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INTERNATIONAL HELLENIC UNIVERSITY

SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING

STUDY GUIDE

DEPARTMENT OF MECHANICAL ENGINEERING

SERRES, 2023

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FOREWORD
(Welcome Note from the Head of the Department)

Dear students,

This Guide summarizes the Curriculum of the Mechanical Engineering Department of the International Hellenic University, Greece, for the Academic Year 2023 – 2024. It also provides a concise and comprehensive guide to our Department facilities and activities. We believe that the information contained in this Study Guide can be a valuable tool, if not an asset, for your college life.

As regards the first-year students, especially, this Guide will provide all the necessary information to familiarize themselves with the academic environment in which they will study. Hence, on this first occasion of getting acquainted with you, on behalf of the Mechanical Engineering Dept., I would like to congratulate you for your choice and to welcome you to the International Hellenic University, a modern and constantly developing tertiary educational Institute, where you will spend many creative and pleasant moments along with your studies.

Our aim is to provide you with all the scientific tools necessary for your subsequent professional career as Mechanical Engineers, in order to be able to contribute to Greece's technological development and the prosperity of our society. By attending classes, participating actively in laboratories and the other educational activities of the Mechanical Engineering Dept., interacting with your fellow students, and cooperating with teachers, but also intervening creatively in all matters of our academic community, you will acquire not only the necessary scientific knowledge, but also critical and creative thinking that will definitely assist you in your subsequent professional career.

On behalf of the Department, I would like to assure you that, all of us, i.e., the members of the Teaching and Research Staff (TRS) of the Department, in cooperation with the Academic Fellows and the beneficiaries of the Program for Acquiring Academic Experience who serve in it, as well as all the relevant members of the Technical and Administrative Staff, will always be by your side to support you throughout your studies. I wish to each and every one of you to have a Happy and Prosperous new Academic Year 2023 - 2024.

On behalf of the Mechanical Engineering Department,

The Head of the Department

Kostas KLEIDIS
Associate Professor

1. The INTERNATIONAL HELLENIC UNIVERSITY

1.1 General Information

The International Hellenic University (IHU) is located in Thermi, Thessaloniki, Greece. It was founded in due of article 1 of the Law 3391/2005 (A΄ 240). It is organized and operates as a Higher Educational Institute of the University Sector, in accordance with paragraph 1 and the indent a' of paragraph 2, of the 1st of Law 4485/2017 (A΄114).

Upon the Law 4610/2019 (Government Gazette 70/A΄/7-5-2019) IHU consists of seven (7) Faculties and/or Schools, each one of them including many Departments.

There is also a University Center for International Studies, located in Thermi, Thessaloniki, Greece, which also operates as an academic unit of the Institute, consisting of the following Departments:

a) Humanities, Social and Economic Sciences, which is part of the School of Humanities, Social and Economic Sciences

b) b) Science and Technology, which is part of the School of Science and Technology.

All IHU's Departments are located in many different cities of Northern Greece, mainly concentrated in four (4) Campuses: Thermi (where the University headquarters are), Sindos, Serres, and Kavala.

1.2 Academic and Organizational Structure

According to the Greek Legislation, each University is subdivided into Faculties and/or Schools, treating a set of related scientific disciplines. In this way, the necessary coordination for the quality of the education provided can be ensured. A Faculty and/or School is subdivided into individual Departments that represent the basic academic units. These units cover the subject of a specific scientific field and award the corresponding degree/diploma. The Schools of the International Hellenic University - with their Departments - are:

SCHOOLS	DEPARTMENTS
SCHOOL of ECONOMICS and BUSINESS ADMINISTRATION (Thessaloniki)	✓ Department of Business Administration (Serres) ✓ Department of Economic Sciences (Serres) ✓ Department of Supply Chain Management (Katerini) ✓ Department of Accounting and Finance (Kavala) ✓ Department of Business Administration, Marketing and Tourism (Thessaloniki) ✓ Department of Accounting and Information Systems (Thessaloniki) ✓ Department of Management Science and Technology (Kavala)

SCHOOL of SOCIAL SCIENCES (Thessaloniki)	✓ Department of Library, Archive, and Information Science (Thessaloniki) ✓ Department of Early Childhood Education and Care (Thessaloniki)
SCHOOL of HEALTH SCIENCES (Thessaloniki)	✓ Department of Biomedical Sciences (Thessaloniki) ✓ Department of Nutritional Sciences and Dietetics (Thessaloniki) ✓ Department of Midwifery Science (Thessaloniki) ✓ Department of Physiotherapy (Thessaloniki) ✓ Department of Nursing (Thessaloniki) ✓ Department of Nursing (Didymoteicho Branch)
SCHOOL of ENGINEERING (Serres)	✓ Department of Computer, Informatics and Tele-communications Engineering (Serres) ✓ Department of Surveying and Geoinformatics Engineering (Serres) ✓ **Department of Mechanical Engineering (Serres)** ✓ Department of Civil Engineering (Serres) ✓ Department of Industrial Engineering and Management (Thessaloniki) ✓ Department of Environmental Engineering (Thessaloniki) ✓ Department of Information Technology and Electronic Engineering (Thessaloniki)
SCHOOL of DESIGN SCIENCES (Serres)	✓ Department of Creative Design and Clothing (Kilkis) ✓ Department of Interior Architecture (Serres)
SCHOOL of SCIENCES (Kavala)	✓ Department of Computer Science (Kavala) ✓ Department of Physics (Kavala) ✓ Department of Chemistry (Kavala)
SCHOOL of GEOSCIENCES (Drama)	✓ Department of Agricultural Biotechnology and Oenology (Drama) ✓ Department of Agriculture (Thessaloniki) ✓ Department of Forestry & Natural Environment (Drama) ✓ Department of Food Science & Technology (Thessaloniki)
SCHOOL of HUMANITIES, SOCIAL SCIENCES and ECONOMIC STUDIES (Thessaloniki)	✓ Department of Humanities Social Sciences and Economic Studies (Thessaloniki)
SCHOOL of SCIENCE and TECHNOLOGY (Thessaloniki)	✓ Department of Science and Technology (Thessaloniki)

The administration of each and every School is carried out by the Deanery and the Dean. The Deanery of each School consists of:

- the Dean of the School,
- the Heads of the Departments of the School, and
- representatives of the Special Technical Laboratory Staff (in Greek, E.TE.P.), the Special Teaching Laboratory Staff (in Greek, E.D.I.P.), and the students at the School.

An academic Department is governed by:

- the Department's Assembly
- the Management Board, and
- the Head of the Department.

The Assembly of the Department consists of the members of the Department's Educational Staff, representatives of the technical staff, undergraduate and postgraduate students. Provided that the members of the Dept's Educational Staff exceed the number of twenty (20), there is the ability of organizing Sectors within the Department, each one contending a particular scientific direction. The General Assembly of a Sector is made up of the associated Educational Staff members (not less than five) and of student representatives.

The Campus of Serres

Serres Campus was established in 1993. It is located at the southeast corner of the city of Serres, stretching over an area of 248.000 m^2, consisting of modern installations and a beautiful surrounding.

Figure 1. Eagle-eye view of the Serres Campus of IHU

The installations complex of Serres Campus consists of the following buildings:

1. Two buildings with teaching classrooms and four auditoriums (A, B)
2. Four buildings housing laboratories, two amphitheaters and Professors' offices (Γ, Δ, Ε, Ζ)
3. A building complex housing the Departments of Information & Communications and Geomatics & Surveying (Σ)
4. The Administration Building, housing the Secretariats of all Departments as well as the rest of the services (Κ)

5. The Campus Library (M)
6. A fully equipped Gym (at the basement of building Δ)
7. Conference Centre with two auditoriums and a conference room (Λ)
8. Auditorium of 1000 seats (P)
9. Multipurpose Building (O)
10. Students' Restaurant and Dormitories (N)
11. Students' Canteen (Π)

To meet the educational and research needs, the Department of Mechanical Engineering uses classrooms and laboratory spaces in buildings B, Γ, Z, and O, in a total area of 6.250 m^2.

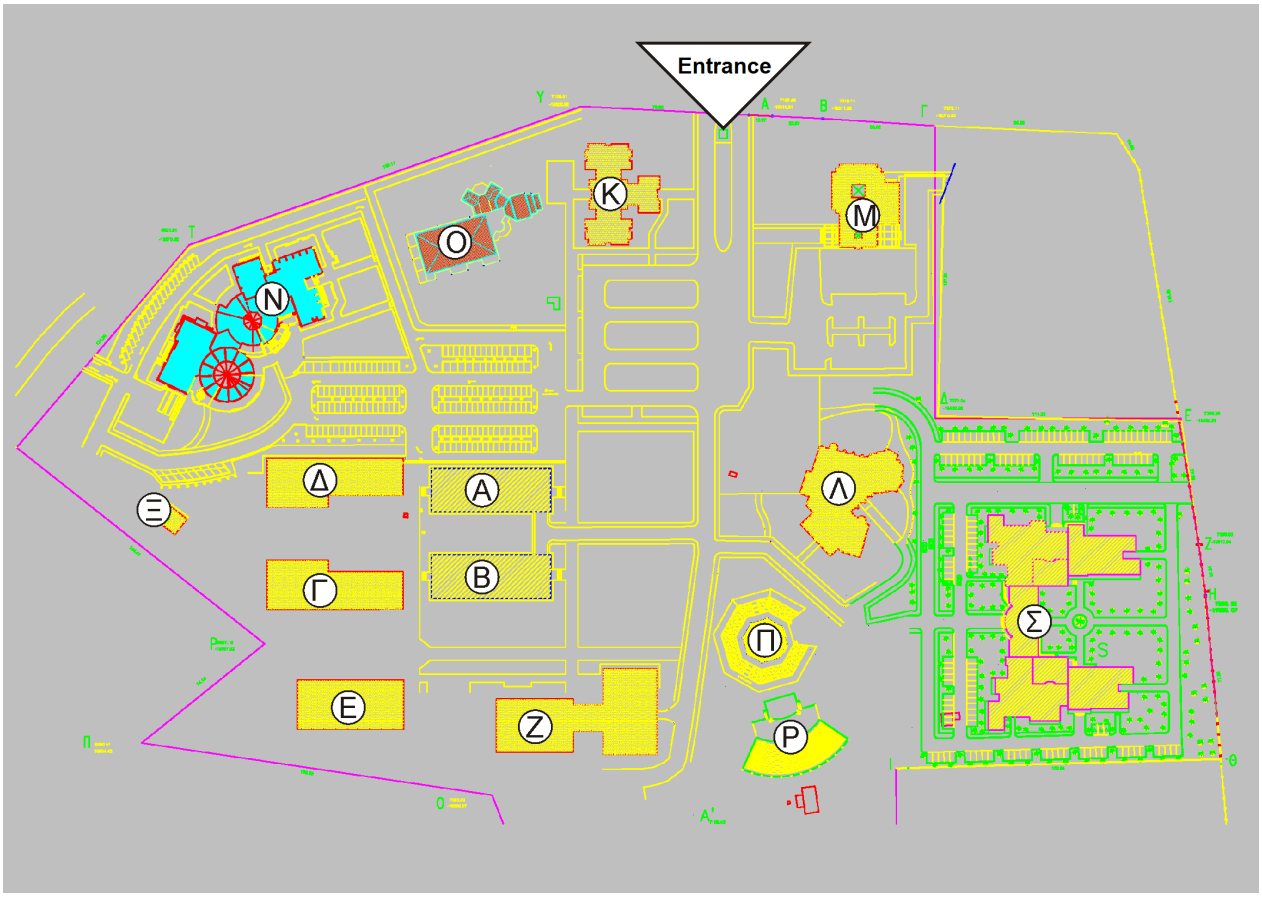


Figure 2. Schematic drawing of IHU's Serres Campus

2. The CITY of SERRES

2.1 Geographic and Demographic Data

The Prefecture of Serres is one of the seven (7) Prefectures of Central Macedonia territory. Being at the eastern side of Central Macedonia, it extends from Strymonikos Gulf (at the south) till the Greek-Bulgarian border, at the north. To the east, the Prefecture of Serres borders to the Prefectures of Drama and Kavala, and to the west with the associated administrative regions of Thessaloniki and Kilkis. The prefecture of Serres has a small coastline on the North Aegean Sea, along the Strymonikos Gulf (or Gulf Orfanos).

The county of Serres is among the most lowland prefectures, given that 48% of the total area is characterized as flat- hilly and lies east of the mountain line of Kerkini - Vertiskos – Kerdylion, west of the mountains Orvilos and Menikio, northeast of Pangeon mountain, and south of the mountain of Laelias. The Prefecture of Serres is crossed by the river Strymon, which stems from Bulgaria and flows into the homonymous Gulf. Its principal tributary, river Aggitis is located in the eastern part of the county, being the natural border between the Prefecture of Serres and the associated administrative region of Drama.

