuits. He/she will be able to analyze basic dc and ac electric circuits in order to be able to follow the courses of Electric Machines and Electromechanical Applications. With the help of the laboratory exercises he/she better assimilates the theory and also obtains capabilities in the use of software for the design and analysis of electric circuits.

Prerequisites	-
Teaching methods	Hours of Instruction 57 (Theory: 39, Laboratory: 18)
Assessment methods:	Final written exam (compulsory) , Laboratory assignments (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Analysis of electric circuits, N. Margaris, Tziolas Editions, 2009.
[2] Electric Circuits, J. Edminister, ESPI Editions, 1980.

117 Electrical Machines	Sm.	C.H.	ECTS
	6	5	5

Course title	Electric Machines
Course code	117
Course type	Mandatory
Course level	Undergraduate (first cycle)
Year of studies	3
Semester	6
ECTS Credits	5
URL	http://eclass.uowm.gr/courses/MECH170/
Hours per week	5
Instructor(s)	Th. Theodoulidis

Course content: Basic principles of electromagnetism and ac and dc electric machines. Equivalent circuits. dc motors. Three phase and single-phase induction

motors. Synchronous motors. Load curves (torque-speed). Speed control, starting and motor selection.

Expected learning outcomes and competences to be acquired: The student is introduced to the basic principles of electrical machinery. Learns to analyze the basic types of electric motors in order to obtain information about their efficiency and load curves. Can also study driver systems depending on the required application/setup. In the lab he/she assimilates better the basic configurations and obtains real experience.

Prerequisites	Electrotechnics
Teaching methods	Hours of Instruction 52 (Theory: 40, Laboratory: 12)
Assessment methods	Final written exam (compulsory) , Laboratory assignments (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Electric Machines, S. Chapman, 4th edition, Tziolas Editions, 2009.
[2] Electric Machines, C. Hubert, ION Editions, 2008.

118 Heat Transfer	Sm.	C.H.	ECTS
	5	5	5.5

Course title	Heat Transfer
Course code	118
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	3
Semester	5
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH105/
Hours per week	5
Instructor(s)	E. Konstantinidis

Course content: Introduction to the mechanisms of heat transfer: conduction, convection and radiation.
Conduction: Fourier's law, thermal conductivity, heat diffusion equation in Cartesian, polar and spherical coordinates. Steady-state conduction: heat resistance concept, critical radius of insulation, multi-dimensional configurations (analytical, graphical and numerical solutions), shape factor in common configurations, heat-transfer enhancement via fins.
Transient heat conduction: Biot number, lumped-capacitance method, analytical solutions in simple geometries, Heissler charts, semi-infinite media.

Forced convection: Newton's law of cooling, local and average heat-transfer coefficient, Nusselt number, Prandtl number, Reynolds number, dimensional analysis, analogy between heat/mass and momentum transport, internal and external flows, laminar and turbulent flow, flow and heat transfer over flat plates, cylinders and tube bundles, flow and heat transfer inside pipes.
Natural convection: natural convection currents, Grashof number, Rayleigh number, natural convection over open surfaces and enclosed regions, Bernard convection cells, combined natural and forced convection.
Boiling and condensation: pool boiling, boiling curve, empirical relationships for nucleate boiling, tube boiling, drop and film condensation, condensation over tubes and tube bundles.
Thermal radiation: fundamentals of electromagnetic radiation and waves, Wien's displacement law, black-body radiation, Stefan-Boltzmann equation, interaction between radiation and real surfaces, heat exchange between surfaces, view factor.

Expected learning outcomes and competences to be acquired : 1) understand the fundamental mechanisms of heat transfer, 2) acquire the knowledge base for related engineering problems, 3) develop skills for the solution of problems involving heat transport, 4) recognize heat transfer problems for further study

Prerequisites	Thermodynamics I, Mathematics I, II
Teaching methods	lectures and tutorials
Assessment methods	15% coursework (x3), 85% final written exam
Language of instruction	Greek

Recommended bibliography

[1] Heat and Mass Transfer, Cengel Yunus., Ghajar A., McGraw Hill (translated into greek)
[2] Principles of Heat and Mass Transfer, Kakatsios, X., Symeon, 2006 (in greek)
[3] A Heat Transfer Textbook, Lienhard J. H. (iv) and Lienhard J. H. (v) Phlogiston Press, 2003. (freely available online)

119 Thermodynamics I	Sm.	C.H.	ECTS
	3	5	6.5

Course title	Thermodynamics I
Course code	119
Course type	Mandatory Course
Course level	Undergraduate
Year of studies	2
Semester	3
ECTS Credits	6.5
URL	http://eclass.uowm.gr/courses/MECH153/
Hours per week	5
Instructor(s)	A. Tomboulides

Course content: Basic principles of Thermodynamics. The First Law of Thermodynamics in closed systems, properties of pure substances, Phase diagrams for gases and liquids, equations of State, the First Law of Thermodynamics for open flowing systems, The Second Law of Thermodynamics, Entropy and the third Law, Power, refridgeratıon and heating cycles, Gas and vapor cycles: Carnot, Otto, Diesel, Brayton, Rankine.

Expected learning outcomes and competences to be acquired: Course focuses on the understanding of the fundamental concepts and principles in thermodynamics with emphasis on the solution of engineering problems and on the analysis of energy systems and flow processes.

Prerequisites	Mathematics I, Mathematics II, Physics
Teaching methods	Oral presentations and exercises
Assessment methods	Written exam, 70% final exam, 30% midterm exam
Language of instruction	Greek

Recommended bibliography

[1] Thermodynamics: An Introduction to the Fundamentals and Applications, Hans Dieter Baehr, 2011
[2] Thermodynamics, An Engineering Approach, 3rd edition, Dr. Y. Cengel, Dr. M. Boles
[3] Fundamentals of Engineering Thermodynamics, M. J. Moran, H. N. Shapiro

120 Fluid Mechanics I	Sm.	C.H.	ECTS
	4	5	6

Course title	Fluid Mechanics I
Course code	120
Course type	Mandatory
Course level	Undergraduate (first cycle)
Year of studies	2
Semester	4
ECTS Credits	6
URL	http://eclass.uowm.gr/courses/MECH103/
Hours per week	5
Instructor(s)	E. Kikkinides

Course content: Basic definitions. Properties of fluids. Fluid Statics: Measurement of pressure, hydrostatic forces, buoyancy and Archimedes's law. Introduction to Fluid Dynamics: Bernoulli's equation and its applications. Kinematics of fluids, Eulerian and Lagrancian description of flow. Reynolds transport theorem. Control

volume formulation and application in mass, momentum and energy conservation. Differential analysis of flow fields: stream function, vorticity and potential; elementary ideal, potential, flows and their combinations, examples and applications. Continuity equation, Euler and Navier Stokes equations of motion, Energy equation and their applications. Viscous flows and their application in simple geometries: Poiseuille flow in a slit channel and a cylinder, Quette flow. Dimensional analysis, similarity and dimensionless numbers. Π- Buckingham's theorem. Flow in tubes: Fully developed flow, introduction to turbulence and the concept of the boundary layer. Dimensional analysis and the use of Moody's charts to determine the pressure drop in smooth and rough tubes.

Expected learning outcomes and competences to be acquired: This course aims in the in depth understanding of the basic principles of Fluid Mechanics and also serves as an introduction to advanced applications of flow of real fluids. The student acquires fundamental knowledge on the phenomenology and the mathematical description of real flows and learns to use this knowledge in solving practical problems. For example the application of Bernoulli's equation for ideal flows, the application of Poiseuille's equation for viscous flows, the measurement of hydrostatic pressure, the determination of pressure drop in tubes, etc.

Prerequisites	Physics, Mathematics II, Thermodynamics I
Teaching methods	Hours of Instruction 63 (Theory: 39, Exercises: 26)
Assessment methods:	Final written exam (75% of the final grade), optional midterm exam (25% of the final grade)
Language of instruction	Greek

Recommended bibliography

1. Fluid Mechanics, Goulas A. (in Greek).
2. Fluid Mechanics, Tsaggaris S. (in Greek).
3. Fluid Mechanics with Student CD, WHITE F.

123 Industrial Management	Sm.	C.H.	ECTS
	6	5	5.5

Course title	Industrial Management
Course code	123
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	3
Semester	6
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH177/
Hours per week	5
Instructor(s)	Sofia Panagiotidou

Course content: Introduction to production operations. Forecasting: time series and causal models; constant, linear-trend and seasonal models. Design of Production Systems: product design; process selection and capacity planning; facilities layout. Planning and Control of Production Systems: long, medium and short range production planning; inventory management; quality control; equipment maintenance and replacement.

Expected learning outcomes and competences to be acquired: After the completion of the course the students should be able to understand the role and interrelations of the main operations and decision making tools in production systems (such as inventory control, equipment maintenance, quality control, demand forecasting, production planning), and their interactions to the external environment.

Prerequisites	Statistics, Operations Research
Teaching methods	Hours of Instruction 65 (Theory: 39, Exercises: 26)
Assessment methods:	Final written exam (compulsory), Intermediate written exam and/or assignments (optional)
Language of instruction	Greek

Recommended bibliography

[1] Management of Production Systems, S. G. Dimitriadis, A. N. Michiotis, Kritiki Publ., 2007.
[2] Operations Management, J.K. Shim, J.G. Siegel, Kleidarithmos Publ., 2002.

127 Alternative Energy Systems		Sm.	C.H.	ECTS
		6	4	4.5
Course title	New & Renewable Energy Sources			
Course code	127			
Course type	Compulsory			
Course level	Undergraduate (first cycle)			
Year of studies	3			
Semester	6			
ECTS Credits	4.5			
URL	http://eclass.uowm.gr/courses/MECH132/			
Hours per week	4			
Instructor(s)	G. Skodras			

Course content: Introduction to energy policy issues. Energy in the European Union. The EU Green Bible for the security of the energy supply. The EU White Bible for the Renewable Energy Sources. Energy reserves and resources. The Greek energy system. Solar energy-basic principles. Solar collectors and photovoltaics. Wind energy and wind parks. Energy from biomass. Energy utilization of biomass.

Hydropower and power plants – Advantages and disadvantages. Geothermal energy and geothermal fields. Tidal and wave energy. Ocean thermal energy. Energy conservation. Thermodynamic analysis of the renewable energy systems. Environmental analysis of the renewable energy systems. Social and economic impacts.

Expected learning outcomes and competences to be acquired : The course presents systematically the renewable energy sources the systems and the cutting edge developments. After the completion the students will be able to approach effectively the issues of RES and to handle design and implementation problems, by means of scientifically rigorous quantitative methods.

Prerequisites	Thermodynamics, Mathematics, Statistics
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26) – Home works 3
Assessment methods	Final written exam (compulsory) , Intermediate written exam (optional)
Language of instruction	Greek

Recommended bibliography

[1] Ήπιες μορφές ενέργειας, Έκδοση 1η 2008, Παπαϊωάννου Γ.
[2] Ήπιες μορφές ενέργειας, Έκδοση 1η 2008, Κανελλοπούλου Ελ.
[3] Ήπιες μορφές ενέργειας Ι – Περιβάλλον και Ανανεώσιμες Πηγές Ενέργειας, Έκδοση 1η 2003, Καπλάνης Σ.
[4] Ήπιες μορφές ενέργειας, Έκδοση 1η 2006, Κουτσούμπας Χρ.
[5] Συμβατικές & Ήπιες μορφές ενέργειας, Έκδοση 1η 2006, Κ. Μπαλάρας, Α. Αργυρίου, Φ. Καραγιάννης

131 Environmental Technology	Sm.	C.H.	ECTS
	6	4	4.5

Course title	Environmental Technology
Course code	131
Course type	Mandatory
Course level	Undergraduate (first cycle)
Year of studies	3rd
Semester	6th
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH119/
Hours per week	4
Instructor(s)	G. Marnellos and E. Papista (Teaching Assistant)

Course content: Environmental/Atmospheric pollution, Sources of environmental pollution, Effects of environmental pollution to human health, flora, fauna and materials, Greenhouse effect, Depletion of ozone layer, Acid deposition,

Photochemical smog, Atmospheric chemistry, Analysis of gaseous pollutants, Pollution control technologies for stationary and mobile sources, Particulate matter, Technologies for particulate matter control (Cyclones, Electrostatic Precipitators, Baghouses), VOCs, SOX and NOX abatement and control.

Expected learning outcomes and competences to be acquired: The course presents to students the effects of various human activities on the environment. Specifically, the causes, trends and technological solutions to address the environmental problems that are related to air pollution (gaseous and particulate pollutants) from stationary and mobile sources, are presented. Moreover the students learn to design control pollution technology systems from technological and economic point of view.

Prerequisites	-
Teaching methods	Hours of Instruction 52 (Theory: 26 h, Exercises: 26 h)
Assessment methods:	Final written exam (compulsory) , Midterm written exam (optional)
Language of instruction	Greek

Recommended bibliography

[1] “Air Pollution Control”, D. Cooper και C. Alley
[2] “Air Pollution. Effects, Control and Alternative Technologies”, I. Yentekakis
[3] “Introduction to Environmental Engineering”, A. Koungolos

132 Mathematical Analysis III	Sm.	C.H.	ECTS
	3	4	5

Course title	Applied Mathematics I
Course code	132
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	2nd
Semester	3rd
ECTS Credits	5
URL	eclass.uowm.gr/courses/ICTE109/
Hours per week	4
Instructor(s)	Th. Zygiridis

Course content: Introduction. First-order ordinary differential equations. Separable equations. Exact equations, integrating factors. Linear equations. Solution via substitution. Higher-order ordinary differential equations. Linear equations with constant coefficients. Order reduction. Solution of inhomogeneous differential equations. Laplace transform and its use for solving differential equations. Series solution of differential equations, ordinary and singular points. Systems of

differential equations, solution with the matrix method. Complex numbers. Complex functions. Differentiation of complex functions. Integration of complex functions.

Expected learning outcomes and competences to be acquired: Upon successful completion of this course, students will be able:

- to recognize the mathematical models for certain physical problems,
- to identify the general form of differential equations,
- to apply appropriate methods for determining partial and general solutions,
- to solve initial value problems,
- to determine solutions in the form of power series,
- to exploit the Laplace transform,
- to solve systems of differential equations,
- to graphically solve certain types of differential equations,
- to deal with fundamental problems of complex analysis.

Prerequisites Elements of the following courses are required:

- Mathematical Analysis I
- Mathematical Analysis II
- Linear Algebra

Teaching methods Lectures, exercises

Assessment methods Written intermediate exam (25%), written final exam (75%)

Language of instruction Greek

Recommended bibliography:

[1] W. E. Boyce, R. C. Diprima, Στοιχειώδεις Διαφορικές Εξισώσεις & Προβλήματα Συνοριακών Τιμών, ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ, 1999.

[2] Τραχανάς Στέφανος, Συνήθεις Διαφορικές Εξισώσεις, ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 2008.

[3] Κάρολος Σεραφειμίδης, Διαφορικές Εξισώσεις, Εκδόσεις "σοφία", 2010.

[4] Σταυρακάκης Νίκος, Συνήθεις Διαφορικές Εξισώσεις, Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ ΟΕ, 2010.

[5] David Logan, J., A First Course in Differential Equations [electronic resource], Heal Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.

[6] Soare, Mircea V. Teodorescu, Petre P. Toma, Ileana, Ordinary Differential Equations with Applications to Mechanics [electronic resource], Heal Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.

133 Thermodynamics II	Sm.	C.H.	ECTS
	6	5	5.5

Course title Thermodynamics II

Course code 133

Course type Mandatory Course

Course level	Undergraduate
Year of studies	3
Semester	6
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH129/
Hours per week	5
Instructor(s)	A. Tomboulides

Course content: Thermodynamic System Equilibrium, Gibbs and Helmholtz functions. Combustion processes. Stoichiometry in complete combustion, application of the first law of thermodynamics in combustion processes, heating value, enthalpy of reaction. Application of the second law in combustion processes. Thermodynamic relations, Maxwell's equations. Thermodynamic properties of systems with fixed chemical composition, ideal gases and mixtures. Thermodynamic properties of gaseous mixtures of variable composition. Chemical potential and chemical equilibrium. Dissociation.

Expected learning outcomes and competences to be acquired: This course focuses on understanding the theoretical fundamentals of thermodynamic system equilibrium, thermodynamic relations, thermodynamic properties of mixtures of fixed and variable composition with emphasis on combustion processes and chemical equilibrium phenomena.

Prerequisites	Mathematics I, Mathematics II, Physics, Thermodynamics I
Teaching methods	Oral presentations and exercises
Assessment methods	Written exam, 70% final exam, 30% midterm exam
Language of instruction	Greek

Recommended bibliography

[1] Advanced Engineering Thermodynamics, Rowland S.Benson, 2nd edition
[2] Thermodynamics, An Engineering Approach, 3rd edition, Dr. Y. Cengel, Dr. M. Boles
[3] Thermodynamics: An Introduction to the Fundamentals and Applications, Hans Dieter Baehr, 2011

135 Materials Science and Technology II	Sm.	C.H.	ECTS
	3	5	6

Course title	Materials Science and Technology II
Course code	135
Course type	Compulsory
Course level	Undergraduate (first cycle)

Year of studies	2nd
Semester	3rd
ECTS Credits	6
URL	https://eclass.uowm.gr/courses/MECH199/
Hours per week	5
Instructor:	S. Makridis

Course content: Equilibrium phase diagrams in binary systems (complete solid solubility, lever rule, eutectic phase diagrams and peritectic phase diagrams). The Fe-C system. Basic solidification mechanisms. Nucleation and Growth, Casting, Segregation. Phase transformations and thermal processing of steel alloys and cast metals (fabrication processes, precipitation processes, annealing processes, recovery, recrystallization and grain growth). Diffusion phase transformations. TTT and CCT diagram. Hardening and strengthening of steels. Precipitation hardening. Jominy test. Engineering materials (steels, cast irons, copper alloys, light metals, titanium alloys, Zn alloys, Pb alloys, superalloys. Corrosion and surface protection. Ceramics

Expected learning outcomes and competences to be acquired: To acquire general knowledge about the properties of materials and their significance in various applications To study the materials by using the phase diagram, so as to correlate, to a first approximation, the properties of materials with their structure. To realize the importance of phase transformations and thermal processing of materials in mechanical applications. To familiarize with the different industrial alloys.

Prerequisites:	Statics, Strength of Materials, Mechanical Drawing, Machine Elements I
Teaching methods:	Lectures and tutorials
Assessment methods:	Final Exam

Recommended bibliography

[1] Μεταλλογνωσία για το Μεταλλουργό Μηχανικό και τον Τεχνολόγο Υλικών, 2η Έκδοση, Τριανταφυλλίδης Γιώργος

137 Mathematical Analysis IV	Sm.	C.H.	ECTS
	4	4	5

Course title	Applied Mathematics II
Course code	137
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	2nd
Semester	4th
ECTS Credits	5
URL	eclass.uowm.gr/courses/ICTE217/

Hours per week 4
Instructor(s) Th. Zygiridis

Course content: Introduction to Partial Differential Equations (PDEs). Examples of PDEs. First-order PDEs. Linear, semi-linear, and quasi-linear PDEs. Characteristic curves. The Cauchy problem. Second-order PDEs, classification, standard forms. Eigenvalue problems. The Laplace equation, solution in Cartesian and polar coordinates, cases of homogeneous and inhomogeneous boundary conditions and infinite domains. Orthogonal functions, Fourier series and Fourier integrals. The heat equation, solution in finite and infinite spaces. Special functions. The wave equation, finite and infinite strings.

Expected learning outcomes and competences to be acquired: Upon successful completion of this course, students will be able:

- to identify different types of PDEs,
- to derive the mathematical models for different problems,
- to solve PDES with the method of characteristics,
- to deal with eigenvalue problems,
- to reduce PDES to their canonical forms,
- to apply separation of variables and other techniques for the solution of PDEs,
- to solve problems in different coordinate systems,
- to solve problems in finite, semi-infinite or infinite spaces,
- to use orthogonal functions and exploit Fourier series and integrals.

Prerequisites:

- Linear Algebra
- Mathematical Analysis II
- Applied Mathematics I

Teaching methods Lectures, exercises
Assessment methods Written intermediate exam (25%), written final exam (75%).
Language of instruction Greek
Recommended bibliography

[1] ΤΡΑΧΑΝΑΣ ΣΤΕΦΑΝΟΣ, ΜΕΡΙΚΕΣ ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ, ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 2009.
[2] Παντελίδης Γεώργιος Ν., Κραββαρίτης Δημήτρης, Εισαγωγή στις διαφορικές εξισώσεις μερικών παραγώγων, Ζήτη, 2003.
[3] Κυβεντίδης Θωμάς, Μερικές διαφορικές εξισώσεις, Ζήτη , 2009.
[4] Tveito, Aslak. Golubitsky, M.Jäger, W.Marsden, J.E. Sirovich, L. Winther, Ragnar, Introduction to Partial Differential Equations [electronic resource], Heal Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.

[5] Myint U, Tyn.Debnath, Lokenath, Linear Partial Differential Equations for Scientists and Engineers [electronic resource], Heal Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
[6] Richard Haberman, ΕΦΑΡΜΟΣΜΕΝΕΣ ΜΕΡΙΚΕΣ ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ, ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ, 2014.

138 Machine Elements II	Sm.	C.H.	ECTS
	5	5	5.5

Course title	Machine Elements II
Course code	138
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	3
Semester	5
ECTS Credits	5,5
URL	http://eclass.uowm.gr/courses/MECH121/
Hours per week	5
Instructor(s)	J. Mirisidis

Course content: Lubricants and lubrication, Hydrodynamic bearings and seals, Shafting and associated parts, Power transmission, Flat, synchronous and V-belts, Parallel axis gears, Planetary gear trains, Nonparallel coplanar and non-coplanar gears, Gearboxes, Design of power transmission systems.

Expected learning outcomes and competences to be acquired: Presentation and understanding of basic rotary motion elements and power transmission and analytical presentation of the necessary figures and calculations in order to analyze and synthesize mechanical engineering.

Prerequisites	Statics, Strength of Materials, Mechanical Drawing, Machine Elements I
Teaching methods	Hours of Instruction 65 (Theory: 39, Exercises: 26) and 1 semester exercise (optional)
Assessment methods:	Final written exam (compulsory), Intermediate written exam and exercise (optional)
Language of instruction	Greek

Recommended bibliography

[1] Machine Elements, Graikousis R., 2nd volume, Giapoulis S. & SIA O.E. Publ., 2013.

140 Mechanical Vibration and Machine Dynamics	Sm.	C.H.	ECTS
	5	5	5.5

Course title	Mechanical Vibration and Machine Dynamics
Course code	140
Course type	Mandatory
Course level	Undergraduate
Year of studies	3
Semester	5
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH107
Hours per week	5
Instructor(s)	D. Giagopoulos

Course content: Free vibration and forced response of single degree of freedom linear oscillators to impulsive, harmonic, periodic and transient excitation (natural frequency, damping ratio, resonance). Response of multiple degree of freedom linear oscillators (formulation of the equations of motion, determination of natural frequencies and mode shapes, modal analysis). Axial, torsional and bending vibration of bars. Applications (measurement and evaluation of vibration characteristics, vibration isolation, vibration absorption, balancing, torsional vibration). The course, beyond the theoretical teaching, introduces the student and into programming, based on application programs in an environment of MATLAB.

Expected learning outcomes and competences to be acquired: Understanding the basic principles of oscillatory phenomena in mechanical structures, the basic principles of finite element method and the study of practical applications in industry.

Prerequisites	Dynamics
Teaching methods	Lectures (13 weeks x 3 hour of Theory and 2 hours of Exercises) and homeworks.
Assessment methods:	Final written exam
Language of instruction	Greek

Recommended bibliography

[1] Vibrations of Mechanical Systems, S. Natsiavas, Zitis Publ.(in Greek), 2001.
[2] Vibrations and Waves , S. Paipetis, D. Polyzos, Stella Parikou Publ.(in Greek), 2003.

141 English I	Sm.	C.H.	ECTS
	1	2	2

Course title	English I

Course code	141
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	1st
Semester	1st
ECTS Credits	2
URL	eclass.uowm.gr/courses/ICTE141/
Hours per week	2
Instructor:	S. Christidou

Course content: The Field of Mechanical Engineering, An evolving profession, Some sectors where mechanical engineers work, An introduction to fluid mechanics, Blaise Pascal and his contribution to hydrostatics, Archimedes and the second principle of hydrostatics, Automobile industry materials.

Expected learning outcomes and competences to be acquired: The general goal of the course is to familiarize the students with the English terminology of their field, in order to acquire the necessary skills which will allow them to comprehend extended texts on their subject of study. Furthermore, the students should reach the level where they could use their oral skills to face several different communication instances considering their field. In general, the students practice all of the four basic language skills: reading comprehension, writing, speaking and listening, with the assistance of mechanics- related learning material. The course also aims at teaching terminology of various sectors of the field of Mechanics, and additionally helping the students find the expressive tools to communicate their knowledge to their reader or listener. The teaching is performed exclusively in English, and at the end of the semester there is a presentation, on part of the students, of an optional assignment on a given mechanics-related subject. The procedures of this presentation follow the rules of an official mechanics conference, the audience being their colleagues.

Prerequisites:	-
Teaching methods:	2 hours per week of theory combined with participatory teaching.
Assessment:	a) Assignment and presentation 25%, Active participation 25%, Final exam 50% b) Assignment and presentation 25%, Final exam 75% c) Active participation 25%, Final exam 75% d) Final exam 100%
Language of instruction	English

142 English II	Sm.	C.H.	ECTS
	2	2	2

Course title	English II

Course code	142
Course type	Compulsory
Course level	Undergraduate (first cycle)
Year of studies	1st
Semester	2nd
ECTS Credits	2
URL	eclass.uowm.gr/courses/ICTE142/
Hours per week	2
Instructor:	S. Christidou

Course content: An Introduction to Thermodynamics, The first, second and third laws of thermodynamics, Thermodynamic cycles, Heat engines, Gasoline engines, Petrol engines, The 4-stroke cycle of a petrol engine, External combustion engines, Steam engine, the steam turbine, reciprocating steam engine, Internal combustion engines, The tw-stroke cycle gasoline engine, Diesel engine, Electric motor, Diesel vs. gasoline engines

Expected learning outcomes and competences to be acquired: The general goal of the course is to familiarize the students with the English terminology of their field, in order to acquire the necessary skills which will allow them to comprehend extended texts on their subject of study. Furthermore, the students should reach the level where they could use their oral skills to face several different communication instances considering their field. In general, the students practice all of the four basic language skills: reading comprehension, writing, speaking and listening, with the assistance of mechanics- related learning material. The course also aims at teaching terminology of various sectors of the field of Mechanics, and additionally helping the students find the expressive tools to communicate their knowledge to their reader or listener.
The teaching is performed exclusively in English, and at the end of the semester there is a presentation, on part of the students, of an optional assignment on a given mechanics-related subject. The procedures of this presentation follow the rules of an official mechanics conference, the audience being their colleagues.

Prerequisites	English I
Teaching methods	2 hours per week of theory combined with participatory teaching.
Assessment	a) Assignment and presentation 25%, Active participation 25%, Final exam 50% b) Assignment and presentation 25%, Final exam 75% c) Active participation 25%, Final exam 75% d) Final exam 100%
Language of instruction	English

144 Linear Algebra		Sm.	C.H.	ECTS
		1	3	3.5
Course title	Linear Algebra			
Course code	144			
Course type	Compulsory			
Course level	Undergraduate (first cycle)			
Year of studies	1st			
Semester	1st			
ECTS Credits	3,5			
URL	eclass.uowm.gr/courses/ICTE211/			
Hours per week	3			
Instructor(s)	K. Balassas			

Course content: Vector Calculus. Straight Lines, Surfaces and Curves in Space. Vector Spaces and Vector Subspaces. Linear independence, Bases and dimension of vector Spaces. Matrices and Determinants. Finite-dimensional linear mappings. Matrices of linear maps. Systems of Linear Equations and Matrices. Solution of Systems of Linear Equations. Eigenvalues-Eigenvectors. Matrix Diagonalization, Quadratic Forms.

Expected learning outcomes and competences to be acquired: Upon successful completion of this course, students will be able:

- to know and manage the general form of curves and surfaces,
- to understand and use concepts of vector spaces,
- to use matrices as tools in theoretical and numerical computations,
- to compute eigenvalues and eigenvectors,
- to compute determinants,
- to solve systems of linear equations,
- to manage and use matrix diagonalization.