The total of the county is 3,790 square kilometers, which accounts for approximately 4% of the territory of Greece. 41% of the county is agricultural land, thus determining the main occupation of its inhabitants. The Prefecture of Serres is administratively divided into seven Municipalities (Municipality of Serres, Sintiki, Visaltia, New Zihni, Heraclea, Amphipolis, and Emmanuel Pappas).

2.2 Historical Data

The city of Serres is built in one of the most troubled crossroads of Europe, being crossed by countless armies and people. It is one of the very few cities of Greece that has maintained uninterrupted presence from the dawn of History till the present epoch. It was first appeared in the early 5th century BC. Herodotus uses the name Siris and the national description Peonian; the residents are named Siropeons. After Herodotus, Theopempos refers to it as Sirra. Later on, the Roman Titus Livius calls it Siras. Finally, Stephen the Byzantine wrote: “Siris in Paeonia” and “Siriopaiones”. The oldest epigraphic monument found preserves the words: “Sirraion city”. It is of the Roman epoch and now is in the Archaeological Museum of Serres. The name Serrai starts to be mentioned from the 5th Century AD. The name Siris is perhaps derived by the word Sirios, which means the Sun.

During the 5th Century AD, Serres is mentioned as the base of the Diocese and during the 6th Century, is one of the greatest cities of the 7th District of the Byzantine Empire. From

the 8th Century, the role of Serres in Greek history becomes a leading one, and the city is considered to be the most important in the geographic area between the rivers Nestos and Strymon.

During the Middle Ages, the city suffered many disasters and was subjugated to various conquerors but survived. In autumn 1204, it was surrendered to the Frank Crusaders. In 1205 the Tsar of the Bulgarians John the First conquered Serres. A few years later, in 1221, the Despot of Epirus, Theodore, took it back but in 1230, the Bulgarian Tsar John the Second reoccupied Serres. The Bulgarian commander Dragotas was forced to temporarily surrender the city to the Emperor of Nicaea John Vatatzi, after a sudden attack in 1245 but, once again, it took it back in 1345. The city was temporarily conquered by the Turks in 1373 and, eventually, they took it permanently in 1383.

During the Turkish occupation was the most flourishing city of Eastern Macedonia, with a population of 50,000 residents and several major schools that prepared the people of the city for the liberation struggle of 1821. The failure of the revolution hardened the stance of the Turkish conquerors. Moreover, the city suffered a lot from the activities of the Bulgarians after 1872. In 1912 it was finally occupied by the Bulgarians, who abandoned it on June 29, 1913, before the advancing Greek army. During World War I, the city of Serres was sat in by Germans and Bulgarians, and remained under their occupation until 1918, when it was finally freed. In World War II, the city occupied by the German Nazis who gave it to their Bulgarian allies. Bulgarians abandoned Serres at the end of World War II. Since then, Serres is following the course of the rest of the country to progress in modern History.

2.3 Useful Links of Transportation

Some useful links are given here, to help visitors of the Department to transport easily and safe.

Police: 100
Fire brigade: 199
Hospital: 166, 2321094500

InterCity Buses:

Tickets:	23210-22822
Tickets (mobile):	6949774400
Fax:	23210-54312
Email:	ktelserres@gmail.com

In-City buses

Telephone: 23210 22338, 23210-62135

Taxi Services in the City

Radio Taxi of Serres

Telephone: 23210 59100

What's UP 69740 59100

CU 69405 59100

Hermes Taxi of Serres

Telephone: 2321050000

CU: 6947050050

What's up: 6981685000

For further information you may also contact the Department's Secretariat:

Address : INTERNATIONAL HELLENIC UNIVERSITY
SERRES Campus
Department of Mechanical Engineering
End of Magnesias str
GR 62124, Serres, Greece

Tel. : **23210-49125**
FAX : 23210-49285
Email: info@mech.ihu.gr
http://mech.ihu.gr/

3. The DEPARTMENT of MECHANICAL ENGINEERING

The Department of Mechanical Engineering of the International Hellenic University, Greece, was established in May 2019, upon the Law 4610 (Government Gazette 90/Α΄/07-05-2019) “Synergies of Universities and T.E.I., access to higher education, experimental schools, General Archives of the State and other provisions". It actually comprises the development and constitutes an evolutionary state of the already existing Department of Mechanical Engineering of the Technological Education Institute (T.E.I.) of Central Macedonia, which was founded in 1983 and assumed its present form in 2013. Since then, the academic personnel of the Department has been involved to (and accomplished) a large number of educational and research projects, funded by the European Union, the Ministry of Education, and the General Secretariat of Research & Technology of Greece, not to mention many other financial resources (national industrial units, municipalities, etc.).

Three sessions of Study Programmes are offered by the IHU Department of Mechanical Engineering, namely Undergraduate, Postgraduate, and Doctoral Studies. They fully cover the discipline of Mechanical Engineering, in terms of designing, developing, constructing, and operating engines, mechanical equipment and processes, as well as systems of power-production and management, driven by efficiency, environmental sustainability, and social sensitivity.

Figure 3. View of the Department's building

Our Department provides extensive opportunities to students of all levels to engage in advanced studies and collaborate with our faculty members and the external associates, thus growing as well-trained engineers and professionals.

One of the main objectives of our Department is to offer academic education with an emphasis on the job-market application level. Accordingly, education is well-balanced between the development of solid theoretical background and the acquisition of technical skills, through workshop courses and training in well-equipped laboratories, enhancing the necessary link between academic knowledge and application. We do believe that, in this way, our graduates are able to fill the gap between the growing industry demands for specialized expertise and the skills currently available on the job market.

The Mechanical Engineering Dept's Curriculum are organized on the basis of two areas of scientific knowledge (Sectors), namely:

- **Manufacturing Sector**,
  offering Elective Courses, such as Experimental Strength of Materials, Machine Tools, Conveying and Elevating Machines, Mechanical Engineering Design and Optimization, Computational Mechanics, Manufacturing Technology, CAD / CAM / CAE Systems, Production Systems – Industrial Robotics, Casting & Welding, Mechatronics, Mechanical Forming, etc..
- **Energy Sector**,
  offering Elective Courses, such as Industrial Refrigeration, Techniques of Natural Processes, Hydrodynamic Turbines and Machines, Steam Turbines and Steam Boilers, Internal Combustion Engines, Heating – Ventilation – Air Conditioning, Computational Fluid Dynamics, Heat Transfer, Environmental Technology, Transportation Effects, Aerodynamics, etc..

The primary target of our Department is to inspire the young people – of every educational background – to understand that science, mathematics, and engineering can give them the exhilarating power to participate, not passively as spectators and consumers, but as the active explorers and the innovators who will design the future.

4. The UNDERGRADUATE STUDIES PROGRAMME

4.1 Scope of the Undergraduate Studies Programme

The scope of the Undergraduate Study Program of the Mechanical Engineering Dept. is to treat the major scientific knowledge areas of the Science of Mechanical Engineering.

- In the beginning, the students obtain an essential background of knowledge on the basic courses of Science and Mathematics, in order to be able to attend and assimilate the modern technology growth.

As regards Mechanical Engineering, in particular, the key point areas of study include:

- Calculation, designing, and manufacturing of individual elements that compose a mechanical system – Machine tools and machining technology.
- Technology of materials used in both energy and manufacturing, study of their structure and their applications.
- Technology of casting and welding.
- Configuration and calculation of the dynamic load distribution on mechanical systems.
- Classical and modern methods of metal forming in manufacturing.
- Methodology of design and optimization of mechanical systems.
- Metrology – quality control of manufacturing systems and products.
- Composite materials mechanics.
- Conveying and elevating machines.
- Electrical and mechanical installations.
- Economic and technical analysis, management and administration of technical projects and productive processes.
- Design, development, and optimization of renewable energy systems.
- Sources of environmental pollution, technologies for environmental protection – pollution control.
- Technology for measuring electric and non-electric quantities in energy systems.
- Environmental studies.
- Designing, manufacturing, and operating HVAC (heat, ventilation, air-conditioning) systems.
- Implementation, development, and optimization of various energy saving mechanical systems.
- Energy installations designing in buildings and industries.
- Energy conversion systems.

- Thermal and hydrodynamic machines – Turbomachinery.

- Vehicle dynamics and technology, classic and alternative fuel technology, classic and synthetic lubricants, tribology.

- Methodology of collection of data, and data analysis – compilation of techno-economic reports and complex workarounds.

- Fieldwork practice – capability of applying the knowledge acquired to the job market.

4.2 Degree Award and Level of Qualification

Degree Awarded: **B. Sc. in Mechanical Engineering** – Level of Qualification: **6** (according to ISCED of UNESCO)

Our Curriculum also reflects the tendency for specialization and deepening in Mechanical Engineering, including Manufacturing Courses, i.e., design, development, manufacturing and operation of machinery, devices, and industrial production installations, as well as Energy Courses, for the operation of production systems and energy management. It also includes Courses of Industrial Production Management, i.e., Production Management, Production Units Administration, Labour Safety – Ergonomics, etc..

4.3 Career Prospects

The undergraduate studies programme of the Mechanical Engineering Dept. ensures to its Graduates all the appropriate cognitive background and the necessary skills needed for a successful professional course. This is most pronouncedly reflected in the high percentage of admission of our graduates in the job market, i.e., 86% in the first six months after the Degree is awarded. It is expected that the experience of the Department's Faculty Members and its facilities that are constantly developed and modernized, along with the novel elements of the Curriculum, will further improve the Department's response to the job market.

5. INFORMATION on the CURRICULUM

5.1 Duration of Studies

The primary session of studies in the IHU Department of Mechanical Engineering consists of attending an Undergraduate Studies Programme, which includes courses corresponding to a minimum of 300 ECTS credits (European Credit Transfer System). Typically, it lasts five (5) academic years and culminates in the award of the B. Sc. in Mechanical Engineering. In each and every academic year the students should attend educational activities corresponding to 60 ECTS credits (Par. 2b, Article 30, Greek Legislation 4009/2011).

The undergraduate Curriculum follows the system of semester courses, distributed into ten (10) academic semesters. During the last two semesters (i.e., 9th and 10th) the mandatory B. Sc. Diploma Thesis takes place. In other words, the minimum duration of the primary session of studies for the Degree award is ten (10) academic semesters. This can be increased only by four more (4) academic semesters. After the completion of the maximum period of studies (14 semesters), the Directors Board of the Department issues an Act of Deletion (article 76, par. 1, Law 4957/2022).

Students who have not exceeded the typical upper limit of study (i.e., 10 semesters), after applying to the Department's Secretariat, may interrupt their studies for a period of time that does not exceed two (2) years. The right of a student to interrupt his/hers studies programme can be applied either once or partially for a period of at least one (1) academic semester. The total duration of the interruption, in case that is partially provided, should not cumulatively exceed two (2) years. During this period, the student status is suspended, hence participation in any educational process is not allowed (article 76, par. 4, Law 4957/2022).

5.2 Admission and Registration

Students of the Mechanical Engineering Dept. are considered those who are legally registered, (i) after their successful examination in the Panhellenic Exams for the Tertiary Education Level, (ii) by a Transfer Process from another Mechanical Engineering Dept. (usually for financial reasons), or (iii) by Admission Exams for Graduates, i.e., exams between Graduates of relative Departments in order to get a second Degree.

The registration of the newly admitted students takes place at the Department's Secretariat within the time limits determined by the Greek Ministry of Education.

Those who succeeded in the Panhellenic Exams for the Tertiary Education Level, need also to complete their registration through the electronic application of the Ministry of Education. In addition, they must also perform an identity check at the Department's Secretariat, by submitting the following supporting documents:

- ✓ Application for registration (it can be downloaded from the website of the Ministry of Education),
- ✓ A photocopy of their identity card (ID),
- ✓ One (1) photo (ID type),

For the remaining categories of the new Department's entrants, the required supporting documents are announced on a case-by-case basis.

5.3 Academic Calendar

Every academic year commences on September 1st of each year and is completed on August 31st of the following year. The educational process of every academic year is organized in two Semesters, the Fall Semester, and the associated Spring one. Each one of them comprises thirteen (13) weeks of class teaching and one examination period (the duration of which is three weeks). Among the various courses, there are some in which the students' progress is tested during the Semester, by progress tests and/or assignments. In this case, students do not take part in the re-sit exams that take place every September.

Fall Semester courses commence in the last week of September and end at mid-January, followed by the first examination period, that of the Fall Semester.

Spring Semester courses start at late-February and end at the beginning of June, followed by the second examination period, that of the Spring Semester.

During July and August, we have the summer vacations period, where there are neither lessons nor examinations. The first Monday of September the Re-Sit examination period commences. Its duration is almost four (4) weeks. In fact, the exact dates are determined by an Act of the IHU Senate.

In every Semester, before the beginning of the associated examination period, the students have the right and the opportunity to evaluate their courses and the associated instructors, aiming at the improvement of the quality of their studies. More information is available at the website of IHU Quality Assurance Unit (MODIP) and the website of our Department.