Prerequisites	-
Teaching methods	Lectures, exercises
Assessment methods	Written final exam (100%)
Language of instruction	Greek

Recommended bibliography:

[1] G. Strang, Γραμμική Άλγεβρα και Εφαρμογές, Πανεπιστημιακές Εκδόσεις Κρήτης, 2009.
[2] Α. Κυριαζής, Εφαρμοσμένη Γραμμική Άλγεβρα, Νικητόπουλος Ε & Σια ΟΕ, 2006.
[3] G. Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, 2003.
[4] Τζουβάρας Θεόδωρος, Γραμμική Άλγεβρα Ι (και ΙΙ), Σαββάλας 2001.
[5] Κουτελιέρης, Σιάννη, Γραμμική Άλγεβρα για Μηχανικούς, Τζιόλας 2005.
[6] Serge, Land, Linear Algebra, Springer Verlag Berlin and Heidelberg GmbH & Co. KG, 1993.

[7] Richard C., Penney, Linear Algebra, John Wiley and Sons Ltd, 1998.

146 Mechanical Drawing II		Sm.	C.H.	ECTS
		2	4	6
Course title	Mechanical Drawing II			
Course code	146			
Course type	Compulsory			
Course level	Undergraduate (first cycle)			
Year of studies	1			
Semester	2			
ECTS Credits	6			
URL	http://eclass.uowm.gr/courses/MECH140			
Hours per week	4			
Instructor(s)	N. Sapidis			

Course content: Computer-aided mechanical drawing (CAD), Projection methods (intersections and developments of geometric solids), Manufacturing processes (surface quality, surface roughness, selection criteria for manufacturing processes, symbols and regulations, notations for heat treatments and hardness processes), Tolerances (dimensional tolerances, fits and fittings, standardization according to ISO, tolerances of form/orientation/location), Power transmission elements (shafts, bearings, wedges, splines, gear geometry and notation, types of gears, sprockets), drawing of mechanical assemblies (e.g., gearboxes), Three-dimensional (3D) representation (types of 3D representations, oblique projection, axonometric projection, perspective representation).

Expected learning outcomes and competences to be acquired : Understanding and ability to apply advanced mechanical-drawing concepts, methods and tools, related to (among others) manufacturing processes, tolerances, fits and fittings, geometric intersections and 3D representations. Ability to produce an ISO-compatible drawing for a low-complexity mechanical assembly addressing all aspects mentioned above.

Prerequisites	Mechanical Drawing I, Mathematics I, Physics, English I
Teaching methods	Lectures (13 weeks x 2 hour of Theory and 2 hours of Drawing Exercises)
Assessment methods	80% final written exam, 20% mid-term exam.
Language of instruction	Greek

Recommended bibliography

[1] A. Antoniadis, “Mechanical Drawing”, 2nd Ed., Tziolas Publications, 2013 (in Greek).

[2] K.-D. Bouzakis, “Rules of Mechanical Drawing”, ZHTH Publications, 2003 (in Greek).

147 Operations Research I		Sm.	C.H.	ECTS
		5	5	5.5
Course title	Operations Research I			
Course code	147			
Course type	Mandatory			
Course level	Undergraduate (first cycle)			
Year of studies	3			
Semester	5			
ECTS Credits	5.5			
URL	http://eclass.uowm.gr/courses/MECH165/			
Hours per week	5			
Instructor(s)	G. Nenes			

Course content: Introduction to optimization, mathematical programming models, variables, objective function parameters, constraints. Linear programming theory, graphical solution, Simplex method, sensitivity analysis. Linear programming problem solving using computer software (lindo, lingo, EXCEL solver). Integer programming. Branch and Bound algorithm. Binary programming. Applications to real-world problems.

Expected learning outcomes and competences to be acquired: Understanding the basic mathematical programming (Linear and Non-linear) concepts and methods. Ability to model real-world operational problems by the development of appropriate mathematical programming models. Ability to solve mathematical programming models by employing the appropriate operations research methodologies and algorithms. The ability to handle data and solve mathematical programming models using computer software. The ability to perform sensitivity analyses on the results of operations research problems. Interpretation of the results of an operations research problem's solution.

Prerequisites	Statistics
Teaching methods	Hours of Instruction 65 (Theory: 39, Exercises: 26)
Assessment methods:	Final written exam (compulsory) , Intermediate written exam (optional)
Language of instruction	Greek

Recommended bibliography

[1] Case Studies of Operations Research, Vol. A, A. K. Georgiou, G. S. Oikonomou, G. D. Tsiotras. Benou Publ., 2006.
[2] Quantitative Analysis, Vol. A and B, D. P. Psoinos. Ziti Publ., 1993.
[3] Operations Research, P. G. Ypsilantis. Propobos Publ., 2007.

[4] Quantitative Analysis for Management Decision Making, Vol. A and B, G. S. Oikonomou, A. K. Georgiou. Benou Publ., 2000.
[5] Introduction to Operations Research, Hamdy A. Taha, translation: A. I. Margaris. Tziola Publ., 2011.

149 Technology and Innovation, Introduction to Economics Sm. C.H. ECTS
2 3 4

Course title	Technology and Innovation, Introduction to Economics
Course code	149
Course type	Compulsory Course
Course level	Undergraduate (first cycle)
Year of studies	1
Semester	2
ECTS Credits	4
URL	http://elearn.materlab.eu/course/view.php?id=14
Hours per week	3
Instructor(s)	E. Samara

Course content: Size and business development – the overall financial budget of enterprises – investment and financing – financing and capital composition Styles – Foreign and Credit Capital – Developmental regimes – Other forms of finance – balance sheet and income statement – Indicators of profitability on invested capital – Balanced Scorecard.

Expected learning outcomes and competences to be acquired: The aim of this course is to introduce the student to basic economic principles, which govern the operation of the business units, to analyze the contribution of each one of them in the capital's profitability and measuring longitudinal indicators shows the effective operation of the enterprise. Also gives the student the ability to comprehend simple fundamentals that govern workplace Business Strategy, and to analyze the contribution of each aspect of the strategy to develop the business project

Prerequisites	-
Teaching methods	Lectures (13 wks x 2 hrs theory and 2 hrs computer based laboratory exercises) and two homework projects.
Assessment methods	80% final written exam, 20% one homework project or/and a computer-based intermediate exam
Language of instruction	Greek

Recommended bibliography

[1] Book, E. Carayiannis, Y.L Bakouros, “Innovation and Entrepreneurship: Theory and Practice”, 2010

199 The Mechanical Engineering Capstone project	Sm.	C.H.	ECTS
	5	4	4

Course title	The Mechanical Engineering Capstone project
Course code	199
Course type	Obligatory
Course level	Undergraduate
Year of studies	3
Semester	5
ECTS Credits	4
URL	
Hours per week	4
Instructor(s)	A. Tourlidakis

Course content The Mechanical Engineering Capstone project is an early requirement for graduation. The course is a multifaceted assignment designed to encourage students to think critically, solve challenging problems, and develop research skills, planning, goal setting, and skills on oral communication, public speaking, teamwork, self-sufficiency, skills that will help prepare them for their thesis research and writing and generally for modern careers. The projects adopted by students should be interdisciplinary ie. requiring students to apply skills or investigate issues across many different subject areas or domains of knowledge, connecting their projects to community issues or problems, and integrating outside-of-school learning experiences, including activities such as scientific observations, interviews, or internships.

Specific content of taught crash courses includes: The role and importance of scientific research – The ethics of research – The research process: Basic terminology, choice of problem areas, revision of research – Structure of a research proposal – Systems of bibliographic reference – Plagiarism – Systematic literature review – Reference lists and bibliographic data bases – Debate techniques

Expected learning outcomes and competences to be acquired After completion of the course the student should be able to:

- Complete a research /review project
- Critically think about challenging problems
- Address interdisciplinary subjects and teamwork
- Recognize the writing techniques of different forms of scientific research
- Skillfully communicate his research results to peers
- Understand the oral and written rules of scientific reasoning

Prerequisites	-
Teaching methods	Instruction of theory, discussion of applications and individual projects, community based learning, project based learning
Assessment methods	30% participation in class, 70% final assignment
Language of instruction	Greek
Recommended bibliography	Material assembled by the instructor

204 Steam Generators I	Sm.	C.H.	ECTS
	7	5	5.5

Course title	Steam Generators I
Course code	204
Course type	Mandatory Course
Course level	Undergraduate
Year of studies	5
Semester	7
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH162/
Hours per week	5
Instructor(s)	A. Tomboulides

Course content: Preliminary concepts. Optimization of thermodynamic efficiency in steam plants. Energy and exergy efficiency. Evolution of steam power plants. Criteria and classification of modern Steam Generators with natural and forced circulation and once-through flow. Flow of energy. Losses and boiler efficiency. Characteristic temperatures. Stoichiometric combustion and fuel-air ratio. Combustion of fuel mixtures. Incomplete combustion. Ash. Slugging and fouling. Combustion of pulverized coal. Drying and grinding of solid fuels. Solid, liquid, and gaseous fuel burners. Combined cycle power plants. Important parameters. Laboratory exercises designed for the understanding of flame geometry, emissions and heat engineering calculations.

Expected learning outcomes and competences to be acquired: This course focuses on the understanding of the principles of operation, thermodynamic optimization and classification of steam-generation facilities. Efficiency of individual systems, combustion of solid, liquid and gaseous fuels, and combined cycle power generation.

Prerequisites	Heat Transfer, Thermodynamics II
Teaching methods	Oral presentations and exercises
Assessment methods	Written exam, Final exam 70%, midterm exam 30%
Language of instruction	Greek

Recommended bibliography

[1] Steam Generators I: General Principles, N. Papageorgiou
[2] Technical Natural Processes II: Steam Power Plant Facilities, volume B, B. A. Sotiropoulos
[3] Steam Power Plants, E. Kakaras

205 Turbomachinery		Sm.	C.H.	ECTS
		8	5	5.5
Course title	Turbomachinery			
Course code	205			
Course type	Mandatory			
Course level	Undergraduate (first cycle)			
Year of studies	4			
Semester	8			
ECTS Credits	5.5			
URL	http://eclass.uowm.gr/courses/MECH158/			
Hours per week	5 (3 hours of Theory Lectures, 2 hours of exercises and tutorials)			
Instructor(s)	A. Tourlidakis			

Course content: Introduction. Applications and basic concepts of turbomachinery. Basic principles of fluid mechanics and thermodynamics. Velocity diagrams. Energy conversion in turbomachinery, efficiency, degree of reaction. Phase changes and cavitation. Characteristic curves of turbomachines and of systems, determination of operating point, connection in parallel and in series. Concepts of similarity, dimensional analysis, non-dimensional numbers, specific speed, non-dimensional cavitation numbers. Axial machines, airfoil theory, flow phenomena and forces on airfoils, non-dimensional numbers, cascade analysis, deviation angle. Radial equilibrium theory. Secondary flows and losses. Axial pumps, axial compressors and blowers, instability phenomena, supersonic flow compressors. Axial turbines, degree of reaction, types and mechanisms of aerodynamic losses in airfoils, turbine blade cooling. Hydraulic turbines. Centrifugal compressors and pumps, flow and velocity diagrams, manufacturing aspects, blade design, exhaust system.

Expected learning outcomes and competences to be acquired : The main aim of the course is to provide to the student to the principles governing the operation of turbomachinery. The student will gain knowledge and in depth understanding of the principles of operation, flow phenomena and design characteristics of turbomachinery components. The student will also gain experience in using specific techniques of analysis, design and selection of various classes of turbomachinery. The student will be able to use basic principles of Fluid Mechanics and Thermodynamics in order to design and analyze various types of turbomachinery such as pumps, compressors, turbines, wind turbines etc. He will learn how to effectively use open source software for aerodynamic airfoil analysis as well as software for the design and analysis of gas turbines.

Prerequisites	Mathematical Analysis I, Mathematical Analysis II, Fluid Mechanics I, Fluid Mechanics II, Thermodynamics, Heat Transfer

Teaching methods	Lectures, exercises, laboratory tutorials for the use of commercial software. Homework and personal assignments with the application of commercial software on real design and analysis problems. Utilization of information technology for the course management.
Assessment methods:	Final examination, intermediate examination, two individual assignments
Language of instruction	Greek

Recommended bibliography

[1] Basic Principles of Turbomachinery, Nanousis Nanousis, Stamoutsos, ISBN: 978-960-411-414-6

[2] Basic Principles of Turbomachinery, Goulas Apostolos.

[3] Fluid Mechanics and Thermodynamics of Turbomachinery, S.L.Dixon, Elsevier, Fifth Edition.

206 Internal Combustion Engines	Sm.	C.H.	ECTS
	7	5	4.5

Course title	Internal Combustion Engines
Course code	206
Course type	Elective Course
Course level	Undergraduate
Year of studies	4
Semester	7
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH125/
Hours per week	5
Instructor(s)	D. Kolokotronis – A. Tomboulides

Course content: Energetic issues of internal combustion engines. Ideal, adopted, and real cycle. Mean pressures and efficiencies of the above cycles. Quality factor. Mechanical efficiency. Energy balances. Supercharging. Distribution, mixture formation, ignition, combustion, flame speed. Pollution due to IC Engines, pollution control. Analysis of indicator diagram. Control practices, representative operation curves at different loads. Operation at partial load. Detailed study of the real cycle of reciprocating engines. Experimental determination of representative cycle characteristics. Control. Heat losses. Basic phenomena and criteria. Cooling systems. Gas flow. Gas exchange mechanisms. Scavenging and supercharging systems.

Expected learning outcomes and competences to be acquired: This course provides knowledge of the basic principles of operation and thermodynamics of the internal

combustion engines as long as analysis of the operational parameters, indicator diagram, combustion and intake and exhaust processes in natural aspirated and supercharged engines. It is expected that at the end of the course, students familiarize with the above so they are able to study and understand ICE operation for various applications by means of deep study of theory and exercises.