HOLIDAYS

Christmas Holidays: December 24 to January 7.

January 30: The Three Patron Saints of Education Day

Shrove Monday

March 25: The Annunciation/National Anniversary of Greek Revolution against the Turkish Rule.

Easter Holidays: From Holy Monday to Thomas Sunday

May 1: Labour Day

Sacred to Holy Ghost: The 1st Monday after Pentecost.

June 29: Serres Liberation Day by the Bulgarian Occupation.

October 28: National Anniversary of the Greek struggle against the Italian Fascists and the Nazis.

November 17: Students' uprising in the NTU of Athens against the Military Junta in 1973.

5.4 Recognition of Former Knowledge

In the IHU Dept. of Mechanical Engineering there is the possibility of accreditation of particular courses to the students who registered after succeeding in the Admission Exams for Graduates. According to Greek Legislation (Law 4957/2022), this can happen for a total number of courses up to 30% of the Department's Curriculum, that is sixteen (16) courses, top. To do so, the eligible students need to apply to the Department's Secretariat. The associated application document can be found in the Department's website – see, e.g., Useful Documents.

5.5 Course Enrolment – Renewal of Registration

Two weeks after the beginning of each academic Semester, the students should submit (via web) a Statement of Courses, involving the courses chosen by them in order to participate in the Semester under consideration.

It can be done by using IHU's Electronic Secretariat, i.e., through the electronic address https://uniportal.ihu.gr.

Notice, however, that the actual content of the Statement of Courses is subject to certain rules and/or restrictions on the ECTS credits available, according to Department's Internal Regulation Rule, as it is given below:

Typical Semester	**ECTS allowed**
1st and 2nd	30
3rd and 4th	48
5th and 6th	60
7th and 8th	60
9th and 10th	60
More…	60

Upon the Statement of Courses, each student acquires the right:

- To receive teaching support and resources (books, notes, etc.).

- To participate in the examinations of the selected Courses.

Students who does not renew their registration for two (2) consecutive or three (3) non-consecutive Semesters, lose the ability to continue their studies and are discarded from the records of the Mechanical Engineering Department.

5.6 Academic ID – Student Pass

Since 24/09/2012, undergraduate, postgraduate, and doctoral students of all Greek Universities can get their academic identity card, simply by applying to the electronic address:

Electronic Service for Acquiring Academic Identity - Information Portal (minedu.gov.gr).

5.7 Teaching Support and Resources

In Greece, all Courses of the Tertiary Education is further supported by the associated coursebooks. They are provided free of charge, through the Electronic Integrated Book Management Service EUDOXUS. Each and every student, after submitting electronically the Statement of Courses, should also perform the associated Statement of Books on the web portal of EUDOXUS (http://eudoxus.gr/), in order to get the coursebooks that he or she wishes to receive.

The Central Information System (CIS) of EUDOXUS presents the catalog of the Department's approved course Textbooks and the student selects the Textbooks he is entitled to. Accordingly, he or she receives an SMS and an e-mail from CIS with the associated PIN and may receive the selected Textbooks from several share points in the city of Serres.

5.8 Courses

The Curriculum of the Mechanical Engineering Department consists of 49 courses, of which, 33 are compulsory core courses, 8 of them are compulsory elective courses and 8 more are purely elective courses. The Curriculum is organized on the following basis:

- ✓ During the first six (6) Semesters, students attend the compulsory core courses.
- ✓ On the 7th Semester the students are called to choose their Direction of Study. In our Dept. there are two Directions of Study, each one fully covering basic knowledge areas of the Science of Mechanical Engineering. They are:

  The Direction (Sector) of Energy, and

  The Direction (Sector) of Manufacturing.

Each one of these Directions involves the attendance of eight (8) compulsory elective courses, distributed in two Semesters, the 7th, and the 8th.

- ✓ Finally, on the 9th Semester each Direction is being further divided in two Specializations, in which special knowledge areas of the Science of Mechanical Engineering is treated.

The Direction of Energy is divided into: Thermo-fluid Mechanics.

Power Generation & Management.

The Direction of Manufacturing is divided into: Mechanical Design & Materials.

Manufacturing & Production Technology.

Each one of these Specializations involves the attendance of eight (8) purely elective courses, distributed in two Semesters, the 9th, and the 10th, along with the elaboration of the mandatory Diploma Thesis.

The educational process related with each, and every course involves one or more of the following formats: Theory, Tutorial Act, and Laboratories. Students should attend all the courses of the Curriculum, according to their Statement. If, within a particular Semester, the number of teaching hours completed in a course is, for any reason, less than the 2/3 of the time allocated in the Curriculum, then, by an Act of the Head of the Department, this course is considered not to have been taught, at all.

ECTS credits: Each course of the Department's Curriculum is characterized by a number of credits. The ECTS credits corresponding to each course, are a measure of the workload required to complete the objectives of an Academic Program by each student. In Greece, one ECTS credit equals to 26 hours of work.

Grade Scale: Grading is expressed as a numerical scale from zero to ten (0 - 10), with five (5) being the minimum passing mark.

Laboratories: The successful completion of a laboratory course or the laboratory part of a combined course requires participation in 80% of the exercises completed during the Semester. In the last week of each Semester, additional laboratory and practical exercises may arranged, for those students who have failed in an exercise or were absent, in order to meet the required rate of 80%.

Grading: The final grade of the theoretical course or the theoretical part of a combined course, is the grade of the final exams on the course.

The grade of a laboratory or the laboratory part of a combined course is, depending on the nature of the course, the average of all individual grades of the exercises that have been successfully carried out or the grade at the final exams of the course. In case of failure in the final exams, there is the possibility of another examination period in a subsequent Semester.

The final grade of a mixed course (theory + laboratory), results from the aggregation of grades of theoretical and laboratory courses which are part of the mixed course, with rates ranging between 0,40 and 0,60 and have a sum of unity (1). This allocation is determined by the hours and conditions of teaching and the nature of each part of the course.

5.9 Examinations

As regards the courses taught in each Semester (Fall and/or Spring) according to the Curriculum, there is one examination period and one repetitive, the duration of both being three weeks. In Fall Semester, the examination period takes place in mid-January, i.e., after the end of the associated courses, while the repetitive takes place in early September. In Spring Semester, the examination period takes place in June, while, once again, the repetitive period takes place in September.

A student is eligible to participate in the examinations of the courses stated at the beginning of the Semester.

A student who has been graded with a mark greater than or equal to five (5) during the first examination period, cannot participate in the repetitive examination period.

5.10 Diploma Thesis

Students of the (typically) last two academic Semesters (9^{th} and 10^{th}) are required to prepare a dissertation project on subjects of modern research, production and / or service offering. The associated Diploma Thesis is being accordingly defended before a three-member Committee, consisting of members of the Dept's Academic Staff, which decide on its grade. The successful completion of the Diploma Thesis acquires thirty (30) ECTS credits.

During the elaboration of the Diploma Thesis, if necessary, premises and equipment of the Department, as well as financial means of the Institute, can be used.

Each Semester, the members of the Dept's Academic Staff, through the Secretariat of the Department, suggest topics of Diploma Theses, which are approved (or not) by the Dept's Assembly and reported promptly to the students through the Dept's website.

A common project can be assigned as a Diploma Thesis to a group of up to two (2) students, along with the associated distribution of work for each one of them.

To proceed with the elaboration of their Diploma Thesis, the students are required to submit to the Secretariat of the Department a Statement, along with a brief description of the project that they are going to undertake, which is countersigned by the supervising Instructor and approved by the Assembly of the Department.

The duration of the elaboration of the Diploma Thesis cannot exceed four (4) academic Semesters. In the case that this limit is exceeded, the students involved are subsequently assigned with a new topic.

Upon completion of the Diploma Thesis, i.e., after its approval by the supervisor, it is submitted through the protocol to the Department, in electronic form (CD), together with an application for its defense. This process should take place at least ten (10) days before the actual date of defense of the Thesis by the student(s).

If a Diploma Thesis is considered incomplete, it is being returned to the student(s) for further processing, thus, both the submission process and the associated defense are repeated.

5.11 Work Placement – Internship

In Mechanical Engineering Science, a period of work placement it is essential to be provided to the students, and, in fact, it does so by our Department. This process is **optional** and has the following characteristics:

- It lasts 4 months and (together with the Diploma Thesis) it typically staffs the 9th and the 10th Semester.
- It is supervised by both a Faculty Member of the Department and a representative of the Company in which the fieldwork will take place.
- It is institutional, something that becomes evident by the associated Social Insurance Coupon, but,
- It does not count as working experience, since it is a part of the Dept's Curriculum.

The aforementioned Work Placement aims to train our students in a real working environment, in the processes of calculation, design, development, construction, operation, and maintenance of machinery, mechanical engineering installations, as well as systems of production and energy management. It is expected that, through Internship the students will become familiar with the working environment in which they should deal (in real time) with real problems that the various Mechanical Engineering Companies are facing.

More specifically, in the context of the aforementioned Internship, a student is expected to deal with the following cognitive areas of Mechanical Engineering:

a) Study (i.e., calculation and design) of engine data using classical and modern methods.
b) Study of mechanical engineering installations and industrial manufacturing systems.
c) Monitoring, organization, control, and construction of machinery and installations, by using classical and modern methods.
d) Operation, monitoring, support, and repairing of damaged machinery and installations.
e) Organization of production, quality assurance, and managing of the various units of industrial production.
f) Control of the end products and the procedures for safe operation, environmental protection, and quality assurance.
g) Laboratory measurements and experiments in all areas of his/hers specialty.
h) Design, development, installation, and operation of power production systems by the exploitation of renewable energy sources.

Student's Internship can be carried out:

a) In Public Services, Public Companies, as well as in Companies of Public Interest and Utilities.

b) In Private Companies producing goods, in preference to Companies of manufacturing mechanical equipment.
c) In Private or Public Laboratories and Engineering Offices.
d) In general, in Companies or Production Units and / or large size service providers, that posses mechanical equipment or design activity in the areas of specialty.

The Internship Program:

The Dept's Supervisor of the Internship, in cooperation with the Supervising Engineer of the Company that "hosts" it, distributes the time of training in all parts of the unit, so as the trainee student to gain as much of experience as possible. For this purpose, at the discretion of the Internship Committee, it is possible to move students between different Company units.

Internship of students of the Mechanical Engineering Dept. is optional and not a mandatory part of their studies. As it is mentioned above, when applied, the Internship is an extra section of the Dept's Curriculum corresponding to ten (10) **extra** ECTS credits.

The workplace for the student Internship can be either of the Public or the Private Sector, as well as in Technical Institutes and/or Companies of the European Union, under the auspices of the European Program Leonardo.

In order to commence an Internship Program, eligible students should apply to the Dept's Secretariat, in order to receive the relevant documents (announcement of Internship, booklet of Internship, and three copies of the Internship apprenticeship).

To complete the Internship Program, a student needs to submit to the Dept's Secretariat an application regarding the approval of Practice, along with the Internship booklet and the stamps of the Social Insurance Organization (in Greek, IKA).

In the IHU Department of Mechanical Engineering, students Internship is remunerated in accordance to the Greek Legislation. Currently, part of the fees comes from the ESPA project.

5.12 Earning the Degree – GPA

The score in all Courses is reflected in the numerical range from zero to ten (0 - 10), based on the minimum mark of success, that is, five (5). All grades are calculated and recorded to the nearest two decimal points. The associated GPA (in Greek, Βαθμός) is given by:

$$B = \frac{c1 \cdot b1 + c2 \cdot b2 + \ldots\ldots\ldots + c\nu \cdot b\nu}{c1 + c2 + \ldots\ldots\ldots + c\nu}$$

where b_1, b_2,..... b_v are the grades in all courses successfully attended by the student and c_1, c_2,...,c_v are the associated ECTS credits. The Diploma Thesis is also considered as a Course.

A student of the Mechanical Engineering Department is declared Graduate, once he or she has completed all the necessary requirements (Courses and Diploma Thesis), from the date on at which the final requirement is submitted via protocol to the Secretariat of the Department.

GPA Classification:

8,50	10,00	**Excellent**
6,50	8,49	**Very Good**
5,00	6,49	**Good**

5.13 Degree Certificate – Transcript of Records – Diploma Supplement

All graduates of the IHU Department of Mechanical Engineering receive, without any discrimination, the Degree Certificate, which serves as a copy of the B.Sc. in Mechanical Engineering, for any legal use.

The knowledge area – direction of study that might has been attended by a student during his/hers studies does not appear in the Degree Certificate.

In the Transcript of Records and the associated Diploma Supplement all the attended courses and the corresponding grades of a student are presented in detail. From these two documents it can become evident the particular curriculum attended by a student as well as the associated direction of studies.

5.14 Digital Skills Certificate

The digital skills certificate is awarded after the successful completion of four (4) out of eight (8) relevant courses, namely:

Course	Semester	Credits
Computer Programming, I	2nd	4.5
Computer Programming II	3rd	4.5
Computer Aided Design I	2nd	4.5
Computer Aided Design II	3rd	4.5
Finite Element I	7th	6.0
Finite Elements II	9th	5.0
Computational Fluid Dynamics	9th	5.0
Computational Metal Forming	10th	5.0

6. STAFF

6.1 Academic Staff

The staff of the Department of Mechanical Engineering consists of the Academic Staff and the Administrative Personnel. Academic Staff, in particular, is further discriminated into Faculty Members and Laboratory Teaching Staff.

Currently, the staff of the IHU Mechanical Engineering Dept. consists of fourteen (14) Faculty Members at all levels, one person in the administration office, and six members of Laboratory Teaching Staff. Ten (10) external associates (teaching and laboratory assistants) are also employed, under one- to three-year contracts, so as the educational needs of the Department are met. One more faculty member, at the Assistant Professor level, is expected to join us within 2024.

FACULTY MEMBERS			
A/A	**FULL NAME**	**TITLE**	**SUBJECT AREA / SPECIALTY**
1.	Gkotsis Paschalis	Professor (Emeritus)	Applied Mechanical Engineering & Dynamics
2.	Chasapis Dimitrios	Professor (Full)	Physics – Thermodynamics
3.	David Konstantinos	Professor (Full)	Machine Tools – Machining Technology
4.	Moissiadis Anastasios	Professor (Full)	Conveying and Elevating Machines – Machine Elements
5.	Anthymidis Konstantinos	Associate Professor	Surface Metal Treatment
6.	Katsanevakis Athanasios	Associate Professor	Energy Systems – Thermal Engines
7.	Pantazopoulos Athanasios	Associate Professor	Computer Science
8.	Sofialidis Dimitrios	Associate Professor	Computational Fluid Dynamics
9.	Kleidis Konstantinos	Associate Professor	Applied Mathematics
10.	Geivanidis Savvas	Associate Professor	Internal Combustion Engines
11.	Misirlis Dimitrios	Associate Professor	Thermo-fluid Mechanics
12.	Sagris Dimitrios	Associate Professor	Industrial Robotics and Production Systems
13.	Friderikos Orestis	Assistant Professor	Computational Mechanics
14.	Simoglou Christos	Assistant Professor	Electrical Engines – Power Stations

15.	Moschidis Nikolaos	Lecturer	Materials Science – Machine Elements

Laboratory Teaching Staff			
A/A	**FULL NAME**	**CATEGORY**	**SUBJECT AREA / SPECIALTY**
1.	Evelzaman Ioannis	Special Teaching Laboratory Staff	Mechanical Engineer, Civil Engineer, M.Sc. in Robotics
2.	Parashou Theodoros	Special Teaching Laboratory Staff	Mechanical Engineer
3.	Liousa Xrysoula	Special Teaching Laboratory Staff	Foreman – Chemist
4.	Basios Athanasios	Special Technical Laboratory Staff	Foreman – Electrician
5.	Ourdoudi Bagia	Special Technical Scientific Staff	Mechanical Engineer, M.Sc. in Computer Networks
6.	Myronidis Gabrielos	Special Teaching Laboratory Staff	Automation Engineer, M.Sc. in Renewable Energy Systems

ADMINISTRATIVE PERSONNEL		
A/A	**FULL NAME**	**Position**
1.	Ntoka Melpomeni	Head of the Secretariat

Address : INTERNATIONAL HELLENIC UNIVERSITY
SERRES Campus,
Department of Mechanical Engineering,
End of Magnesias Str.
GR-62124, Serres, Greece.

Tel. : **23210-49125**
FAX : 23210-49285
E-Mail: info@mech.ihu.gr
http://mech.ihu.gr/

6.2 Administration / Secretariat Office: Duties – Working Hours

The Department's Secretariat is responsible for all student issues, along with the Department's administrative matters.

Student services are provided on all working days during 11.00 am to 13.00, at the Department Secretariat Office located on the ground floor of the Administration Building of Serres Campus.

Student issues include (among others):

- Registration process and procedure
- Students' records (grades, registration renewals, scholarships, etc.)
- Certificates and Degrees,
- Certification of legal use,
- Paper form of students' Internship,
- Courses enrolment
- Deletion of students who do not renew their registration, etc.

Regarding first-year students, in particular, we have:

Registration Renewals – Course Statements are carried out through the Electronic Secretariat at the beginning of each Semester, and for a period of approximately fifteen (15) days. Each student has his/her own personal code, obtained from the Department's Secretariat, with which he or she performs the Course Statement electronically.

When the lists of the successful candidates in the Panhellenic Exams for the Tertiary Education Level are announced by the Ministry of Education, a registration deadline is set for the new entrants, that is common to all higher education Institutions in Greece. This deadline should by no means be missed; latecomers lose their right to register. Registration of new entrants takes place in September.

From November 1 to 15, the Dept's Secretariat, among others, deals with:
- Students' transfer for financial-, social-, and health reasons, as well as regards many-children families.
- Enrolment of Higher Education Graduates, who succeeded in the qualifying exams held every year, at the beginning of December.

6.3 The Role of the Academic Advisor (Tutor)

The institution of the Academic Advisor (Tutor) has been implemented by the Department of Mechanical Engineering since 2010. Each year, prior to November 30, by a decision of the Department's Assembly, all Faculty Members undertake an extra role, that of the Academic Advisor (the Tutor) for each and every one first-year student. This role involves guidance regarding their studies in the Department, along with their future prospects, i.e., after graduation (master and Ph.D. programmes, entering in the job market, etc.).

The Academic Advisor informs the students assigned to him/her about his/her role and invites them to an introductory meeting. Students are required and encouraged to communicate regularly with their Academic Advisor, discuss educational issues and take advantage of his/her knowledge and experience throughout all the years of their studies.

6.4 Instructors' Evaluation by the Students

In each Semester, at the nineth and/or the tenth week of the educational process, evaluation of the Instructors by the students takes place, along with the relevant courses. This is a long-standing institutional process, in which the Mechanical Engineering Department has a great experience (in our Department it takes place since 2010). It is an anonymous, electronic process, in which students actually grade their Instructors, in an effort to upgrade the educational services offered by our Department. The associated results, in a range from 1 (bad) to 5 (excellent) give a five-year average of **4.23** to the Dept's Instructors and a **4.38** to the associated facilities, that is, far above the associated IHU's mean value (3.75), something that not only makes us very proud, but also gives us the strength and the courage to carry on with the good job.

7. FACILITIES

Laboratory Facilities and Equipment

The following Laboratories operate (per Sector – Direction of Studies) in the Department of Mechanical Engineering, to meet its Educational and Research requirements:

GENERAL INFRASTRUCTURE

Physics – Thermodynamics

Informatics

Mathematics – Numerical Methods

MANUFACTURING SECTOR

Machine Tools – Machining Technology

Applied Mechanical Engineering and Dynamics

Machine Elements – Conveying and Elevating Machines

Technology of Materials

Mechanical Drawing and Design

ENERGY SECTOR

Fluid Mechanics – Hydrodynamic Machines

Energy Systems and Thermal Engines

Electrical Measurements and Industrial Automation

Internal Combustion Engines

Heating – Ventilation – Air Conditioning

In particular:

PHYSICS – THERMODYNAMICS LAB

Administrator: Professor Dimitrios CHASSAPIS

Educational Purpose

The Laboratory of Physics - Thermodynamics supports the laboratory part of the following courses:

- Dynamics
- Electromagnetism
- Thermodynamics I and II

Objectives:

The Physics Laboratory aims to bring together Mechanical Engineers with the Experimental Physics and, in fact, with the experimental procedure itself, i.e., to measure a physical quantity, to export useful conclusions by graphic and/or numerical processing of measurements and to quantitatively assess the accuracy of the final result.

The Physics Laboratory equipment serves equally well the development of dissertation projects and research, while providing services to external stakeholders.

Educational equipment:

The Laboratory possesses integrated experimental devices, each one of which may serve up to two students. They cover the following topics:

DYNAMICS

1. Measuring the static and kinetic friction
2. Harmonic oscillations - Oscilloscope
3. The fundamental equation of Mechanics (Machine of Atwood)
4. The coefficient of linear thermal expansion
5. Composition of coplanar forces
6. Straight, smoothly accelerated motion
7. Freefall
8. Determination of gyration by the method of speed oscillations
9. Hooke's Law - Harmonic oscillation of coil springs
10. Measurement of gravitational acceleration on a simple pendulum

ELECTROMAGNETISM

11. Ohm's Law
12. DC Circuit
13. Resonance in forced electromagnetic oscillations – RLC circuit in series
14. Determination of the gravitational constant (torsion balance of Cavendisch)
15. Measuring Earth's magnetic field
16. Grading of a thermal element
17. Transistors - Crystal triodes
18. Electromagnetic induction – Inductance

19. Law of thermal radiation of Stefan – Boltzmann

20. Diffraction spectra of Hydrogen and Mercury

21. Joule's Law

Research equipment:

For research activities and services Physics Lab features the following instruments and software:

- ✓ Integrated measurement system consisting of a radon meter Alphaquard Professional
- ✓ Monitor and Data Expert software of Genitron Instruments.
- ✓ Portable digital gamma spectrometer FieldSPECK of Target System Electronic
- ✓ Portable radiometer FH40G of Eberline Instruments
- ✓ Weather Station Vantage Pro2 and Weatherlink software of Davis Instruments
- ✓ Portable sound measuring MI6301 PR Pro Set and Sound Link software of METREL.
- ✓ Computer Software Mathcad 13 of Mathsoft Engineering & Education

INFORMATICS LAB

Administrator: Associate Professor Athanasios PANTAZOPOULOS

Educational Purpose

Informatics Lab supports the laboratory part of the following courses:

- ➢ Computer Programming, I
- ➢ Computer Programming II

MATHEMATICS – NUMERICAL METHODS LAB

Administrator: Associate Professor Kostas KLEIDIS

Numerical Analysis falls in the subject of Applied Mathematics, treating approximate solutions to complex problems whose solution is very hard and/or impossible to be found in an analytical way. In this case, the mathematical model is substituted by a *numerical model*, where theory and practice are usually interdependent. Every numerical method of solution is comprised of two parts, the *theoretical* and the *applied*. The theoretical part consists of the development of *algorithms* (codes consisted of a finite number of steps for the solution of a problem, with a finite number of operations in every step) and the study of their precision and stability, that is, their *error* analysis. The applied part refers to programing of these algorithms in a programming language, in the optimum way – that is, with the least possible computational time (CPU hours) and memory space (RAM).

The extremely rapid development of computational systems has led to the management of a great deal of intractable scientific applications through numerical methods. For this reason, in 2010 the Lab of Numerical Methods commenced its activities in the Department of Mechanical Engineering. Today, the Laboratory is still being developed aiming to meet (as far as possible) the needs of modern educational process.

Educational Purpose

The Lab of Numerical Methods supports the laboratory part of the courses:

- Numerical Analysis
- Probabilities and Statistics

MANUFACTURING SECTOR

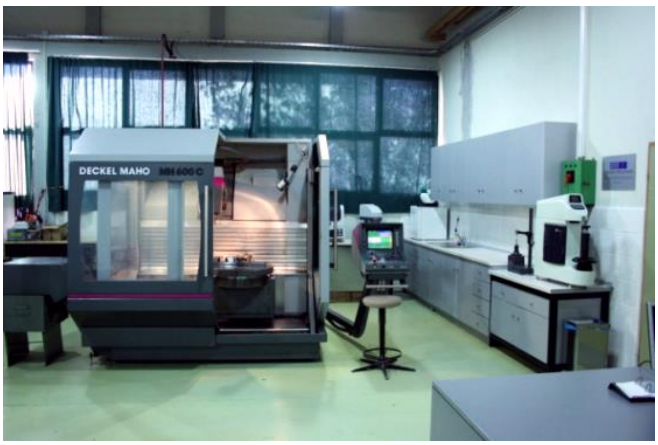
LABORATORY of MACHINING TECHNOLOGY and MACHINE TOOLS (MT^2-Lab)

Members: **Professor Konstantinos DAVID (Administrator)**

Associate Professor Dimitrios SAGRIS (Member)

Assistant Professor Orestis FREIDERIKOS (Member)

The Machining Technology and Machine Tools Lab (MT^2-Lab) of the Mechanical Engineering Department commenced operating in 1994. It is now equipped with suitable mechanical and metrological equipment to meet its mission both in the educational process and in elaborating high-level research. MT^2-Lab's objective is to provide excellent education in the subject of Machine Tools, Machining, and Molding Technology. The Lab is constantly evolving, while, at the same time, it develops knowledge through the implementation of research projects and the provision of technology services to the industry, by providing customized services.



The activities of the MT^2-Lab are related to the following scientific knowledge areas:

- Formatting mechanical products through Machining.
- Automated production systems with Computer (CAD/CAE/CAM) support.
- Quality control of both the product and production process, through appropriate measure-technic systems.