Prerequisites	Thermodynamics I, Thermodynamics II, Fluid Mechanics I
Teaching methods	Oral presentations and exercises
Assessment methods:	Final written exam (compulsory), course project (optional)
Language of instruction	Greek

Recommended bibliography

[1] Internal Combustion Engine Fundamentals, Heywood J., McGraw Hill Education, 1988

[2] Internal Combustion Engines, Energy Performance, transl. Koltsakis G., Grapholine Papouli, 2007

[3] Internal Combustion Engines, Kiriakis N., Sophia Editions, 2006

[4]Principles of Internal Combustion Piston Engines, Rakopoulos K., Fountas Editions, 1988

207 Heating - Ventilation - Air-Conditioning	Sm.	C.H.	ECTS
	7	5	5.5

Course title	Heating, Ventilation and Air-Conditioning
Course code	207
Course type	Elective
Course level	Undergraduate (second cycle)
Year of studies	4
Semester	7
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH216/
Hours per week	5
Instructor	G. Panaras

Course content: Introduction: Targets of HVAC, historical background, review of the basic principles of thermodynamics and heat transfer. Thermal comfort: definition and influencing parameters. Psychrometrics: The thermodynamic properties of moist air and the processes to control them. Heating: Compliance with legislation requirements for building insulation, computation of building heat losses, description of common heating systems, selection and sizing of heating system components. Principles of solar radiation. Heat gains. Air-conditioning: description of common air-conditioning systems, computation of cooling loads, selection and sizing of main components and air- ducts. Cooling: Cooling cycles

with vapor as a working fluid, common refrigerants, heat pumps, evaporative cooling. Absorption cooling cycles.

Expected learning outcomes and competences to be acquired: Through the course, the student is introduced to the basic principles of heating, ventilation and air-conditioning (HVAC), as well as the design and analysis of HVAC systems. The student applies the acquired knowledge by performing two case-studies of HVAC system design; one case study refers to a heating problem while the other refers to a cooling one.

Prerequisites	Heat Transfer, Thermodynamics I
Teaching methods	Hours of Instruction 65
Assessment methods	Final written exam (compulsory), two HVAC projects (optional). 70% final exams, 30% student projects for the calculation of the final grade.
Language of instruction	Greek

Recommended bibliography:

[1] Heating, Ventilation and Air-Conditioning. Leggas S., Parikos D., Parikou Ed., 2008.

[2] Heating, Ventilation and Air-Conditioning. Analysis and Design (in Greek). McQuiston Faye C., Parker Jerald D., Vrachopoulos M. (responsible for the Greek version), Parikou Ed., 2008

210 Unit Operations	Sm.	C.H.	ECTS
	8	4	4.5

Course title	Unit Operations
Course code	210
Course type	Elective
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	8
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH180/
Hours per week	4
Instructor(s)	E. Kikkinides

Course content: Introduction to the basic conservation laws: Momentum, heat and mass transfer. Absorption processes. Phase equilibrium and Henry's law. Absorption using packed towers and transfer units. Resistances to mass transfer between the two phases. Design of absorption towers for dilute and concentrated mixtures. Analytical and graphical methods. Distillation process. Phase equilibrium

in binary mixtures. Ideal and azeotropic mixtures and Raoult's law. McCabe Thiele's graphical method and Lewis's computational method. Short-cut methods for the distillation of multi-component mixtures. Cooling Towers. Design using short-cut methods. Adsorption methods. Equilibrium isotherms, Langmuir's equation. Use of laboratory scale experimental breakthrough curves to design middle scale columns. Membrane processes for gas and liquid separations. Simple and complex flow models. The well mixed model; analytical expressions and design equations. Filtration methods: reverse osmosis, hyper-filtration and micro-filtration. Mechanical separations.

Expected learning outcomes and competences to be acquired: This course aims to introduce the student to traditional and novel unit operation processes used in the industry. The student understands first the basic physicochemical mechanisms of each process and then learns to design each process using short-cut or detailed (graphical or computational) methods.

Prerequisites	Thermodynamics II, Introduction to Environmental Technology
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)
Assessment methods	Final written exam (80% of the final grade), optional midterm exam (20% of the final grade)
Language of instruction	Greek

Recommended bibliography

[1] McCabe W.L.-Smith J.C. , Harriot P., 6th ed., McGraw Hill (transl. In Greek) 2003
[2] Assael M., Maggiliotou C., Introduction to Unit Operations (in Greek), 1998.
[3] Complementary notes by the instructor.

219 Automatic Control Systems		Sm.	C.H.	ECTS
		7	5	5.5
Course title	Automatic Control Systems			
Course code	219			
Course type	Mandatory			
Course level	Undergraduate (first cycle)			
Year of studies	4			
Semester	7			
ECTS Credits	5.5			
URL	http://eclass.uowm.gr/courses/MECH219/			
Hours per week	5			
Instructor:	K. Rallis			

Course content: Introduction to Automatic Control Systems. Mathematical preliminaries:. Laplace transform and Transfer Functions. State variable models.

Closed-loop response. Stability Analysis Ruth-Hurwitz. Root locus method. Methods of Systems Analysis in Frequency domain. Frequency Stability domain. Design closed-loop system with root locus, Bode diagrams, advance, lag, three term control: proportional - integral - derivative, PID.

Expected learning outcomes and competences to be acquired: To introduce the student to basic knowledge of theory (analysis and design) of Automatic Control Systems using appropriate software tools.

Prerequisites	Mathematical Analysis Physics, Introduction to Computing, Electrotechnics .
Teaching methods	Lectures and tutorials
Assessment methods	70% written exam, 30% midterm
Language of instruction	Greek

224 Strategic Management	Sm.	C.H.	ECTS
	8	4	4.5

Course title	Strategic management (The course is not running during the current academic year)
Course code	224
Course type	Elective course
Course level	Undergraduate
Year of studies	4
Semester	8
ECTS Credits	4.5
URL	
Hours per week	4
Instructor(s)	-

Course content: The nature of strategic management – corporate vision – The external business environment – The internal business environment – Designing a strategic plan – Strategic management in practice – Application, evaluation and control of strategies – Analysis of case studies

Expected learning outcomes and competences to be acquired: After completion of the course the student should be able to:

- Understand the basic principles of corporate strategic management
- Analyze the contribution of individual aspects to the development of a strategic management plan
- Design a simple strategic management plan,
- Develop basic steps for its implementation
- Evaluate its effectiveness

Prerequisites	-
Teaching methods	Instruction of theory / Discussion / Case studies / Simulations / Action learning (mini-internships with organizations analyzing or redesigning practices)
Assessment methods	Project work plan 10%, Intermediate report 20%, Final report 70%
Language of instruction	Greek

Recommended bibliography

[1] J. David Hunger and Thomas L. Wheelen 2007. Essential of Strategic management

228 Computational Mechanics I	Sm.	C.H.	ECTS
	7	4	4.5

Course title	Computational Mechanics I
Course code	228
Course type	Elective
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	7
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH186/
Hours per week	4
Instructor(s)	E. Kikkinides

Course content: Introduction. The conservation laws and their mathematical foundation and description using Partial Differential Equations (PDE's). Non-dimensionalization and boundary condtions. Boundary value problems solution procedure. Finite difference methods. Physical domain discretization. Simple and complex expressions. Higher order approximations. Finite difference methods for parabolic PDE's. Model equation case. Explicit and implicit methods. Application: Numerical solution of the transient diffusion (or conduction) equation. Finite difference methods for elliptic PDE's. Model equation case. Solution using direct and iterative processes. Successive Over Relaxation (SOR) methods. The Alternate Direction Implicit (ADI) method. Application: Numerical solution of Laplace's or Poisson's equation. Finite difference methods for hyperbolic PDE's. Model equation case. Up-winding and the problem of artificial dispersion/viscosity. Lax and Lax-Wendroff methods. Mc Cormack's method. Application: Wave propagation in one-dimension. Non-linear problems. Application: Solution of Burger's equation. Introduction in the solution of the Navier Stokes equations.

Expected learning outcomes and competences to be acquired: Aim of this course is to make the student become familiar with the basic concepts of computational

techniques and the acquisition of the necessary knowhow to solve engineering problems requiring the solution of differential conservation laws in the fluid or solid state. Several techniques will be examined and evaluated in terms of accuracy, stability and consistency.

Prerequisites	Mathematics II, Numerical Analysis, Fluid Mechanics I, Heat transfer
Teaching methods	Hours of Instruction 52 (Theory: 32, Laboratories: 20)
Assessment methods:	Final written exam (40% of the final grade) , three term papers (60% of the final grade) and one optional term paper for bonus.
Language of instruction	Greek

Recommended bibliography

[1] Pozrikidis C. Numerical methods in Science and Engineering 6th ed. McGraw Hill (transl. in Greek).
[2] Bergeles G., Computational fluid mechanics (in Greek)
[3] Complementary notes by the instructor.

230 Quality Control	Sm.	C.H.	ECTS
	7	4	4.5

Course title	Quality Control
Course code	230
Course type	Elective Course
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	7
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH167/
Hours per week	4
Instructor(s)	G. Nenes

Course content: Introduction: brief history of quality methodology, quality management, quality costs, methods for quality improvement. Acceptance sampling: lot-by-lot acceptance sampling for attributes, single, double and multiple sampling plans, statistical and economic design. Statistical Process Control: capability analysis, control charts for attributes and variables, statistical and economic design. Planning, organizing and developing quality systems for industry.

Expected learning outcomes and competences to be acquired: The course presents systematically the modern methods of quality assurance placing special emphasis on the techniques of Statistical Quality Control (SQC). After the completion of the

course the students should be able to handle and solve problems related to control and assurance of quality of products and processes by means of scientifically rigorous quantitative methods.

Prerequisites	Statistics
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)
Assessment methods	Final written exam (compulsory) , Intermediate written exam (optional)
Language of instruction	Greek

Recommended bibliography

[1] Statistical Quality Control, G. N. Tagaras. Zitis Publ., 2001.
[2] Management and Statistical Quality Control, Ch. Kitsos, Newtech Publ., 2003

232 Machine elements III	Sm.	C.H.	ECTS
	7	5	4.5

Course title	Machine elements III (The course is not running during the current academic year)
Course code	232
Course type	Elective Course
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	7
ECTS Credits	4.5
URL	-
Hours per week	5
Instructor(s)	-

Course content: Power transmission. Flat, synchronous and V-belts. Design of machine parts produced by die casting. Planetary gear trains. Nonparallel coplanar and non-coplanar gears. Worms and wormgears. Gearboxes. Design of power transmission systems.

Expected learning outcomes and competences to be acquired: Presentation, understanding and applying the principles and rules-Design of mechanical design through the analysis of specific machine elements with the aim of composition engineering.

Prerequisites	Statics, Strength of Materials, Mechanical Drawing, Machine Elements I & II
Teaching methods	Hours of Instruction 65 (Theory: 39, Exercises: 26) and 3 semester exercises (optional)
Assessment methods	Final written exam 70% and 30% exercises
Language of instruction	Greek

Recommended bibliography
[1] Machine Elements, Graikousis R., 2nd volume, Giapoulis S. & SIA O.E. Publ., 2013.

235 Manufacturing processes	Sm.	C.H.	ECTS
	8	5	4.5

Course title	Manufacturing processes (The course is not running during the current academic year)
Course code	235
Course type	Elective Course
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	8
ECTS Credits	4.5
URL	-
Hours per week	5
Instructor(s)	-

Course content: Manufacturing technology with material removal. Mechanic of the cutting processes. Tool wear and life time of uncoated and coated tools. Optimization of cutting conditions. Determination of cutting force components. Cutting tools, material of cutting tools. Grinding, grinding kinematics and tools. Grinding Technologies. Gear manufacturing processes, gear hobbing, shaping, shaving grinding, lapping. Measurement of gear accuracy. Non-conventional methods for metal removal, Electroerosion. Laser applications in cutting.

Expected learning outcomes and competences to be acquired: Student's familiarity with various methods and technologies for product manufacturing processes.

Prerequisites	Materials Science and Technology I & II, Fundamentals of Machining
Teaching methods	Lectures
Assessment methods	Final written exam
Language of instruction	Greek

Recommended bibliography
[1] Manufacturing processes with material removal, Bouzakis K.-D., Ziti Publ., 2010.

240 Electromechanical Applications		Sm.	C.H.	ECTS
		8	4	4.5
Course title	Electromechanical Applications			
Course code	240			
Course type	Elective			
Course level	Undergraduate (second cycle)			
Year of studies	4			
Semester	8			
ECTS Credits	4.5			
URL	http://eclass.uowm.gr/courses/MECH171/			
Hours per week	4			
Instructor(s)	Th. Theodoulidis			

Course content: Syllabus: Electromechanical installations: electrical installations of buildings. Electromechanical applications: nondestructive testing of materials and structures.

Expected learning outcomes and competences to be acquired: Introduction to the studies of electromechanical installations and study of applications where a synthesis of knowledge and tools of Electrical and Mechanical Engineer are required. Based on the laboratory exercises, the student acquires knowledge and capabilities in performing real Non Destructive Inspections by using at least three methods.

Prerequisites	Electrotechnics
Teaching methods	Hours of Instruction 52 (Theory: 39, Laboratory: 13)
Assessment methods	One electric installation study (compulsory) , Laboratory assignments (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Electric installations of buildings, S. Touloglou, ION Editions, 2004.
[2] Electric installations of consumers, P. Ntokopoulos, Zisis Editions, 2005.

241 Systems Reliability, Maintenance and Safety		Sm.	C.H.	ECTS
		8	5	5.5
Course title	Systems Reliability, Maintenance and Safety			
Course code	215			
Course type	Compulsory Course			
Course level	Undergraduate (first cycle)			
Year of studies	4			
Semester	8			
ECTS Credits	5.5			
URL	http://elearn.materlab.eu/course/view.php?id=2			

Hours per week 5
Instructor(s) I. Bakouros

Course content: Reliability theory, reliability distributions, exponential distribution, distribution gamma, Weibull distribution, normal distribution. Systems reliability, reliability estimation, Markov reliability chains, estimation of reliability using generic parts, fault tree analysis, Monte-Carlo Simulation, Duane model. Reliability data collection, cost estimation, maintenance policies, maintenance indices, economic implications of idle time. The theory of replacement, deterministic and stochastic replacement policies. Preventive maintenance, total productive maintenance TPM, Use of simulation in maintenance

Expected learning outcomes and competences to be acquired : This graduate subject aims to introduce the student into the theory of reliability, maintenance and risk simple or complex mechanical parts or machines. It helps the student to combine his knowledge of theory of statistics with solving reliability problems and applying scientific based maintenance policies in any industrial environment.