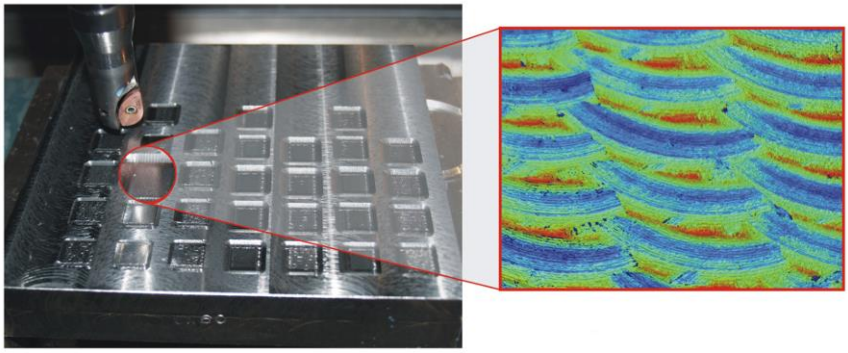
Educational Purpose

MT^2-Lab supports the laboratory part of the following courses:

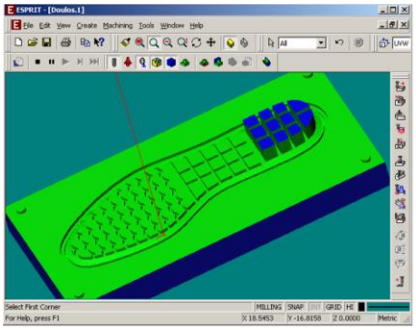
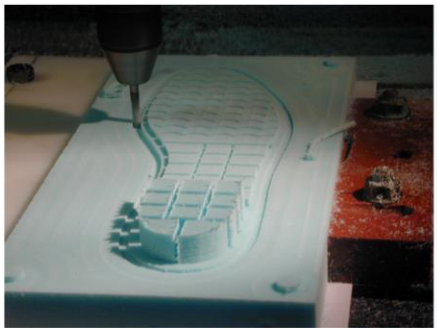
- Machine Tools
- Mechanical Configurations and Tribology
- Mechanical Design
- CAD I
- CAD II
- Production Systems - Robotics
- Mechatronics
- Machining Technology I
- Machining Technology II
- Oscillations and Machine Dynamics
- Computational Metal Forming
- CAD/CAE/CAM
- Experimental Material Strength

Research and Technological Services

1. Elaboration of information processing digitally driven tools (CNC).
2. Design study and manufacture of mechanical products using CAD/CAM/CAE systems.
3. Design study and manufacture of molding pressure modulator and cutting molds.
4. Design study and build tester for studying mechanical parts endurance.



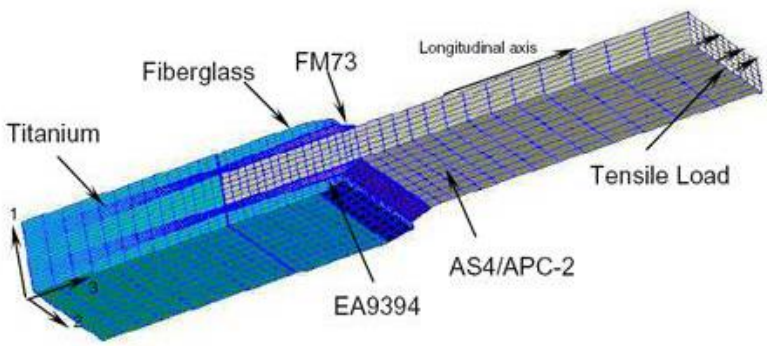
5. Static and dynamic strength of mechanical components using the finite element method.
6. Measurement of various geometrical and surface sizes.
7. Characterization of surfaces.
8. Creating prototypes with rapid prototyping method (Rapid Prototyping, Rapid Tooling).
9. Conduct dynamic balance in the operating conditions.
10. Control measurements of oscillational behavior of industrial structures and machinery.
11. Precision checking of machine tools and mechanical arrangements using Laser beams.
12. Information elaboration of digitally driven industrial arms (Industrial robots).

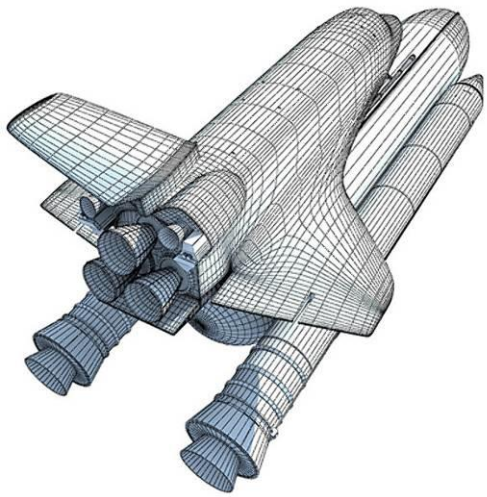




13. Design study of industrial automation.
14. Non-destructive testing (ultrasound, cracks, thick coatings)
15. Mechanical strength testing of materials (tension, compression, bending, torsion)
16. Metallographic examination of materials and mechanical properties

Furthermore:

Composite Materials and constructions made of them, development, modeling, simulation, and transmission of fracture, as well as the fracture load with the use of finite elements. Structural optimization of constructions.

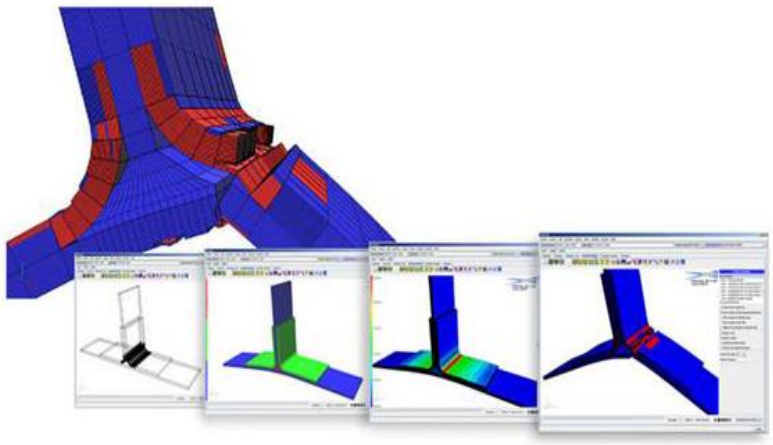




Consulting Services

1. Consulting services on issues related to manufacturing systems and automation. Presentation of new methods and techniques, industrial production systems.

2. Digital Assessment driven CNC Machine Tools and software products CAD/CAM/CAE for integration into industrial production.



Seminars

1. Training of industrial technical staff in aspects of exploitation, use, and application of new technology systems of industrial production.

2. Organizing seminars, conferences, workshops for training, informing on modern scientific achievements and innovations in the field of industrial production systems.

Laboratory Equipment

Appliances - Instruments - Machinery

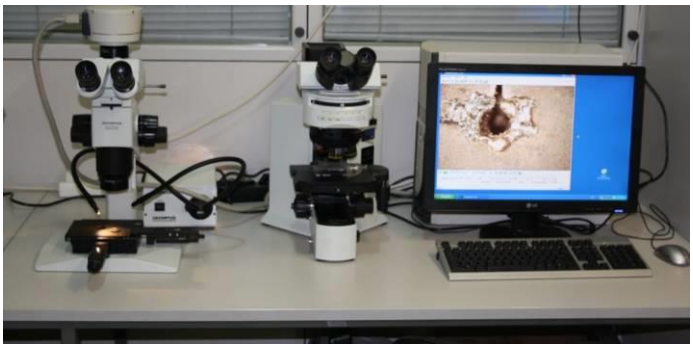
1. CNC machining center DECKEL-MAHO 5-axis
2. CNC milling machine3-axis with Heidenhein 530 i TNC guidance.
3. 3 CNC educational lathes (EMCO)
4. Rapid Prototyping Machine (Rapid Prototyping, Rapid Tooling Z-CORPORATION)
5. 3D optical profile meter (White Light Inter-ferrometer VEECO)
6. Optical Microscope (digital camera), OLYMPUS
7. Optical Stereoscope (digital camera), OLYMPUS
8. Micro durometer Vickers
9. Digital Rockwell hardness meter
10. Portable hardness meter Rockwell, Vickers

11. Digital Friction meter (TESA, DIAVITE)

12. Ultrasound for non-destructive testing NDT (Echograph Karl DEUTSCH).

13. Apparatus for measuring thickness of coating (Leptoskop Karl DEUTSCH)

14. Crack detector (crack detector Rmg 1045) Karl DEUTSCH



15. Various metering sensors (of, e.g., acceleration, velocity, etc.)

16. Force Sensor-acceleration for Model Analysis (KISTLER 8770A)

17. Strain gauge with measurement acquisition device (HBM)

18. Inductive LVDT transposition devices

19. Dynamometric 3-axis bank (KISTLER)

20. Apparatus for oscillation analysis and dynamic balancing

21. Measuring devices with Laser flatness, alignment, etc.

22. Instrument of signal acquisition and processing

<u>OTHER INSTRUMENTS</u>

23. Digital oscilloscope

24. Programmable checking device PLC Simatic S7-300

25. Inductive furnace with digital temperature indication

26. Full range of appliances metallographic laboratory (preparation metallographic specimens STRUERS).

27. Engine tensile, compression, bending, buckling 120 tn (INSTRON KN1200)

28. Torsion machine (INSTRON M55)

Software

1. Finite element analysis (FEM) (ANSYS, COMSOL, GENOA)
2. Design 3D-Design (SOLIDWORKS, TOPSOLID, ALIBRE)
3. Software for design and execution of mechanical configurations CAM (SolidCAM, Top CAM, Esprit, EdgeCam)
4. Analysis and processing of measuring data (LABVIEW)
5. Software analysis of composite materials by the finite element analysis method (GENOA)

Sub-LAB of MACHINING TECHNOLOGY I

The Lab of Machining Technology I is equipped with the most modern machinery, tools, and instruments. In this Laboratory, each Semester, about eighty (80) students carry out laboratory exercises, in four (4) different groups. These exercises are carried out in separate sections, that include all the cognitive areas of the studies outline, namely,

1. Fitter
2. Measurements
3. Welding
4. Piper
5. Rolling mill
6. Sharpeners and Foundry

The students during their exercise acquire knowledge that is indispensable to every manufacturer Mechanical Engineer.

Sub-LAB: MACHINING TECHNOLOGY II

Machining Technology II Lab is fully equipped with lathes, milling tools axis, drills, etc., in order to meet the Department's educational needs. The current equipment is in excellent

condition and, recently, some tool machines were further equipped with digital position measuring systems. During the 8th Semester, the students are trained both in handling the abovementioned tools, making a total of ten different exercises, and also in theoretical articles related to technology of metal forming involving material removal. Each semester, around 80 students are trained, in four (4) groups.

Sub-LAB of MECHANICAL DRAWING and DESIGN

The Laboratory of Mechanical Design includes the latest and finest drawing boards, equipped with a mechanism to move parallel or perpendicular to the parallel graph head, with a swivel mechanism and table lift design. They also include local lighting for each drawing board and utility bench for placing instruments and design materials. The Lab is equipped with libraries for storing prototype designs, measurement instruments, designing instrumentation, machine parts and prototype parts (pieces) for better understanding the designs.

In the Mechanical Design Lab, each Fall Semester, six student teams of 24 persons, perform their laboratory exercises in the context of the course Mechanical Design. In their training, the students design components of elevations, intersections, details, and practice in fitting scales. They also produce construction and brief designs. Students are also trained in the selection of tables of standard machine elements, the use of techniques of international regulations such as DIN, ISO etc..

Alongside with all the above, there are operating models for the study and design of clusters such as various types of transmission, pumping station, etc., and accurate instruments of measuring length and roughness.

LABORATORY of MACHINE ELEMENTS – CONVEYING & ELEVATING MACHINES

Administrator: Professor Anastasios MOISSIADIS

The Laboratory of Machine Elements – Conveying & Elevating Machines deals with the design, analysis, and synthesis of engineering systems in general, and lifting and transport in particular. The corresponding courses combine a broad range of cognitive subjects of Engineering such as Mechanical, Electrical and Electronic, Machine Elements, Hydraulic Systems, etc., hence Lab's mission focuses on guiding students in the correct application of knowledge acquired in respective core courses, combining,

and composing them with new knowledge referred to lifting and handling equipment. This is achieved through integrated design and calculation of specific machinery of lifting and transport, which extends from the initial conception of the principle of the system, to elaboration of the required summary and construction design.

Particular emphasis is given on understanding the problems of functionality, engineering configuration, resilience, potential of assembly - disassembly, cost, weight and volume, and the rational use of the offered materials for the planned construction. In the laboratory analysis of the following components is a non-continuous transport system (crane bridge): Lift system, braking system, marching system, metallic construction, construction measures to increase operational safety and availability of lifting and transportation systems.

Analysis is performed on individual parts of a continuous transportation system (conveyor belt): Driving mechanism, transportation belts, tensioning devices, metal construction and seating of the belt cleaning systems and protection. In the workshop, students have the opportunity to implement and test the above mentioned skills by means of a series of simple or complex lifting devices, manual or motorized, that are in the laboratory and used as measurement standards and testing. By doing this, the workshop is directly related to the practical application and needs of an engineer, who deals with maintenance, design and support of engineering installations.

Educational Purpose

The Laboratory of Machine Elements – Conveying & Elevating Machines supports the laboratory part of the following courses:

- Conveying and Elevating Machines
- Machine Elements I
- Machine Elements II
- Mechanical Installations

TECHNOLOGY of MATERIALS LAB

Administrator: Konstantinos ANTHIMIDIS (Associate Professor)

Educational Purpose

The Technology of Materials Laboratory supports the laboratory part of the following courses:

- Introduction to Materials Science

- Technology of Mechanical Engineering Materials
- Casting and Welding
- Heat and Surface Metal Treatment
- Materials and Environment
- Materials and Mechanical Design
- Advanced Materials

The Materials Technology Laboratory was founded in 2006. Since then, it is growing more and more with the supply and installation of new modern machinery and equipment to support the practical training of students on topics related to:

- Cutting and preparation of mineral samples
- Observing the microscopic structure of samples
- Measuring the hardness of samples
- Measuring the resistance of samples
- Casting of metals, in particular aluminum alloys

Equipment

The Laboratory is equipped with:

- Furnace for melting metal
- Molds for blended casting
- Power cutter for cutting specimens
- Grinding machines for grinding of samples
- Microscopic observation of specimens
- Micro durometer and Rockwell durometer for measuring the hardness of specimens.
- Tensile machine to measure the tensile

Apart from educational purposes, the Laboratory equipment is used especially for dissertation projects and research programs of the Institute.

ENERGY SECTOR

FLUID MECHANICS & HYDRODYNAMIC MACHINES LABORATORY

Administrator: Dimitrios SOFIALIDIS (Associate Professor)

The laboratory is located on the ground floor of the heavy-duty machinery building of the Mechanical Engineering Department installations.

EQUIPMENT

The laboratory is equipped with the following instruments:

- A closed network appliance of a KAPLAN water turbine with variable angle fins.
- A PELTON water turbine system.
- An axial fan with import & export ducts.
- A network appliance with centrifugal pump and PELTON water turbine.
- Centrifugal blower witch changeable propeller.
- Piping network with two centrifugal pumps capable of individual operation and connection in series or parallel.
- Network for the calculation of linear and local pressure losses.

Auxiliary Equipment

- Viscosity meter
- Pitot Tubes
- Flowmeters
- Manometers
- Dynamometers
- Instruments for electrical measures

Educational Purpose

The laboratory serves the needs of the laboratory parts of the courses:

- **Fluid Mechanics**
- **Advances in Fluid Mechanics**

These courses involve:

1. Calculation of physical properties
2. Measurement of hydrostatic forces
3. Measurement of forces due to flow in bodies or walls in contact with fluid
4. Measurement of loss of pressure in closed networks

➢ **Turbomachinery**

Involving:

1. Laboratory determination of operating characteristics curves of centrifugal pump.
2. Mapping of the centrifugal blower.
3. Mapping of axial fan blower.
4. Definition of centrifugal pump performance curves in dynamic conditions of similarity.
5. Classification of KAPLAN & PELTON water turbine.
6. Conjunction centrifugal pump and hydraulic system, finding operating point.
7. Calculate fin angle of centrifugal pump.

LABORATORY of ENERGY SYSTEMS and THERMAL ENGINES

Administrator: Athanasios KATSANEVAKIS (Associate Professor)

Educational Purpose

The Laboratory of Energy Systems and Thermal Engines serves the needs of the following courses:

- Renewable Energy Sources
- Steam Turbines and Steam Boilers
- Flow Networks

Renewable Energy Sources (RES)

Course Objective: To acquire knowledge and skills in the field of renewable energy use.

Course Purpose: The ability to understand the phenomena associated to renewable energy sources and converting them into useful work. The calculation of environmental impacts emerging from the use of renewable energy sources.

Course description: The course is implemented through lectures, active participation in solving practical problems, as well as participation in workshops.

The subjects covered are:

About RES, potentials and limits of using renewable energy, meeting energy needs with renewable energy, problems and current efforts for their exploitation, Fundamentals of wind energy, wind characteristics, boundary layer, the wind energy, wind measurements, Betz limit, types wind generators (W/G), W/G efficiency, W/G main sections, wind farms, force analysis on the W/G blades -spoilers-, calculation of annual energy production, economic component of wind energy, solar energy fundamentals, solar radiation, solar constant, characteristics of solar radiation outside and inside the Earth's atmosphere, location and movement of the sun relative to the observer on earth, direct and diffuse solar radiation, methods and instrumentation, calculation of solar radiation, solar flat collectors, operating principles, balances energy, typical performance, selective surfaces, pivot, solar panels, efficiency, photovoltaics (P/V) typical P/V performance, P/V wiring ways, efficiency, hydro, hydroelectric types of power plants, calculation of the energy produced, biomass, combustion, pyrolysis, gasification, biofuels, financial elements of RSE investments.

Experiments implemented in laboratory devices:

Measurement of energy contained in air flow, operating data of small laboratory W/G and calculation of efficiency, effect of the impact angle of blade attack on the characteristics of W/G, measuring the operational characteristics of P/V in the laboratory and outdoors, measuring the impact of P/V connection, energy balance in solar collectors, visiting RSE installation.

Steam boilers, steam turbines and energy systems

Course Objectives: To acquire knowledge in the field of industrial boilers of thermal turbomachinery and production systems and energy conversion.

Course Purpose: The ability to understand the phenomena associated with the production and use of thermal energy and convert it into work. The energy calculation of the components of the plants, the use and conversion of heat into work. The calculation of environmental impacts from energy production and use.

Course description: The course is implemented through lectures, active participation in solving practical problems as well as participation in workshops.

The subjects covered are:

Fundamentals of Engineering Thermodynamics, statutory terms, conditions and water vapor, combustion, combustion equations, calculations for supplying combustion air, waste gas composition, carbon dioxide production, environmental implications of energy production and energy use, fuel, types of burners, description and operation of steam productors, energy balancing in exchangers and boilers, heat transfer in key parts of the steam productor, smoke stack, calculate dew point of waste gases, steam pipe networks, elements of steam networks, pressure loss calculations, heat, steam traps, condensate networks, constructional elements of networks, water processing for use in steam boilers, steam boiler operation safety regulations, basic operating principles of steam whirls, calculation flow in blades, triangles of speed, thermodynamic calculations, whirls of action and reaction, calculation of whirl efficiency, electrical energy production cycles, RANKINE cycle, energy balances in circles of power production, calculation of efficiency, methods for improving efficiency, alternative power production methods, future directions.

Experiments implemented in the laboratory device of superheated steam production of up to 400 kg/h and power of up to 15 kW:

Power balance of steam boiler, waste gas analysis, heat loss from insulated pipe, energy balance of steam whirl, energy balance in a heat exchanger condenser, calculation of efficiency of RANKINE cycle. The experimental results are compared with the results of the theoretical calculations in order the students to gain perception about the relationship between natural phenomena and methodologies of calculation.

In the laboratory there is a combustion chamber, to familiarize students with the operation of burners and, also, to configuring the combustion parameters.

ELECTRICAL MEASUREMENTS and INDUSTRIAL AUTOMATION LAB

Administrator: Christos SIMOGLOU (Assistant Professor)

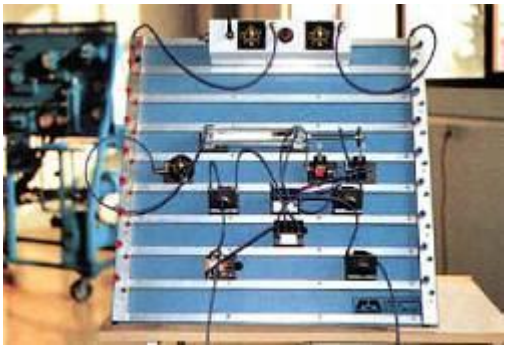
The Laboratory of Electrical Measurements and Industrial Automation serves the needs of the courses:

- Automation Control
- Electric Engines
- Electrical Technology & Electronics
- Electric Systems in Industry
- Electric Systems in Renewable Energy Systems
- Medium and High-Power Electrical Substations
- Electric Energy Storage and Demand Management

AUTOMATION CONTROL

The existing technology in Greece and generally around the world, is mixed, in the sense that it consists of at least three types or stages of development: manual technology, machines and automation. Automation in Greece is prevalent only in a limited scale but it is one of the most dynamically developing new technologies, related to Scientific and Technological Revolution. The Laboratory of Industrial Automation which is part of the Energy Sector of the Engineering Department, serves the task of providing basic training to students of relevant fields and of developing activities in the field of basic applied research to achieve specific results.

Students are educated in subjects related to design, composition and applied automation systems using hydraulics, pneumatic and electro-pneumatic systems, as well as using PLC. In this way, students get the necessary introductory elements of one of the most dynamically developing technological sector. The equipment consists of high-tech instruments, so as to be adjusted for future applications.



As far as research is concerned, the laboratory can assist in matters related to automatic control machines and apparatus with flexible multichannel measuring systems as well as design of Industrial Automation using PLC or other methods. About research, the laboratory can assist in matters related automatic engine control and appliances with flexible multichannel measurement systems and industrial automation design using PLC or other methods.

ELECTRICAL TECHNOLOGY & ELECTRONICS

The mission of the Laboratory is primarily to offer basic education to the students in the related filed and, secondly, to develop activities concerning basic applied research in order to achieve concrete and specific results.

The education of students is achieved in areas related to measurement, phenomena and devices using direct and alternating current (single phase and three phase) power, devices and basic electronic instruments, as well as design of elements industrial and biotechnical plants.

The laboratory can assist in research matters related to power systems, renewable energy and modern industrial and domestic electrical installations. The laboratory equipment consists of modern instruments and equipment of high technology with the prospect that with slight additions and modifications it can be adapted to future developments and applications. Approximately 60-70 students, divided into three groups, each semester.

ELECTRIC ENGINES

This laboratory aims to provide high quality and adequate knowledge of infrastructure and sufficient knowledge to enable graduates to approach the modern and high technology of Electric Engines, in order to monitor the evolution of different forms of the profession.

The education of students is in areas related to the behavior of electrical machines dc and ac current, the types of connection methods and cycle configurations in various arrangements, the selection and design of electrical movements and the partial evaluation and repair of their faults. The equipment consists of high technology instruments that can be adapted to future developments and applications.

The laboratory can assist in research matters relating to methods of designing various types of electric machines, using modern software (MATHEMATICA), as well as in planning and exploring problems of electrically driven installations.

LABORATORY of INTERNAL COMBUSTION ENGINES

Administrator: Savvas GEIVANIDIS (Associate Professor)

The Internal Combustion Engines Laboratory serves the needs of the courses:

- Internal Combustion Engines
- Vehicle Motion Systems

The Laboratory is equipped with the following instruments:

Models of engines intersected for inspection during training of their operation. Engines for students to practice disassembling and assembling, and Engines capable of operating to practice measurements and settings.

Instruments for measuring various engine components while being operational, to state that they meet their specifications; hence, they operate without problems.

The Laboratory also possesses the jet engine of an F5 aircraft, a donation from Hellenic Air Force, to be used for educational purposes.

Equipment:

Cluster of an electromagnetic dynamometer to conduct laboratory measuring exercises of various parameters in operating engines and study the effect of altering their parameters on the performance of the engines. It has the ability to measure combustion air supply, fuel supply, cooling water flow, torque, turns, load, various temperatures on engine operation with fuel or without fuel for friction measuring. It also has the capability to dynamic-pointing diagram of pressure-volume or crank angle pressure and image capturing for further processing.

Instrument for measuring of emissions that are contained in exhaust gas of otto engines. It is of type NDIR and is capable of measuring carbon monoxide, carbon dioxide, unburned hydrocarbons, oxygen because the air-fuel equivalent of the air-fuel ratio, turns, lubricant temperature. Meets the standards set by legislation for the adoption of emission control card (ECC). Used for student training, but also for emission measurements of moving vehicles.

Electronic system for vehicle inspection. It has the ability of inspecting the proper operation of systems of passenger carrier vehicles. It measures various operational parameters, compares them with those provided by the vehicle manufacturer and gives possible causes of divergence. The inspection can be done by (in) putting the vehicle type using a by a special disk of the corresponding vehicle type or import a vehicle code from a disk containing various types of vehicles.