Prerequisites	Statistics
Teaching methods	Lectures (13 wks x 2 hrs theory and 2 hrs computer based laboratory exercises) and two homework projects.
Assessment methods	70% final written exam, 30% one homework project or/and a computer-based intermediate exam
Language of instruction	Greek

Recommended bibliography
[1] Book, Y.L Bakouros, “Reliability and Maintenance”, 2010

246 Inventory and Supply Chain Management	Sm.	C.H.	ECTS
	8	4	4.5

Course title	Inventory and Supply Chain Management
Course code	246
Course type	Elective course
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	8
ECTS Credits	4,5
URL	http://eclass.uowm.gr/courses/MECH169/
Hours per week	4
Instructor(s)	G. Nenes

Course content: Introduction: The significant role of Inventory management and Logistics. Introduction to Supply Chain Management. Forecasting Methods. Deterministic systems of inventory management: (a) the case of known and constant demand (EOQ methods) and (b) the case of known and inconstant. Stochastic systems of inventory management: sQ, RS, sS, RsS systems. Seasonable and innovative products (Newsvendor problem). Supply Chain Management and multi-echelon inventory optimization.

Expected learning outcomes and competences to be acquired: Understanding of the terms Logistics and Supply Chain Management. Learning quantitative inventory management methods for the case of deterministic and stochastic demand. Solving numerical examples and problems with the application of the introduced quantitative methods. Development of critical skill to choose and apply the appropriate quantitative method depending on the case under study.

Prerequisites	Statistics
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)
Assessment methods	Final written exam (compulsory) , Intermediate written exam (optional)
Language of instruction	Greek

Recommended bibliography

[1] Logistics: A quantitative approach, Vidalis M, Kleidarithmos Publ., Athens 2009.
[2] Production Planning, Pappis K, Stamoulis Publ., Athens 2006.
[3] Design and optimization of Supply Chain Management, Marinakis I, Mygdalas A, Sofia Publ., Thessaloniki 2008.
[4] Inventory Management and Production Planning and Scheduling, Silver EA, Pyke DF, Peterson R, John Wiley and Sons 3rd ed., New York 1998.

249 Fluid Mechanics II	Sm.	C.H.	ECTS
	8	4	5.5

Course title	Fluid Mechanics II
Course code	249
Course type	Compulsory (or Elective)
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	8
ECTS Credits	5.5
URL	http://eclass.uowm.gr/courses/MECH137/
Hours per week	4
Instructor(s)	E. Konstantinidis

Course content: Review of basic principles of fluid mechanics. Mathematical description of isothermal flow, continuity and Navier-Stokes equations. Boundary layer theory and practice, flow parallel to a flat plate, velocity profile, Pandtl's analysis, Blaussius solution, momentum-integral analysis, skin friction, turbulent boundary layers, law of the wall, effect of surface roughness, boundary layers in flows with pressure gradients, flow separation. External flow over submerged bodies, drag coefficient, aero/hydrodynamic forces on submerged bodies, effect of Reynolds number, unsteady phenomena, flow over a circular cylinder, vortex shedding, Strouhal number, vortex-induced vibrations, vehicle aerodynamics, flow past airfoils, lift, drag-lift curve, dynamic stall. Transition to turbulence, types of transition, linear stability analysis, Orr-Somerfield equation, shear layers and wakes. Turbulent flows, statistical description of turbulence, integral scales, inertial subrange, Kolmogorov theory, energy dissipation, turbulence modelling, eddy viscosity, Reynolds-Averaged Navier-Stokes equations, large-eddy simulation, direct numerical simulation. Compressible flow, speed of sound, Mach number, unidirectional adiabatic and isentropic flow, normal shock waves, Fanno and Raileigh flow. Two-dimensional compressible flows, oblique shock waves.

Expected learning outcomes and competences to be acquired: The course aims to the comprehensive treatment of Fluid Mechanics principles and their application to the study of engineering flows. The phenomenology and the mathematical description of a variety of flows is covered with a view to develop the understanding and skills required for the solution of practical problems.

Prerequisites	Fluid Mechanics I, Thermodynamics I
Teaching methods	lectures and tutorials
Assessment methods	25% homework (x3), 75% final written exam
Language of instruction	Greek

Recommended bibliography

[1] Goulas A., Fluid Mechanics, Giaxoudi, 2005 (in greek)
[2] Tsangaris S., Fluid Mechanics, Symeon, 2005 (in greek)
[3] White F.M., Fluid mechanics, 5th edn., McGraw-Hill, 2003.

250 Experimental methods and Measurement technology	Sm.	C.H.	ECTS
	7	4	7.5

Course title	Measurement Science and Technology
Course code	250
Course type	Elective
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	7

ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH156/
Hours per week	4
Instructor(s)	E. Konstantinidis

Course content: Measurement science: mathematical description of measurement systems, input-output signal characteristics, transfer function, measurement standards, static and dynamic calibration, bias and random errors, statistical analysis of data, measurement uncertainty and error propagation, analogue and digital signal processing. Measurement techniques for temperature, static and dynamic pressure, local flow velocity, flowrate, strain, displacement, force and torque.

Expected learning outcomes and competences to be acquired: This course introduces the student to the basic principles of measurement techniques in mechanics. The students become familiarized with the design of experimental plans, the operation of measurement instruments, and the analysis of data through laboratory exercises.

Prerequisites	Fluid Mechanics I, Heat Transfer, Statistics
Teaching methods	lectures, tutorials and laboratory exercises
Assessment methods	30% laboratory reports, 70% final written exam
Language of instruction	Greek

Recommended bibliography

[1] Bergeles, Papantonis, Tsangaris, Measurement Techniques for Fluid Flow, Symeon, 1998
[2] Goulas, A. Measurement Techniques in Fluid Mechanics, Giaxoudi, 1988
[3] Tavoularis, S., Measurement in Fluid Mechanics, Cambridge, 2005

251 Energy design of buildings I	Sm.	C.H.	ECTS
	8	4	4.5

Course title	Energy Design of Buildings I
Course code	251
Course type	Elective
Course level	Undergraduate (second cycle)
Year of studies	4
Semester	8
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH227/
Hours per week	4
Instructor(s)	G. Panaras

Course content: Objectives & content of energy design. Building uses. Indoor comfort conditions: Thermal Comfort, Air quality, Visual comfort, Acoustic Comfort. Estimation of heating and cooling loads. HVAC systems dimensioning. Bioclimatic design of buildings. Passive solar systems for heating of buildings. Natural cooling of buildings: Solar protection, passive and hybrid techniques for natural cooling. Natural and forced ventilation of buildings. Natural Lighting of Buildings. Conventional Energy Systems. Solar thermal systems. Solar air-conditioning systems. RES systems in buildings. Analysis of the energy performance of buildings: Energy loads modeling, degree days method, typical meteorological year, modeling of systems performance. Implementation in the optimum design of buildings.

Expected learning outcomes and competences to be acquired: The course presents the basic design principles for achieving the lowest possible energy consumption in buildings. The basic knowledge for the integration of passive solar systems in buildings is provided to the students; the case of renewable energy systems is examined, as well as that of conventional systems of low energy consumption. The knowledge provided finds application in the design of a low energy/zero-energy building and in the evaluation of its energy performance, on the basis of the developed methodological tools.

Prerequisites	Heating, Ventilation and Air-Conditioning,
Teaching methods	Hours of Instruction 52
Assessment methods	Final written exam (compulsory), Building Energy Design Project (optional)
Language of instruction	Greek

Recommended bibliography

[1] Energy in architecture, Tsigas E., Malliaris Ed., 1996

252 Computer Aided Manufacturing for Industrial Production Sm. 8 C.H. 4 ECTS 4.5

Course title	Computer Aided Manufacturing for Industrial Production
Course code	-
Course type	Elective course
Course level	Undergraduate (second cycle)
Year of studies	4
Semester	8
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH252/
Hours per week	4
Instructor:	A. Tsouknidas

Course content: Introduction to computer aided industrial manufacturing, automatic control and guidance, computerized numerical control (CNC) metalworking machine tools, Programming and Simulation of CAM systems.

Expected learning outcomes and competences to be acquired : Operating principles and introduction to digitally control and programmable machinery. Application in laboratory student produced machined samples.

Prerequisites	Fundamentals of Machining
Teaching methods	Lectures and practical tutorials
Assessment methods	80% final written exam, 20%, either mid-term exam or homework.
Language of instruction	Greek
Recommended bibliography	

253 Multivariate Statistics	Sm.	C.H.	ECTS
	8	4	4.5

Course title	Multivariate Statistics
Course code	253
Course type	Elective course
Course level	Undergraduate (second cycle)
Year of studies	4
Semester	8
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH205/
Hours per week	4
Instructor(s)	S. Panagiotidou

Course content: Two-dimensional random variables: joint, marginal and conditional distributions. Covariance and correlation. Independent random variables, sums of random variables. The bivariate normal distribution. Analysis of variance: the fixed and random effects models for one factor. Design of statistical experiments: factorial and fractional factorial experiments, design and statistical analysis. Simple and multiple linear and nonlinear regression analysis. Correlation.

Expected learning outcomes and competences to be acquired : After the completion of the course the students should be able to implement the theory fundamentals and apply the statistical analysis methods in problems where more than one random variables are involved.

Prerequisites	Statistics
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)

Assessment methods	Final written exam (compulsory), Intermediate written exam and/or assignments (optional)
Language of instruction	Greek

Recommended bibliography

[1] Probability and Statistics for Engineers, G. Ch. Zioutas, Zitis Publ., 2013.

[2] Statistics for Economics and Business Administration, G. Keller, Epikentro Publ., 2010.

254 Power Systems	Sm.	C.H.	ECTS
	7	4	4.5

Course title	Power Systems
Course code	254
Course type	Elective
Course level	Undergraduate (first cycle)
Year of studies	4
Semester	7
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/ICTE239/
Hours per week	4
Instructor(s)	Th. Theodoulidis

Course content: The power system, generation, transmission, distribution of energy. Three phase systems, transformers, synchronous generators, power lines. Real power-frequency and reactive power-voltage curves and control. Modeling of power lines, stability. Power flow and network faults. Economical aspects of power systems.

Expected learning outcomes and competences to be acquired: The student will be able to analyze a power system and make basic calculations voltage-current, transmitted power, power loss and efficiency. He/she will be able to choose the appropriate model of power line and do calculations with the relevant equivalent circuits. Will be introduced in the operation of the synchronous generator and make basic calculations by using it's equivalent circuit.

Prerequisites	-
Teaching methods	Hours of Instruction 52 (Theory: 52)
Assessment methods	Final written exam (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Συστήματα ηλεκτρικής ενέργειας, Μαλατέστας Παντελής, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & YIOI, 2013.

[2] Συστήματα Ηλεκτρικής Ισχύος, Nasar Syed A., ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ, 2002.
[3] Εισαγωγή στα συστήματα ηλεκτρικής ενέργειας, Βοβός Ν.Α., Γιαννακόπουλος Γ., Ζήτη Πελαγία & Σια, 2008.

309 Pipeline Hydraulics		Sm.	C.H.	ECTS
		10	4	4
Course title	Pipeline Hydraulics			
Course code	309			
Course type	Elective			
Course level	Undergraduate (first cycle)			
Year of studies	5			
Semester	10			
ECTS Credits	4			
URL	http://eclass.uowm.gr/courses/MECH138/			
Hours per week	4			
Instructor(s)	E. Konstantinidis			

Course content: Review of fluid flow trough closed pipes, head loss, friction factor, minor losses, hydraulic and energy grade lines, empirical relationships, non-cicrcular tubes, hydraulic diameter. Pipelines: material, thickness, optimum diameter, flow control, definition and properties of valves, hydraulic characteristics of valves, selection of valves. Pipe networks: layout, nodes and branches, mathematical description of pipe systems, solution of the system of equations, linearization of equations, Hardy-Cross method, dedicated software. Pumps: types, positive-displacement and dynamic pumps, characteristics, selection. Centrifugal pumps: dimensional analysis, characteristic curves, hydraulic power, efficiency, affinity laws, specific speed, cavitation, Net Positive Suction Head. Pumping stations: design and operation point, operation, control and automation, layout, configuration of suction. Fluid transients: rigid-column theory, water hammer, pressure surges, Bergeron method, Parmakian method, numerical solution of equations, method of characteristics, surge protection and control devices, surge tanks, design of air chambers. Transport of gases: basic equation for gas flow, compressibility factor, empirical equations (Panhandle, AGA, Crane), simple models, isothermal flow, analytical computer models, power requirements, compressors, types of, multistage compressors, reduction of compression work.

Expected learning outcomes and competences to be acquired : The course aims at learning the technologies of mass transport in closed conduits under pressure, understanding the basic principles of their design and operation, and developing appropriate methodologies for the treatment of engineering problems

Prerequisites Fluid Mechanics I, Turbomachinery

Teaching methods	lectures and tutorials
Assessment methods	20% coursework (pump selection and network analysis study), 30% design project, 50% final exam
Language of instruction	Greek

Recommended bibliography

[1] Papantonis D., Hydrodynamic Facilities, Symeon, 1998 (in greek)

[2] Papantonis D., Hydrodynamic Machines, 2nd ed., Symeon, 2002 (in greek)

316 Solar Technique/Photovoltaic Systems	Sm.	C.H.	ECTS
	10	4	4

Course title	Solar Technique - Photovoltaic Systems
Course code	316
Course type	Elective Course
Course level	Undergraduate
Year of studies	4
Semester	10
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH197/
Hours per week	4
Instructor(s)	M. Souliotis

Course content: Solar Radiation. Parameters and Calculation of the Incoming Solar Radiation on horizontal and Inclined Surface. Calculation of the Energy Needs in Space Heating and Domestic Water Heating. Flat Plate Solar Thermal Collectors. Concentrating Solar Thermal Collectors. Storage of Solar Energy in Heating Processes. Integrated Solar Energy Systems for Heating Processes. F-Chart Method. Technology of the Photovoltaics. Photovoltaic Panels. Photovoltaic Systems. Dimension Process in Photovoltaic Systems.

Expected learning outcomes and competences to be acquired : The course deals with the basic principles of the exploitation of Solar Energy. After the completion of the course the students should be able to design solar systems for the coverage of thermal and electrical needs in buildings.