HEATING – VENTILATION – AIR CONDITIONING (HVAC) LABORATORY

Administrator: Dimitrios MISIRLIS (Associate Professor)

The HVAC Laboratory serves the needs of the courses:

- Heating – Ventilation – Air Conditioning
- Heat Transfer
- Advances in Heat Transfer
- Industrial Refrigeration & Cooling

The HVAC Laboratory deals primarily with Heating and Air-Conditioning and to a lesser extent with Ventilation and Cooling since no special Cooling course has been set by the Greek Ministry of Education. In our Department, this gap is covered by an optional course of the 9th Semester, namely, Industrial Refrigeration & Cooling.

Equipment:

The HVAC laboratory is equipped with various devices and instruments. Among these devices there are a boiler and a heater where students are taught how to make various measurements on the efficiency, the exhaust gas temperature, soot, pressure, etc., using the BRIGON device.

There is also an exhaust gas analyzer which enables the students to obtain the above measurements electronically, while another device allows students to cut, but also to unite plastic tubes.

Laboratory units, called pilots, are provided in the HVAC laboratory, for the needs of the Industrial Refrigeration course. On them, the students can learn the basics of a refrigerating unit, the associated cycle and how to calculate the cooling capacity of the facility.

There is also a fully independent Air Conditioning Unit which is connected to a computer. Students can adjust, and observe the various changes to statutory changes, whilst they are able to measure air flow in m^3/h or m^3/s, with four different methods.

7.2 Teaching Classrooms

The IHU Department of Mechanical Engineering is housed in a campus of 248,000 square meters Southeast of the city of Serres, which includes modern building facilities and a beautiful surrounding area. To meet the educational and research activities of the Department, adequate building infrastructure is available, covering a total area of 6,250 square meters, which includes seven (7) teaching classrooms, with a total capacity of 350 people, two (2) amphitheaters, with a total capacity of 200 people, and twenty (20) of exclusive use, fully equipped Laboratory classrooms, with a total capacity of 400 people. The value of the installed laboratory equipment of the Department exceeds 7,300,000 €.

Labs of heavy-duty machinery

A complex of two building units, on two levels (ground floor and first floor), where the so-called Heavy Laboratories of the two Sectors of the Mechanical Engineering Department are housed. The installation occupies a total area of 4,000 m^2. In it, the laboratory part of most courses is carried out, along with the research work of the Faculty Members.

Labs of light-duty machinery

This building houses the Laboratories of the General Infrastructure Courses. It also houses two classrooms of Mechanical Design, as well as the Laboratory of Materials Technology. One of the two amphitheaters used for the educational needs of the Department, the so-called STEF Amphitheater (of capacity about 120 people), is also located here. Offices of many faculty members of the Department are also housed in this building. The total area used by the IHU Department of Mechanical Engineering is 1000 m^2.

Classrooms

At Serres Campus, the Department of Mechanical Engineering uses seven (7) classrooms on the ground floor of building B, of total capacity about 350 people, and an amphitheater (of capacity approximately 80 people) on the second floor. The total area of the above facilities amounts to 1200 m^2.

Postgraduate Studies Facilities

In the Multipurpose Building (O), right behind the Administration Building, the Department of Mechanical Engineering uses a classroom on the ground floor, of total area 50 m^2, equipped with a network of 20 PC units. All classrooms are equipped with visual aids of teaching (such as, PCs, video projectors, overhead projectors, interactive tables, etc.) and are used during 08:00 - 21:00 five days a week (Monday to Friday). The postgraduate studies classroom is used also on Saturday.

7.3 e-Learning

IHU offers to the students and the teaching staff a platform of asynchronous distance learning, the so-called e-Learning.

e-Learning platform is an integrated System of Electronic Courses Management. It has been designed with the orientation of enhancing the conventional teaching, by utilizing the already highly assimilated information technology in the field of education. It follows the philosophy of an open-source software and supports the service of asynchronous distance learning without limitations and commitments. The access to the service is done by using a simple browser (web browser) without the requirement of specialized technical knowledge.

The aim is to enhance the educational process, by offering to the participants a dynamic environment of interaction and continuous communication between teachers and students. Specifically, it allows the teacher to electronically organize, store, and present the educational material and provides to the student an alternative channel of personalized learning, independent of spatiotemporal constraints.

The e-Learning platform is available at the electronic address http://elearning.cm.ihu.gr

7.4 Institutional Research Laboratories

In the Department of Mechanical Engineering there are also three (3) Institutional Research Laboratories, namely,

- ✓ Laboratory of Mechanical Engineering Technology and Production Systems, under the distinctive title **MT-Lab** (FEK 4103/24-09-2020).
- ✓ Laboratory of Electromechanical Studies and Constructions, under the distinctive title **OPTI-Lab** (FEK 4234/30-09-2020).
- ✓ Vehicle Technology Laboratory, under the distinctive title **VT-Lab** (FEK 4288/2-10-2020).

These Laboratories have a purely research character, while in their founding act (in Greek, FEK) it is also predicted the provision of services to industrial enterprises and organizations in Greece or / and abroad.

The students (and not only) can enjoy an exciting journey in ALL the Laboratories of the IHU Department of Mechanical Engineering on the website of the Department, http://mech.ihu.gr or / and on the Department's channel on YouTube: Department of Mechanical Engineering - YouTube.

8. The UNDERGRADUATE STUDY PROGRAM

The duration of studies in the Mechanical Engineering Department is ten (10) semesters. During these semesters, studies include lectures, laboratory exercises, tutorials, seminars, visits to production areas, and elaboration of mechanical engineering dissertations.

The structure of the Curriculum of the Department consists of three (3) groups of courses:

- ✓ The group of Courses of General Infrastructure (CGI), which, among others, includes Physics, Mathematics, Informatics, etc..
- ✓ The group of Courses of Special Infrastructure (CSI), which, among others, includes Mechanics, Materials Technology, Mechanical Design, Machine Elements, etc., and aims to prepare students in key-subject areas of Mechanical Engineering.
- ✓ The group of Courses of Specialty (SC), referring to a particular Direction of Study or/and the associated Specialization studies in the Department.

The Specialty courses are divided into two main Directions of Study, the manufacturing sector, and the associated energy one.

- ✓ In the **Manufacturing Sector** the offered Specialty Courses are Machine Tools, Industrial Robotics, Mechanical Installations, Conveying and Elevating Machines, Casting and Welding, etc..
- ✓ In the **Energy Sector** the offered Specialty Courses are Turbomachinery, Heating – Ventilation – Air Conditioning, Steam Turbines – Steam Boilers, Internal Combustion Engines, Renewable Energy Sources, etc..

The following Curriculum contains the titles and numbers of Mandatory (M), Compulsory Elective (CE), and Elective courses taught in the Undergraduate Studies Programme of our Department, as well as the associated ECTS credits.

8.1 Table I. An Overview of the Curriculum

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Mathematics I – Calculus of one Variable	Mathematics II– Calculus of several Variables	Mathematics III – Differential Equations	Numerical Analysis	Statistics & Probability Theory	Heat Transfer	Manufacturing Sector: Machining Technology II	Manufacturing Sector: Elevating & Conveying Machines	Manufacturing Sector: Structure Failure Analysis	Energy Sector: Environmental Technology
Physics I – Dynamics	Physics II – Electro-magnetism	Thermo-dynamics I	Fluid Mechanics	Thermo-dynamics II	Electric Engines	Manufacturing Sector: Electrical & Mechanical Installations	Manufacturing Sector: Metal Forming	Manufacturing Sector: Mechanical Design – Optimization	Energy Sector: Industrial Refrigeration and Cooling
Mechanical Drawing	Computer Aided Design (CAD) I	Computer Aided Design (CAD) II	Engineering Materials Technology	Electrical Technology & Electronics	Internal Combustion Engines	Manufacturing Sector: Finite Elements I	Manufacturing Sector: Industrial Robotics	Manufacturing Sector: Electric, Hydraulic & Pneumatic Motion Systems	Energy Sector: Flow Networks
Introduction to Materials Science	Mechanics I– Statics	Mechanics II – Material Strength	Machining Technology I	Machine Elements II	Metrology – Quality Control	Manufacturing Sector: Casting & Welding	Manufacturing Sector: Machine Tools - CIM	Manufacturing Sector: Materials & Environment	Energy Sector: Computational Methods in Fluid Dynamics & Heat Transfer
Technical Terminology – English	Computer Programming I	Computer Programming II	Machine Elements I	Machine Dynamics & Vibrations	Management & Implementation of Technical Projects	Energy Sector: Automation Control	Energy Sector: Heat – Ventilation – Air Conditioning	Manufacturing Sector: Nano-technology	Energy Sector: Transport Phenomena
	Labour Safety – Ergonomics	Production Management	Production Units Administration			Energy Sector: Vehicle Motion Systems	Energy Sector: Steam Boilers - Steam Turbines & Energy Systems	Manufacturing Sector: Materials & Mechanical Design	Energy Sector: Gas Turbines & Aero-Engines
						Energy Sector: Renewable Energy Sources	Energy Sector: Turbomachinery	Manufacturing Sector: Computerized Numerical Control (CNC) Machining	Energy Sector: Electric Systems in Industry
						Energy Sector: Advances in Fluid Mechanics	Energy Sector: Techniques & Measurements of Natural Processes	Manufacturing Sector: Mechatronics	Energy Sector: Electric Systems in Renewable Energy Sources
								Manufacturing Sector: Finite Elements II	Energy Sector: Advances in Wind Energy
								Manufacturing Sector: Experimental Strength of Materials	Energy Sector: Advances in Solar Power
								Manufacturing Sector: Mechanics of Composite Materials	
								Manufacturing Sector: Reverse Engineering & Rapid Prototyping	
								Diploma Thesis	

Mandatory:	33 courses
Manufacturing Sector:	16 elective courses
Energy Sector:	16 elective courses
Diploma Thesis:	2 semesters

10th	
Manufacturing Sector: Advanced Materials	Energy Sector: Aerodynamics
Manufacturing Sector: Tribology – Lubricants	Energy Sector: Multiphase Flows
Manufacturing Sector: Modern Welding Technologies	Energy Sector: Advances in Heat Transfer
Manufacturing Sector: Thermal & Surface Metal Treatment	Energy Sector: Combustion
Manufacturing Sector: Dynamics of Systems	Energy Sector: Design of Elements for Thermal Turbomachines
Manufacturing Sector: Analysis & Synthesis of Mechanisms	Energy Sector: Buildings Energy Assessment
Manufacturing Sector: Optimum Product Development	Energy Sector: Processing & Management of Solid Waste
Manufacturing Sector: Industrial Measurements – Machine Diagnostics	Energy Sector: Medium & High-Power Electrical Substations
Manufacturing Sector: Computational Metal Forming	Energy Sector: Electric Energy Storage & Demand Management
Manufacturing Sector: Bio-engineering	Energy Sector: Power Electronics & Applications
Diploma Thesis	

8.2 Table II. Elective & Optional Courses

Semester		Manufacturing Sector	Energy Sector	Modes of choice
7th		Machining Technology II	Automation Control	4 courses of the selected Sector and 1 from the other Sector
		Electrical & Mechanical Installations	Vehicle Motion Systems	
		Finite Elements I	Renewable Energy Sources	
		Casting & Welding	Advances in Fluid Mechanics	
8th		Elevating & Conveying Machines	Heat – Ventilation – Air Conditioning	4 courses of the selected Sector and 1 from the other Sector
		Metal Forming	Steam Boilers - Steam Turbines & Energy Systems	
		Industrial Robotics	Turbomachinery	
		Machine Tools - CIM	Techniques & Measurements of Natural Processes	
9th	A	Structure Failure Analysis	Environmental Technology	3 elective courses of the A' Specialization
		Mechanical Design – Optimization	Industrial Refrigeration and Cooling	
		Electric, Hydraulic & Pneumatic Motion Systems	Flow Networks	
		Materials & Environment	Computational Methods in Fluid Dynamics & Heat Transfer	
		Nano-technology	Transport Phenomena	
		Materials & Mechanical Design	-	
	B	Computerized Numerical Control (CNC) Machining	Gas Turbines & Aero-Engines	3 elective courses of the B' Specialization
		Mechatronics	Electric Systems in Industry	
		Finite Elements II	Electric Systems in Renewable Energy Sources	
		Experimental Strength of Materials	Advances in Wind Energy	
		Mechanics of Composite Materials	Advances in Solar Power	
		Reverse Engineering & Rapid Prototyping	-	
10th	A	Advanced Materials	Aerodynamics	3 elective courses of the A' Specialization
		Tribology – Lubricants	Multiphase Flows	
		Modern Welding Technologies	Advances in Heat Transfer	
		Thermal & Surface Metal Treatment	Combustion	
		Dynamics of Systems	Design of Elements for Thermal Turbomachines	
	B	Analysis & Synthesis of Mechanisms	Buildings Energy Assessment	3 elective courses of the Specialization
		Optimum Product Development	Processing & Management of Solid Waste	
		Industrial Measurements – Machine Diagnostics	Medium &High Power Electrical Substations	
		Computational Metal Forming	Electric Energy Storage & Demand Management	
		Bioengineering	Power Electronics & Applications	