Prerequisites	-
Teaching methods	Hours of Instruction 52
Assessment methods:	Final written exam (compulsory), Small project at home (optional)
Language of instruction	Greek

Recommended bibliography

[1] Ήπιες Μορφές ενέργειας ΙΙ - Ηλιακή Μηχανική, Καπλάνης Σωκράτης.

[2] Φωτοβολταϊκή Τεχνολογία, Καγκαράκης Κωνσταντίνος.

318 Wind and water turbines, hydroelectric plants	Sm.	C.H.	ECTS
	9	4	4

Course title	Wind and Water Turbines – Hydroelectric Plants
Course code	318
Course type	Elective
Course level	Undergraduate (first cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH159/
Hours per week	4 (2 hours of Theory Lectures, 2 hours of exercises and tutorials)
Instructor(s)	A. Tourlidakis

Course content: Wind turbines. Introduction to wind energy and wind turbines. Atmosphere and wind energy potential. Types of wind turbines and subsystems. Aerodynamic design of horizontal axis wind turbines. Aerodynamic design of vertical axis wind turbines. Static and dynamic wind loading. Selection of installation site. Wind farms. Turbine components' selection. Economics of wind energy. Water turbines and hydroelectric plants. Global and national situation, benefits and impacts. Hydroelectric plants and their classification , advantages and disadvantages, hydrodynamic potential, hydrographs. Principles of operation and classification of water turbines, impulse turbines, reaction turbines, similarity theory, specific speed, cavitation phenomena.

Expected learning outcomes and competences to be acquired : The main aim of the course is to provide the student with an introduction to the principles governing the operation of wind generators and water turbines. The student will gain an in depth knowledge and understanding of the principles of operation, of the flow phenomena and the design characteristics of these machines. He / she will also gain experience in using specific techniques for the analysis, design and selection of various classes of wind and water turbines. During the course the development and use of computational methods are encouraged, and there is also requirement for an experimental activity and a group project.
The student will be able to assess the wind potential of an area, to select the location for the installation of wind turbines and perform economic and technical evaluations. In addition, the student will be able to assess the hydrological potential of a region, select the appropriate type of turbines and assess the expected power output.

Prerequisites Fluid Mechanics I, Turbomachinery

Teaching methods	Lectures, exercises, laboratory tutorials for the use of open source software. Homework and personal assignments with the application of software on real design and analysis problems. Utilization of information technology for the course management.
Assessment methods:	Final Examination, group project assignment
Language of instruction	Greek

Recommended bibliography

[1] "Wind Turbines", Bergeles George H., Simeon Publications

[2] "Management of Wind Power", Second Edition, Kaldellis John K. Stamoulis

327 Energy design of buildings II	Sm.	C.H.	ECTS
	9	4	4

Course title	Energy Design of Buildings II
Course code	327
Course type	Elective
Course level	Undergraduate (third cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH217/
Hours per week	4
Instructor(s)	G. Panaras

Course content: National regulation for the Energy Performance of Buildings (KENAK), basic principles. Estimation of building energy performance, available methodologies and calculation tools. Energy inspection of the building as a whole, as well as of its installations. Requirements and equipment for the inspection. Laboratory exercise: Study of the operation of a system responsible for the regulation of thermal comfort conditions.

Expected learning outcomes and competences to be acquired: In the course, the students get familiar with the certification of the energy performance of buildings and its requirements; methodologies and software tools are included. The theoretical background provided through the prior course of Energy Design in Buildings I, can be re-examined with regard to the applied character of the Regulation for the Performance of Buildings (KENAK). The laboratory exercises in the regulation of thermal comfort conditions, also contribute towards a more applied direction. Within the context of the course, the students select an existing building and proceed to the certification of its energy class, while also proposing specific interventions towards the upgrading of its energy class.

Prerequisite:	Energy Design of Buildings I
Teaching methods	Instruction, Specialized software practice, Execution of laboratory exercises (total hours 52)
Assessment methods	Final written exam (compulsory), Laboratory exercise (compulsory), Building Certification Project (compulsory). Calculation of the final grade: 70% final exams, 30% laboratory exercises and student projects.
Language of instruction	Greek

Recommended bibliography

[1] Energy in architecture, Tsigas E., Malliaris Ed., 1996

348 Combustion Phenomena	Sm.	C.H.	ECTS
	10	4	4

Course title	Combustion Phenomena
Course code	348
Course type	Elective Course
Course level	Undergraduate
Year of studies	5
Semester	10
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH144/
Hours per week	4
Instructor(s)	D. Kolokotronis

Course content: Kinetic theory of gases, transport phenomena, chemical thermodynamics. Overview of chemical kinetics: order of reaction, chain reactions, permanent condition and chemical equilibrium. Detonation limits and oxidizing characteristics of fuels (hydrogen, carbon monoxide, methane, paraffins, aromatic hydrocarbons). Premixed flames: 1-D flow, laminar flame structure, flame speed (Mallard and LeChatelier), ignition limits, quenching distance, flashback and blowoff, flame stability limits. Turbulent flows with flames, turbulent flame speed, flame stabilisation in high velocity flows, Diffusion flames: Phenomenology, 1-D flame balances, turbulent fuel jets. Ignition: chain ignition, forced thermal ignition.

Expected learning outcomes and competences to be acquired: The course includes the presentation of basic phenomena related to combustion, as chemical equilibrium, chemical kinetics and mass, momentum and energy transport phenomena. The course also includes presentation of practical problems related to combustion. It is expected that at the end of the course, students familiarize with the above so they are able to study and understand combustion phenomena for various applications by means of deep study of theory and practical and theoretical exercises.

Prerequisites	Thermodynamics I, Thermodynamics II, Fluid Mechanics I
Teaching methods	Oral presentations and exercises
Assessment methods	Final written exam (compulsory), course project (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] An Introduction to Combustion: Concepts and Applications, Turns S.R., McGraw Hill Education, 2011

[2] Theory of Combustion and Combustion Systems, Founti M., N.T.U.A., 2005

349 Special topics on energy conversion technologies Sm. 10 C.H. 4 ECTS 4

Course title	Special Topics on Energy Conversion Technologies
Course code	349
Course type	Elective
Course level	Undergraduate (third cycle)
Year of studies	5th
Semester	10th
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH173/
Hours per week	4
Instructor(s)	G. Marnellos

Course content: Introduction to energy systems, Global, European and National energy balance, Fossil Fuels, Conventional power generation, Solar Energy, Wind Power, Biomass & Synthetic Fuels, Geothermal Power, Hydropower, Techno-economic evaluation, Kwh cost calculation: parameters influencing cost, maintenance, fuel and operation cost, specific heat consumption, examples

Expected learning outcomes and competences to be acquired: This course deals with special topics on energy conversion technologies such as (a) conventional and alternative energy conversion technologies, (b) cogeneration and combined cycles (c) trends for power plants towards zero emissions and higher efficiencies (d) kWh costing.

Prerequisites	Heat Transfer, Fluid Mechanics, Thermodynamics, Steam Generators I & II
Teaching methods	Hours of Instruction 52 (Theory: 26 h, Exercises: 26 h)
Assessment methods:	Final written exam (compulsory) , Midterm written exam (optional)

Language of instruction Greek
Recommended bibliography
[1] Personal notes (in Greek and English version)
[2] “Alternative Energy Forms”, V. Bitzionis
[3] “Biofuels – Sustainable Energy”, N. Karnavos, A. Lappas and G. Marnellos

350 Special topics on pollution control technologies	Sm.	C.H.	ECTS
	9	4	4

Course title	Special Topics on Pollution Control Technologies
Course code	350
Course type	Elective
Course level	Undergraduate (third cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH131/
Hours per week	4
Instructor(s)	G. Marnellos

Course content: Wastewater treatment, Wastewater charecteristics, Sewage sludge treatment, Solid waste management, Recycling, Combustion, Thermochemical and biological processes, Pollution control technologies in Otto engines, Three-way catalytic converters, λ sensors, Pollution control technologies in Diesel engines, Soot formation, Soot traps, Pollution control technologies in airplanes, Hybrid cars, Fuel cell cars.

Expected learning outcomes and competences to be acquired: The course will refer to special issues in control pollution technologies related to wastewater treatment and solid waste management as well as their potential exploitation for power generation. The course also focuses on pollution control technologies employed in the case of mobile sources and on alternative means of transport (e.g., hybrid and hydrogen cars).

Prerequisites	Chemistry, Environmental Technology
Teaching methods	Hours of Instruction 52 (Theory: 26 h, Exercises: 26 h)
Assessment methods:	Final written exam (compulsory) , Midterm written exam (optional)
Language of instruction	Greek

Recommended bibliography
[1] Personal Notes
[2] “Waste Water Treatment Technologies”, Metcalf & Eddy
[3] “Air Pollution Control”, D. Cooper and C. Alley
[4] “Air Pollution. Effects, Control and Alternative Technologies”, I. Yentekakis

[5] “Quality Control and Treatment of Water”, M. Mitrakas

352 Techno-economic assessment		Sm.	C.H.	ECTS
		9	4	4
Course title	Engineering and feasibility study			
Course code	352			
Course type	Elective course			
Course level	Undergraduate (third cycle)			
Year of studies	5			
Semester	9			
ECTS Credits	4			
URL	http://eclass.uowm.gr/courses/MECH163/			
Hours per week	4			
Instructor(s)	G. Skodras			

Course content: Principles and methodology of financial analysis of industrial plants. Design and optimization methodology. Evaluation indices. Engineering and financial evaluation of investment plans. Design and time scheduling. Methodology of feasibility studies and financial analysis of investments.

Expected learning outcomes and competences to be acquired: The course presents systematically the design and optimization of industrial plants, as well as the preparation of feasibility studies. After the completion the students will be able to approach effectively the issues of the financial and engineering evaluation of industrial plants and to handle design and optimization problems, by means of scientifically rigorous quantitative methods.

Prerequisites	Thermodynamics, Mathematics, Statistics, Steam generators, Engineering and energy legislation
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26) & Three home works (3)
Assessment methods	Final written exam (compulsory), three home works (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Σχεδιασμός και οικονομική ανάλυση εγκαταστάσεων για μηχανικούς, 3rd edition, McGraw Hill, M. Peters, K. Timmerhaus, R. West

356 Technology, Research, Innovation Policies and Entrepreneurship			
	Sm	C.H.	ECTS

	9	5	4

Course title	Technology, Research, Innovation Policies and Entrepreneurship
Course code	356
Course type	Elective Course
Course level	Undergraduate (first cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://elearn.materlab.eu/course/view.php?id=8
Hours per week	5
Instructor(s)	I. Bakouros

Course content: National Policies of research and technological growth –National policies of innovation –European map of research and technological growth – Models of policies of research and growth –Models of policies of innovation – Analysis of case studies. Study and Development of Business Plan.

Expected learning outcomes and competences to be acquired: Aim of course is το make students understand the significances of policies of Innovation, Research and Technological Growth. Emphasis is given in the policies in regional, national and European level. Examples- case studies from pilot regions and National Innovation Systems are studied.

Prerequisites	-
Teaching methods	Lectures (13 wks x 4 hrs theory) and two obligatory homework projects.
Assessment methods	30% final oral exam, 70% two homework projects
Language of instruction	Greek

Recommended bibliography

[1] Book, E. Carayiannis, Y.L Bakouros, “Innovation and Entrepreneurship: Theory and Practice”, 2010

367 Simulation and System Dynamics	Sm.	C.H.	ECTS
	10	4	4

Course title	Simulation and System Dynamics
Course code	367
Course type	Elective Course
Course level	Undergraduate (first cycle)
Year of studies	5
Semester	10
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH168/
Hours per week	4

Instructor(s) G. Nenes

Course content: Design, analysis and development of simulation, random numbers, random numbers generators and simulation sampling, statistical analysis of simulation results. Applications in industrial management and operations research. Practice on specialized simulation software. Fundamental system concepts, the object of a system dynamics analysis.

Expected learning outcomes and competences to be acquired: Knowledge of the terminology of discrete event simulation and continuous simulation. Ability to analyze a physical system and to develop a simulation model. Simulation model transformation using simulation environments (programming languages). Ability of statistical analysis and explanation of simulation results.

Prerequisites	Statistics
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)
Assessment methods	4 Intermediate Written Assignments (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Simulation Techniques Theory & Applications, Roumeliotis, M., Souravlas, I.S., Tziola Publ., Thessaloniki 2012.
[2] Theory of System Dynamics, Georgiadis, P., Sofia Publ., Thessaloniki 2006.
[3] Simulation and Applications, Sfakianakis, M., Patakis Publ., Athens 2001.
[4] Spreadsheet modeling and decision analysis, Ragsdale, C., South-Western Educational Publishing (3rd edition), 2000.

371 Vehicle Design Methods	Sm.	C.H.	ECTS
	9	4	4

Course title	Vehicle Design Methods (The course is not running during the current academic year)
Course code	371
Course type	Elective
Course level	Undergraduate
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH143
Hours per week	4
Instructor(s)	-

Course content: Introduction, Wheels and tires, Resistance movement, Circle drive, Energy analysis, Vehicle Engine and performance, Fuel consumption, Driving limits, Brakes, Suspension

Expected learning outcomes and competences to be acquired: Understanding of the basic principles of operation of individual systems of the modern vehicles. Calculation of basic components of the vehicle. Understanding the steps and methods of design of modern vehicles.

Prerequisites	-
Teaching methods	Lectures (13 weeks x 2 hour of Theory and 2 hours of Exercises) and homeworks.
Assessment methods	25% oral exam, 75% homework
Language of instruction	Greek
Recommended bibliography	

372 Numerical methods in design of mechanical structures

Sm.	C.H.	ECTS
7	5	4.5

Course title	Numerical methods in design of mechanical structures
Course code	372
Course type	Elective
Course level	Undergraduate
Year of studies	4
Semester	7
ECTS Credits	4.5
URL	http://eclass.uowm.gr/courses/MECH128
Hours per week	5
Instructor(s)	D. Giagopoulos

Course content: Introduction to FEM, The Total Potential Energy of System. Matrix Algebra, Spring, Bar and Beam elements. Stiffness and Mass matrices, Plane trusses Two dimensional problems (membranes, disks, plates, shells)., Stress and strain relations, Strain and displacement relations, the equilibrium Equations. Equations solving, direct and iterative methods. Linear Static analysis, Structural vibration and dynamics, Basic equations, modal equations, damping, transient response analysis. 3D problems. The course, beyond the theoretical teaching, introduces the student and into programming, based on application programs in an environment of MATLAB, and commercial finite element computer software.

Expected learning outcomes and competences to be acquired : Understanding the mathematical background of the Finite Element Method (FEM) and use the method to solve structural dynamics problems. The engineering problem involves a structure subjected to certain loads. The idealization of the problem to a

mathematical model requires certain assumptions that together lead to differential equations governing the mathematical model. The finite element analysis FEA solves these differential equations. The Numerical methods in design of mechanical structures is particularly important in cases of real applications, because of the complexity and size of the calculations, of the conventional mathematical methods

Prerequisites	Mechanical Vibrations and Machine Dynamics, Statics, Mechanics of Materials.
Teaching methods	Lectures (13 weeks x 2 hour of Theory and 2 hours of Exercises) and homeworks.
Assessment methods	25% final exam, 75% homework
Language of instruction	Greek

Recommended bibliography

[1] Introduction to Finite Elements in Engineering, Chandrupatla-Tirupathi-Belegundu, Klidarithmos Publ.(in Greek), 2006.
[2] Finite Element Method , P. Gotsis, Zitis Publ.(in Greek), 2008.

376 Technical and Energy Legislature	Sm.	C.H.	ECTS
	9	3	4

Course title	Engineering and energy legislation
Course code	376
Course type	Elective course
Course level	Undergraduate (third cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH120/Hours per week 3
Instructor(s)	G. Skodras

Course content: General principles of law. The basic legal concepts are discussed and explained. The various branches of law are presented and briefly analyzed. The "Technical & Energy legislation" includes the subjects of "Construction works", "Environmental legislation", "Energy legislation", "Energy market deregulation", "Health and safety legislation".

Expected learning outcomes and competences to be acquired: The course presents systematically the engineering and energy legislation issues. It provides fundamental information in the context of the EU and Greek legislation with respect to energy, environment, construction works, health and safety and energy market liberalization. After the completion the students will be able to approach effectively the issues of licensing industrial plants and energy markets as well, and to handle

establishment and operation of construction works, energy generation, distribution and services, by means of scientifically rigorous methods.

Prerequisites	-
Teaching methods	Hours of Instruction 39 (Theory: 27, Exercises: 12) & Three home works (3)
Assessment methods	Final written exam (compulsory), three home works (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Δίκαιο της ενέργειας, Θ. Φορτσάκης, Wolters Kluwer – Ant. N. Sakkoulas
[2] Συλλογή νομοθεσίας για τις Ανανεώσιμες Πηγές Ενέργειας (ΑΠΕ), Κ.Π. Βατάλης, Εκδόσεις Σάκκουλα
[3] Συλλογή νομοθεσίας για τις Ανανεώσιμες Πηγές Ενέργειας (ΑΠΕ), Συμπλήρωμα, Κ.Π. Βατάλης, Εκδόσεις Σάκκουλα
[4] Κώδικας Διαχείρισης του Συστήματος & Συναλλαγών Ηλεκτρικής Ενέργειας, Εκδόσεις Σάκκουλα
[5] Εισαγωγή στο δίκαιο ηλεκτροπαραγωγής από Ανανεώσιμες Πηγές Ενέργειας, Κ.Π. Βατάλης, Εκδόσεις Σάκκουλα
[6] Η περιβαλλοντική αδειοδότηση έργων σε περιοχές του δικτύου Natura 2000, Κ. Γώγος, Εκδόσεις Σάκκουλα
[7] Κώδικας δημοσίων έργων – Νομοθεσία και Νομολογία κατ' άρθρο, Β.Ε. Κωτσοβίνος
[8] Δημόσια Έργα – Κωδικοποιημένη Νομοθεσία Δημοσίων Έργων και Μελετών-Ερμηνεία-Νομολογία, Δ. Σολδάτος, Εκδόσεις Μ. Δημοπούλου
[9] Κωδικοποίηση Νομοθεσίας Δημοσίων Έργων, Ζ. Χατζηχαλκιάς, Εκδόσεις Ιων
[10] Ασφαλιστικά και Εργασιακά Θέματα, Εργατοϋπαλληλικό Κέντρο Θεσσαλονίκης
[11] Βασικές διατάξεις προστασίας του περιβάλλοντος, Α.Ι. Τάχος, Εκδόσεις Σάκκουλα
[12] Δίκαιο του περιβάλλοντος, Ε. Κουτούπα-Ρεγκάκου

377 Operations Research II	Sm.	C.H.	ECTS
	9	4	4

Course title	Operations Research II
Course code	377
Course type	Elective course
Course level	Undergraduate (third cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH204/
Hours per week	4

Instructor(s) S. Panagiotidou

Course content: Stochastic processes and discrete-time Markov chains: classification of states, long-run properties. Markovian processes with rewards, control and optimization. Applications in inventory control and maintenance management. Continuous-time Markov chains, birth-and-death processes. Queuing theory: classification of queuing systems and examples of queuing phenomena. Queuing models with a single or multiple servers, finite or infinite queue, finite or infinite population. Priority in queues service. Linear and nonlinear queuing networks. Optimization of queuing systems and networks.

Expected learning outcomes and competences to be acquired: After the completion of the course the students should be able to understand the theory fundamentals and apply the stochastic methods of operations research. More specifically, the main objective is the understanding of the basic concepts of stochastic processes, Markov chains and queuing theory and the ability to apply them for solving relevant problems.

Prerequisites	Statistics
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)
Assessment methods:	Final written exam (compulsory), Intermediate written exam and/or assignments (optional)
Language of instruction	Greek

Recommended bibliography

[1] Introduction to Operations Research, H. Taha, Tziola Publ., 2011.
[2] Quantitative methods for Decision making in Management Science, Part B, G. Oikonomou & A. Georgiou, Eugenia Mpenou Publ., 2011.

379 Applications of Materials for Energy and Environmental Technologies

Sm.	C.H.	ECTS
10	4	4

Course title	Applications of Materials in Energy and Environmental Technologies
Course code	379
Course type	Elective Course
Course level	Undergraduate
Year of studies	5
Semester	10
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH233/
Hours per week	4

Instructor(s) S. Makridis

Course content: The course deals with the description and analysis of metallic and ceramic materials for energy and environmental technologies. The studied materials can be used in alternative technologies for the improvement of energy efficiency in systems (used materials in: batteries, hydrogen technologies, elecrtrochromic devices, phase change, piezoelectric devices, magnetocaloric and electrochromic devices) and also in environmental technologies (several kinds of filters, fuel cells, sensors, CO_2 capture, etc). From materials to processes and applications in Energy and Environmental Systems (Comsol multiphysics software).

Expected learning outcomes and competences to be acquired: After the completion of the course the students should be able to comprehend in the connection of materials and their properties with the energy and environmental technologies.

Prerequisites	Materials Science and Technology I & II
Teaching methods	Lectures and tutorials
Assessment methods	Final written exam (compulsory), Small project at home (optional)
Language of instruction	Greek

Recommended bibliography

[1] Επιστήμη και Τεχνολογία Υλικών, Βατάλης Αργύρης Σ.

380 Computer-Aided Design	Sm.	C.H.	ECTS
	9	4	4

Course title	Computer-Aided Design
Course code	380
Course type	Elective
Course level	Undergraduate
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH117
Hours per week	4
Instructor(s)	N. Sapidis

Course content: Introduction to Computer-Aided Design and to CAD/CAE/CAM Systems. Coordinate systems and geometric transformations. Basic principles of CAD and related mathematical & information models. Elements of three-dimensional (3D) Computer Graphics. Mathematical models, data structures and algorithms for geometric modeling of curves, surfaces and 3D solids. Representation and processing/management of mechanical assemblies. Mechanical Computer-Aided Design. Laboratory exercises using a CAD system.

Expected learning outcomes and competences to be acquired : Understanding and ability to apply basic geometric (CAD) models for curves/surfaces/solids as well as standard geometric transformations. Ability to create and process a 3D model of a low-complexity mechanical component in a standard CAD system.

Prerequisites	Introduction to Computing, Linear Algebra, Mechanical Drawing II, Mathematics IV, Machine Elements II
Teaching methods	Lectures (13 weeks x 2,5 hours of Theory and 1,5 hours of CAD Exercises)
Assessment methods	80% final written exam, 20%, either mid-term exam or homework.
Language of instruction	Greek

Recommended bibliography

[1] N. Bilalis & E. Maravelakis, "CAD/CAM Systems & 3D Modeling", Kritiki Publications, 2009 (in Greek).
[2] K. Lee, "Principles of CAD/CAM/CAE Systems", Kleidarithmos Publications, 2009 (translated into Greek).

381 Computational Mechanics II	Sm.	C.H.	ECTS
	10	4	4

Course title	Computational Mechanics II
Course code	381
Course type	Elective
Course level	Undergraduate
Year of studies	5
Semester	10
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH381
Hours per week	4
Instructor	R. Sotiropoulou

Course content: Introduction to UNIX. Basic laws of gases, liquids and particles. Gas, liquid and particulate pollutants. Equations of transport and diffusion of pollutants in turbulent flow. Transport of particles in turbulent flow. Turbulent diffusion modeling. Atmospheric Diffusion of Pollutants. Features of plumes, The Gauss model for diffusion, Software tools and applications.

Expected learning outcomes and competences to be acquired: The aim of the course is the students to acquire the necessary knowledge to study environmental engineering problems with emphasis on fluid flow using computational tools. The

student will become familiar with existing computational codes developing additional knowledge on their use and evaluation. Emphasis will be given on practical engineering applications.

Prerequisite	Numerical Analysis and Simulation, Fluid Mechanics, Computational Mechanics I
Teaching methods	Weekly oral lectures (3 hours theory, 2 hours lab with mandatory presence), weakly mandatory home exercises, 2 mandatory homeworks, final examination.
Assessment methods	60% assignments, 40% final exam
Language of instruction	Greek

Recommended bibliography

382 Rotordynamics	Sm.	C.H.	ECTS
	10	4	4

Course title	Rotordynamics
Course code	382
Course type	Elective
Course level	Undergraduate
Year of studies	5
Semester	10
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH114
Hours per week	4
Instructor(s)	D. Giagopoulos

Course content: Free vibration and forced response of single degree of freedom linear oscillators to impulsive, harmonic, periodic and transient excitation (natural frequency, damping ratio, resonance). Response of multiple degree of freedom linear oscillators (formulation of the equations of motion, determination of natural frequencies and mode shapes, modal analysis). Axial, torsional and bending vibration of bars. Applications (measurement and evaluation of vibration characteristics, vibration isolation, vibration absorption, balancing, torsional vibration). The course, beyond the theoretical teaching, introduces the student and into programming, based on application programs in an environment of MATLAB.

Expected learning outcomes and competences to be acquired : Understanding through a number of available methods the complete dynamic performance of rotors. The dynamics of rotor-bearing systems is directly related to energy machines (hydrodynamic machines, turbomachinery, generators, compressors, etc.) and other production machines, whose performance depends on the angular velocity. To achieve optimal performance of these machines requires a thorough dynamic analysis.

Prerequisites	Mechanical Vibrations and Machine Dynamics, Dynamics, Statics, Introduction to Computers
Teaching methods	Lectures (13 weeks x 2 hour of Theory and 2 hours of Exercises) and homeworks.
Assessment methods	25% final exam, 75% homework
Language of instruction	Greek

Recommended bibliography

[1] Vibrations of Mechanical Systems, S. Natsiavas, Zitis Publ.(in Greek), 2001.
[2] Machine dynamics , A. Kanararhos, I. Antoniadis, Papasotiriou Publ.(in Greek), 1998.

383 Energy saving technologies and Industrial Systems Optimization

Sm	C.H.	ECTS
10	4	4

Course title	Methodologies of energy conservation and optimization of industrial plants
Course code	383
Course type	Elective course
Course level	Undergraduate (third cycle)
Year of studies	5
Semester	10
ECTS Credits	4
URL	
Hours per week	4
Instructor(s)	G. Skodras

Course content: Energy resources and reserves. Energy consumption and energy intensity in the Greece, the EU and the globe. The perspectives of the various energy resources. The energy conservation policy in the EU and in Greece. Global energy and exergy balances, energy and exergy efficiency indices. Combustion issues, combustion reactions, stoichiometry and efficiency. Energy losses and efficiency in combustion systems. Energy efficiency and losses in energy conversion and transportation systems. Methodologies and techniques to reduce energy losses. Objective functions and optimization of industrial plants. Financial analysis of energy conservation.

Expected learning outcomes and competences to be acquired: The course presents systematically the energy conservation methodologies and the optimization of industrial plants issues. Energy and exergy analysis of the processes, as well as alternative routes for industrial processes of lower energy consumption are

discussed and analyzed. After the completion the students will be able to approach effectively the issues of energy conservation at industrial plants and to handle optimization problems, by means of scientifically rigorous quantitative methods.

Prerequisites	Thermodynamics, Mathematics, Statistics, Steam generators, Engineering and feasibility studies
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26) & Three home works (3)
Assessment methods	Final written exam (compulsory), three home works (compulsory)
Language of instruction	Greek

Recommended bibliography

[1] Αρχές διαχείρισης ενέργειας στη βιομηχανία, Β' έκδοση 2003, ΕΜΠ, Β. Λυγερού, Α.Ι. Λυγερός

385 Gas Turbine Technology	Sm.	C.H.	ECTS
	9	4	4

Course title	Gas Turbine Technology
Course code	385
Course type	Elective Course
Course level	Undergraduate (first cycle)
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH157/
Hours per week	4 (2 hours of Theory Lectures, 2 hours of exercises and tutorials)
Instructor(s)	A. Tourlidakis

Course content: Introduction and applications of gas turbines. Open cycle configurations. Closed cycle configurations. Aircraft Propulsion. Industrial applications. Environmental issues. Power Cycles. Ideal cycles. Gas turbine component losses. Operation at the nominal operating point. Combined cycle and cogeneration schemes. Gas turbine cycles for aircraft propulsion. Simple Turbojet engine. The Turbofan engine. The Turboprop engine. The Turboshaft engine. Auxiliary power units . Axial and radial flow Compressors. Principles of operation. Work done and pressure rise. Dimensional flow. Compressor performance characteristics and design processes. Combustion systems. Types of combustion systems. The combustion process. Emissions. Coal gasification. Axial and radial flow Turbines. Basic theory. Selection of aerodynamic parameters. Blade cooling. Performance prediction of simple gas turbines. Components characteristics. Operation at off-design conditions.

Expected learning outcomes and competences to be acquired : The purpose of this course is to introduce to the students the basic operating principles, the components and the applications of gas turbine. Upon completion of the course the student will be able to obtain state-of-the-art knowledge in the area of operation and thermodynamics of modern gas-turbine engines. The student is expected to acquire knowledge and be able to analyze thermodynamic cycles of various types of gas turbine engines for aircraft propulsion and industrial applications. The student will be able to calculate the thrust and specific consumption of various types of aircraft engines such as turbojet, turbofan and turboprop; and, to assess the effects of speed and altitude on performance characteristics. In addition, the students will be able to select the main operating parameters of industrial gas turbines and calculate the effect of the characteristics of individual components on the overall engine performance such as the power output and the specific consumption. The student will be able to use specialized software for the preliminary design and analysis of the operation of gas turbines.

Prerequisites	Fluid Mechanics I, Thermodynamics I, Turbomachinery.
Teaching methods	Lectures, exercises, laboratory tutorials for the use of commercial software. Homework and personal assignments with the application of commercial software on real design and analysis problems. Utilization of information technology for the course management.
Assessment method	Final examination, intermediate examination, assignment
Language of instruction	Greek

Recommended bibliography

[1] Gas Turbine Theory by G.F.C. Rogers, H. Cohen & Paul Straznicky ISBN 978-0132224376

[2] «Operation of Gas Turbines and Power Generation - Propulsion», A. Polyzakis

386 Emissions and Transport of Air Pollutants	Sm.	C.H.	ECTS
	9	4	4

Course title	Emissions and transport of Air pollutants
Course code	386
Course type	Elective
Course level	Undergraduate
Year of studies	5
Semester	9
ECTS Credits	4
URL	http://eclass.uowm.gr/courses/MECH185/
Hours per week	4
Instructor(s)	R. Sotiropoulou

Course content: The atmosphere: Origins - Structure – Composition. Key features and principles of the atmosphere - The Boundary layer. Atmospheric pollutants and their sources. Basic principles of air pollution. Air pollution meteorology. Atmospheric stability. Basic atmospheric diffusion principles. Effective emission height. Atmospheric diffusion modeling. Scalar transport theory. Pollutants deposition. Instrumentation - Measurement of Meteorological Parameters.

Expected learning outcomes and competences to be acquired: The aim of this course is the understanding of the basic principles of physics and atmospheric dynamics, the sources of pollution, the life cycle of atmospheric pollutants starting from their emissions or formation and until their final removal from the atmosphere, the environmental burden mechanisms and the impacts on health and ecosystems. After the teaching of this course, the student will be able to apply integrated approaches towards environmental impact assessment.

Prerequisites	Mathematical Analysis III, Fluid Mechanics, Thermodynamics I
Teaching methods	Hours of Instruction 52 (Theory: 26, Exercises: 26)
Assessment methods:	Final written exam (compulsory), Weekly exercises (compulsory).
Language of instruction	Greek

Recommended bibliography

[1] Μ. Λαζαρίδης (2005), Ατμοσφαιρική Ρύπανση με Στοιχεία Μετεωρολογίας, Εκδόσεις Τζιόλα.
[2] Ν. Μουσιόπουλος (1997), Φαινόμενα Μεταφοράς στην Ατμόσφαιρα, Εκδόσεις Γιαχούδη – Γιαπούλη.
[3] Χ. Ζερεφός (2001), Μαθήματα Φυσικής της Ατμόσφαιρας και Φυσικής του Περιβάλλοντος, Έκδοση Α.Π.Θ, Υπηρεσία Δημοσιευμάτων.
[4] J. Seinfeld, S. Pandis (1998), Atmospheric Chemistry and Physics, Publication: John Wiley & Sons, Inc.

387 Environmental Management		Sm.	C.H.	ECTS
		9	4	4
Course title	Environmental management			
Course code	387			
Course type	Elective course			
Course level	Undergraduate			
Year of studies	5			
Semester	9			
ECTS Credits	4			
URL				
Hours per week	4			

Instructor(s) R. Sotiropoulou

Course content: Introduction to environmental management. Applications in solid waste management. Learning of computational tools for the calculation of the biogas produced by waste disposal sites. Renewable energy and related advanced technologies. Environmental management systems.

Expected learning outcomes and competences to be acquired : The course aims at familiarizing students with the basic principles of environmental management. After completion of the course the student should be able to understand the basic environmental management issues, to use various tools for designing environmental management solutions.

Prerequisites	-
Teaching methods	Instruction of theory, discussion of applications, debate skills
Assessment methods	30% assignments, 30% presentations on environmental management issues, 40% final exam and debate.
Language of instruction	Greek

Recommended bibliography

[1] T. Tietenberg, Economics of the environment and natural resources. Typothito Editions, Athens

388 Economic Valuation of Energy and Industrial Externalities

Sm.	C.H.	ECTS
10	4	4

Course title Economic Valuation of Energy and Industrial Externalities (The course is not running during the current academic year)
Course code
Course type Elective course
Course level Undergraduate
Year of studies 5
Semester 10
ECTS Credits 4
URL
Hours per week 4
Instructor(s) A. Kontogianni
Course content Introduction to the concept of externalities – Institutional and legal context of externality valuation – Externalities in energy and industrial processes – Basic economic concepts - Overview of methods – Stated preferences and surveys: Contingent Valuation Method (CVM) – Designing a questionnaire –

Collecting data – Analysis of data I: Descriptive statistics – Analysis of data II: Estimating WTP functions – Problems and case studies

Expected learning outcomes and competences to be acquired : After completion of the course the student should be able to:

- Describe in economic terms energy and industrial externalities
- Design a stated preference survey,
- Develop an appropriate research protocol
- Analyze the data collected.

Prerequisites	-
Teaching methods	Instruction of theory, discussion of empirical applications, individual projects
Assessment methods	Project work plan 5%, construction of research protocol 10%, intermediate report on field work 30% , final report 55%
Language of instruction	Greek

Recommended bibliography

[1] Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Ozdemiroglu, E., Pearce, D.W., Sugden, R., Swanson, J., 2002. Economic Valuation With Stated Preference Techniques: a Manual. Edward Elgar Publishing, UK. (Department for Transport).

389 Risk Management and Safety of Large Industrial Systems

Sm.	C.H.	ECTS
9	4	4

Course title	Risk Management and Safety of Large Industrial Systems
Course code	389
Course type	Mandatory
Course level	Undergraduate
Year of studies	5
Semester	9
ECTS Credits	4
URL	
Hours per week	4
Instructor	I. Bakouros

Course content: This course covers the scientific area of Risk Management and Safety of Large Industrial Systems with emphasis to Petroleum Industry. The following subjects are covered In details: Safety and loss prevention, definition of hazard, risk and risk assessment, scope and outline of risk management, frequency and severity, intrinsic and extrinsic safety, risk balance, Pareto principle, epidemiological approach, hazard warning. Identification of hazards and basic definitions: toxicity, flammability, sources of ignition, fires, explosions, ionizing

radiation, noise pollution, temperature and pressure deviations. Fire protection: classification of fires, fundamentals of fire suppression, fire protection systems and facilities, thermal radiation. Hazard and operability studies (HAZOP): basic principles, explanation of guide, procedures, critical examination of flow sheets. Risk analysis; acceptable risks and safety priorities, frequency of accidents, safety checklists and fault trees, assessment of risks from complex plants. Strengths and limitations of quantitative risk assessment, modeling, a systematic approach to risk reduction, human factors, and management of process safety, insurance. Industrial hygiene, identification MSDS, evaluating exposure to volatile toxicants. Flow of fluids through a pipe, liquids through pipes Toxic release and dispersion models, parameters affecting dispersion.

Expected learning outcomes and competences to be acquired : The objective of the course is to 1) Develop an understanding of the fundamental principles underlying safety and risk management. Understand issues related to the practical application of safety and risk management. 2) Develop management skills related to planning, developing and report writing activities. Develop some understanding of the professional obligations related to the discipline of safety and risk management.

Prerequisites	-
Teaching methods	Lectures, Notes, Related Practical Guides, Internet Sources
Assessment methods	
Language of instruction	Greek
Recommended bibliography	

390 Renewable Energy Sources Laboratory	Sm.	C.H.	ECTS
	10	4	4

Course title	Renewable Energy Sources Laboratory
Course code	390
Course type	Compulsory Course
Course level	Undergraduate
Year of studies	5
Semester	10
ECTS Credits	4
URL:	http://eclass.uowm.gr/courses/MECH231/
Hours per week:	4
Instructor(s):	M. Souliotis, G. Panaras

Course content: Introduction to Renewable Energy Sources (RES), RES in buildings. Laboratory exercise: Measurements, quality of measurements and

uncertainties. Laboratory exercise: Instrument calibration. Application in liquid flowmeter. Laboratory exercise: Meteorological station. Measurement of ambient temperature, Use of pyranometers for the measurement of solar radiation. Measurement of wind velocity and direction. Measurement of humidity. Laboratory exercise: Photovoltaic systems. Study of a photovoltaic panel. Measurement of the I-V characteristic, Measurement and estimation of the characteristic electrical parameters. Design of a PV system. Laboratory exercise: Solar thermal energy. Study of a flat plate solar collector. Estimation of optical efficiency and thermal losses. Study of thermal solar system performance. Heating storage thermal losses. Complete system estimation of performance.

Expected learning outcomes and competences to be acquired: At the end of this course the students should be able to know the use of instruments for the measurement of solar radiation, wind speed, temperature, radiation intensity, as well as humidity and conduct efficiency measurements of renewable energy systems (solar thermal, photovoltaics). Moreover, the work with renewable energy sources technologies in a laboratory environment, should provide them with the ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to renewable energy sources, especially focused on the experimental study and research.

Prerequisites	New & Renewable Energy Sources, Energy Design of Buildings I
Teaching methods	Instruction (26 hours), execution of Laboratory Exercises (26 hours)
Assessment methods	Written Reports every week (compulsory), Final written exam (compulsory). Calculation of the final grade: 30% final exam, 70% laboratory exercises.
Language of instruction	Greek

Recommended bibliography

[1] “RES Laboratory Exercises Notes”, M. Souliotis, G. Panaras. 2014.

Thesis Diploma Thesis	Sm.	C.H.	ECTS
	9-10	-	30

Course title	Diploma Thesis
Course code	-
Course type	Mandatory
Course level	Undergraduate
Year of studies	5
Semester	9-10
ECTS Credits	30
URL	
Hours per week	-

Instructor(s) -

Course content: Each student can chooses a thesis topic to develop the thesis. The only limitation to this option is that the thesis should correspond to one discipline (at least) from the courses included in Concentration of Studies, which he himself attended. The assignment of the thesis is at the beginning of the ninth semester and preparation is undertaken throughout the period of the fifth year of study.

Expected learning outcomes and competences to be acquired: This extended written project is an extensive study in a scientific area of the Department. The thesis is meant to demonstrate that the student is able to work and to pursue science in a specific subject.

10. OTHER USEFUL INFORMATION

10.1 ADMINISTRATION OF UNIVERSITY OF WESTERN MACEDONIA

Executive Committee Board Office
St. Demetrios Park, 50131, Kozani
Tel 0030 24 610 56 200. FAX 0030 24610 56201.

Alternatively, all useful information is offered to the public through the University`s website: ***www.uowm.gr***.

10.2 INTERNSHIP

The Department of Mechanical Engineering has also instituted student internships followed by a submitted funding proposal in order to form an integral part of the curriculum.

Students are advised to apply to the Administration Office of the Department for a placement, after a prior agreement between the Department and the companies, clearly defining the terms of employment and work responsibilities during the internship. After assessing the applications by the internship program departmental coordinator, Prof. G. Marnellos and also by Permanent Teaching Staff members who are in charge of the Department's cooperation with each company, the applied students are selected to be placed to specific companies.

The internship could **potentially** deem the Engineering Design Project and students will obtain the corresponding ECTS credits.

The duration of the internship will be three (3) months, mainly during summertime (June, July and August).

Students who will gain access to the Internship program must have finished their third year of studies. Emphasis will be placed mainly on graduating students for participating in internships.

10.3 STUDENTS BOARDING AND ACCOMMODATION

Assisting students who face financial difficulties to cope with their studies and based on both ministerial decrees and decisions of the Executive Committee Board of UOWM, the following services are provided:

a. Free boarding to beneficiary students, in the students restaurant of UOWM located in the city of Kozani (Address: 20 Konstantinoupoleos str.- Kozani, tel.nr. 0030 24611 81039)

b. Rent assistance if **not** provided by the state.

The preconditions for free boarding and provision of the rent benefit (if the student is entitled to one) as well as the dates for submitting applications, are announced timely by the Administration Office.

10.4 HEALTH CARE

All students (undergraduate, postgraduate, expatriates and foreign) are entitled to health, medical and nursing care for a period equal to the years of studies which are considered having a minimum duration of the undergraduate studies incremented by two years.

For this purpose the University provides students with a healthcare booklet that can be used in the region of the university concerned and only in exceptional cases outside it.

In case that the student is entitled directly or indirectly to additional health coverage by another healthcare insurer, and still wants the student healthcare plan, he should waive the insurance from the other carrier and choose the student insurance instead by a solemn statement (Law 1599/86), stating that "he is not insured under any other insurance carrier."

Additional information on healthcare is provided in the Healthcare booklet

For obtaining the Healthcare booklet, the students should address to the Administration Office.

10.5 ACADEMIC IDENTITY CARD – STUDENT TICKET

Every student is granted an Academic Identity Card. The relevant acquisition process is described on the website http://academicid.minedu.gov.gr/. The Academic ID Card is valid for as many years as the student membership lasts and

covers multiple uses, including the Student Ticket (Pass). The duration of the Student Ticket is valid for n + 4 semesters. The discounts provided to Means of Transportation, are those laid down by the legislation concerned.

The Academic Identity Card is deposited at the Administration Office of the Department with the swearing-in ceremony of the student or when for any reason the student membership ceases to exist (e.g. interruption of studies). No discounts for the Student Ticket are granted to those admitted to the Department with classification, as graduates of other Universities.

University of Western Macedonia
Department of Mechanical Engineering
Faculty of Engineering

http://www.mech.uowm.gr/