8.3 The Curriculum per Semester

No	Course Title	Semester	Hours / Week	ECTS
1	Mathematics I – Calculus of One Variable	1st	5	7,5
2	Physics I – Dynamics	1st	4	6,0
3	Mechanical Drawing	1st	4	6,0
4	Introduction to Materials Science	1st	4	6,0
5	Technical Terminology – English	1st	3	4,5
6	Mathematics II – Calculus of Several Variables	2nd	3	4,5
7	Physics II – Electromagnetism	2nd	4	6,0
8	Computer Aided Design (CAD) I	2nd	3	4,5
9	Mechanics I – Statics	2nd	4	6,0
10	Computer Programming I	2nd	3	4,5
11	Labour Safety – Ergonomics	2nd	3	4,5
12	Mathematics III – Differential Equations	3rd	3	4,5
13	Thermodynamics I	3rd	4	6,0
14	Computer Aided Design (CAD) II	3rd	3	4,5
15	Mechanics II – Material Strength	3rd	4	6,0
16	Computer Programming II	3rd	3	4,5
17	Production Management	3rd	3	4,5
18	Numerical Analysis	4th	3	4,5
19	Fluid Mechanics	4th	3	4,5
20	Engineering Materials Technology	4th	3	4,5
21	Machining Technology I	4th	4	6,0
22	Machine Elements I	4th	4	6,0
23	Production Units Administration	4th	3	4,5
24	Statistics & Probability Theory	5th	4	6,0
25	Thermodynamics II	5th	4	6,0
26	Electrical Technology & Electronics	5th	4	6,0
27	Machine Elements II	5th	4	6,0
28	Machine Dynamics & Vibrations	5th	4	6,0
29	Heat Transfer	6th	4	6,0
30	Electric Engines	6th	4	6,0
31	Internal Combustion Engines	6th	4	6,0
32	Metrology – Quality Control	6th	4	6,0
33	Management & Implementation of Technical Projects	6th	4	6,0

No	Course Title	Semester	Hours / Week	ECTS
34	Machining Technology II	7th-Man	4	6,0
35	Electrical & Mechanical Installations	7th-Man	4	6,0
36	Finite Elements I	7th-Man	4	6,0
37	Casting & Welding	7th-Man	4	6,0
38	Automation Control	7th-Ener	4	6,0
	Vehicle Motion Systems	7th-Ener	4	6,0
	Renewable Energy Sources	7th-Ener	4	6,0
	Advances in Fluid Mechanics	7th-Ener	4	6,0
39	Elevating & Conveying Machines	8th-Man	4	6,0
40	Metal Forming	8th-Man	4	6,0
41	Industrial Robotics	8th-Man	4	6,0
42	Machine Tools - CIM	8th-Man	4	6,0
43	Heat – Ventilation – Air Conditioning	8th-Ener	4	6,0
	Steam Boilers - Steam Turbines & Energy Systems	8th-Ener	4	6,0
	Turbomachinery	8th-Ener	4	6,0
	Techniques & Measurements of Natural Processes	8th-Ener	4	6,0
44	Structures Failure Analysis	9th-Man-A	4	5,0
45	Mechanical Design – Optimization	9th-Man-A	4	5,0
46	Electric, Hydraulic & Pneumatic Motion Systems	9th-Man-A	4	5,0
	Materials & Environment	9th-Man-A	4	5,0
	Nanotechnology	9th-Man-A	4	5,0
	Materials & Mechanical Design	9th-Man-A	4	5,0
44	Computerized Numerical Control (CNC) Machining	9th-Man-B	4	5,0
45	Mechatronics	9th-Man-B	4	5,0
46	Finite Elements II	9th-Man-B	4	5,0
	Experimental Strength of Materials	9th-Man-B	4	5,0
	Mechanics of Composite Materials	9th-Man-B	4	5,0
	Reverse Engineering & Rapid Prototyping	9th-Man-B	4	5,0
44	Environmental Technology	9th-Ener-A	4	5,0
45	Industrial Refrigeration and Cooling	9th-Ener-A	4	5,0
46	Flow Networks	9th-Ener-A	4	5,0
	Computational Methods in Fluid Dynamics & Heat Transfer	9th-Ener-A	4	5,0
	Transport Phenomena	9th-Ener-A	4	5,0
44	Gas Turbines & Aero-engines	9th-Ener-B	4	5,0
45	Electric Systems in Industry	9th-Ener-B	4	5,0
46	Electric Systems in Renewable Energy Sources	9th-Ener-B	4	5,0
	Advances in Wind Energy	9th-Ener-B	4	5,0
	Advances in Solar Power	9th-Ener-B	4	5,0
47	Advanced Materials	10th-Man-A	4	5,0
48	Tribology – Lubricants	10th-Man-A	4	5,0
49	Modern Welding Technologies	10th-Man-A	4	5,0

No	Course Title	Semester	Hours / Week	ECTS
	Thermal & Surface Metal Treatment	10th-Man-A	4	5,0
	Dynamics of Systems	10th-Man-A	4	5,0
47	Analysis & Synthesis of Mechanisms	10th-Man-B	4	5,0
48	Optimum Product Development	10th-Man-B	4	5,0
49	Industrial Measurements – Machine Diagnostics	10th-Man-B	4	5,0
	Computational Metal Forming	10th-Man-B	4	5,0
	Bioengineering	10th-Man-B	4	5,0
47	Aerodynamics	10th-Ener-A	4	5,0
48	Multiphase Flows	10th-Ener-A	4	5,0
49	Advances in Heat Transfer	10th-Ener-A	4	5,0
	Combustion	10th-Ener-A	4	5,0
	Design of Elements for Thermal Turbomachines	10th-Ener-A	4	5,0
47	Buildings Energy Assessment	10th-Ener-B	4	5,0
48	Processing & Management of Solid Waste	10th-Ener-B	4	5,0
49	Medium &High Power Electrical Substations	10th-Ener-B	4	5,0
	Electric Energy Storage & Demand Management	10th-Ener-B	4	5,0
	Power Electronics & Applications	10th-Ener-B	4	5,0
	Total of ECTS:			**270**

Diploma Thesis: **30**

Degree Award: **300**

9. POSTGRADUATE STUDY PROGRAMMES in the DEPARTMENT

One (1) postgraduate studies programme is currently offered by IHU's Department of Mechanical Engineering.

9.1 M.Sc. Studies Programme in Renewable Energy Systems

Renewable energy sources (RES) are the only sources that, while not burdening the environment, can support a structured and reliable proposal, capable of becoming the next long-term energy doctrine of our country. On this, the relatively favorable legislation ensures investments in the sector and has gained the trust of very large investors. It is clear that the rapid development in the field of RES requires specialized and well-trained human resources.

9.1.1 History

In an effort to meet the demands of the domestic (and foreign) industry for specialized expertise in electricity production from RES, the Department of Mechanical Engineering organizes (since 2012) and offers the M.Sc. Studies Programme entitled "Renewable Energy Systems" (FEK 2802/17-10-2012, 2793/13-07-2018, and 4063/22-09-2020).

9.1.2 Objectives

The M.Sc. Studies Programme entitled "Renewable Energy Systems" operates on the following basis:

- The promotion of knowledge and the development of research in related, cutting-edge scientific areas, which concern the mechanical design, development, and optimization of systems and devices for the extraction and exploitation of energy from environmentally friendly sources, with the aim of protecting the environment and ensuring the highest possible energy security.

- The provision of the necessary, high-level knowledge for the development of specialized scientists, capable of staffing the productive & administrative units of the Companies that are active in the production of power from RES, which are a basic component of sustainable development.

- To equip young scientists with the necessary knowledge, skills, and values, so that they can effectively contribute to the development of research and its applications regarding climate protection, promoting the production of electricity from RES, which is an environmental and energy priority of outmost importance for Greece (Law 3851/2010).

• To prepare specialized executives with a clear knowledge of the modern trends of Mechanical Engineering Science and Technology, and the cultivation of analytical, interpretive, and synthetic abilities, so that these executives to be able to develop innovative approaches, to exploit opportunities and to solve problems in the field of energy.

The operation of the M.Sc. Studies Program entitled "Renewable Energy Systems" lies in ensuring that its postgraduate students will attain solid foundations of knowledge and principles, which will make them capable of continuous learning and personal improvement in a constantly changing, but also promising work environment. It is estimated that, in this way, we can cover the gap between the constantly increasing demands of the domestic (and foreign) industry for specialization and excellence on issues related to electric-power production from RES and the skills currently available in the job market.

9.1.3 Degree Award

The M.Sc. Studies Programme entitled "Renewable Energy Systems" awards the Degree of Master of Science (M.Sc.) in designing, developing, and optimizing mechanical systems for the most efficient utilization of RE sources, i.e.,

Master of Science (M.Sc.) in Renewable Energy Systems

9.1.4 Admission

In the M.Sc. Studies Programme of the IHU Department of Mechanical Engineering entitled "Renewable Energy Systems", graduates of Universities of Greece or equivalent Institutes abroad whose Degree is recognized by the Inter-University Organization for Recognition of Academic Degrees and Information (in Greek, DOATAP) are accepted, coming from Departments of Engineering Schools (with a clear order of priority, Mechanical Engineers, Naval Engineers, Civil Engineers, Electrical Engineers, etc.), as well as from the Depts of Environmental Research, Management of Natural or/and Energy Resources, and Physical Sciences.

9.1.5 Duration of Studies

The M.Sc. Studies Programme entitled "Renewable Energy Systems" operates as a full-time program. Accordingly, studies last three academic semesters and correspond to 90 ECTS credits. Teaching of ALL courses takes place during the first two semesters of studies, while the last semester (the third) is devoted to the elaboration of the (mandatory) Diploma Thesis.

9.1.6 The Curriculum per Semester

In the M.Sc. Studies Programme entitled "Renewable Energy Systems" ALL courses are compulsory. It is a set of ten (10) courses (5 in the Fall Semester and 5 in the associated Spring

one), which form the background of the specialization program in the design, development, and optimization of RES systems. Each compulsory course is equivalent to 6 ECTS credits.

The detailed content of the Curriculum for being awarded the Master of Science in "Renewable Energy Systems" from the IHU Department of Mechanical Engineering, is:

1st Semester

Code	Course	Hours/Week	ECTS
101	Applied Thermodynamics	3	6
102	Advanced Materials	3	6
103	Computational Mechanics	3	6
104	Economic-Technical Design and Cost Analysis	3	6
105	Special Topics in Heat Transfer	3	6
	Semester's total	**15**	**30**

2nd Semester

Code	Course	Hours/Week	ECTS
201	Mechanical Design & Optimization	3	6
202	Computational Fluid Dynamics	3	6
203	Energy Conversion Systems	3	6
204	Renewable Energy Sources I	3	6
205	Renewable Energy Sources II	3	6
	Semester's total	**15**	**30**

3rd Semester

Code	Course	Hours/Week	ECTS
301	Diploma Thesis	-	30
	Semester's total		**30**

9.1.7 Number of Admissions

The number of the admitted postgraduate students in the M.Sc. Studies Programme entitled "Renewable Energy Systems" is forty (40) people, annually.

9.1.8 Academic Staff

The Academic Staff of the M.Sc. Studies Programme entitled "Renewable Energy Systems" consists mainly of Faculty Members of the Mechanical Engineering Department, along with Members of other IHU Departments, as well as Scientists under contract, who have a cognitive subject suitable to the specialized topics of the Curriculum. The total list of the Academic Staff of the M.Sc. Studies Programme entitled "Renewable Energy Systems" is given in the table below.

ACADEMIC STAFF			
A/A	**FULL NAME**	**TITLE**	**Department**
1.	Chasapis Dimitrios	Professor	Mechanical Engineering (IHU, Serres)
2.	David Konstantinos	Professor	Mechanical Engineering (IHU, Serres)
3.	Moissiadis Anastasios	Professor	Mechanical Engineering (IHU, Serres)
4.	Anthymidis Konstantinos	Associate Professor	Mechanical Engineering (IHU, Serres)
5.	Katsanevakis Athanasios	Associate Professor	Mechanical Engineering (IHU, Serres)
6.	Sofialidis Dimitrios	Associate Professor	Mechanical Engineering (IHU, Serres)
7.	Kleidis Kostas	Associate Professor	Mechanical Engineering (IHU, Serres)
8.	Geivanidis Savvas	Associate Professor	Mechanical Engineering (IHU, Serres)
9.	Misirlis Dimitrios	Associate Professor	Mechanical Engineering (IHU, Serres)
10.	Sagris Dimitrios	Associate Professor	Mechanical Engineering (IHU, Serres)
11.	Friderikos Orestis	Assistant Professor	Mechanical Engineering (IHU, Serres)
12.	Aidonis Dimitrios	Associate Professor	Logistics (IHU, Katerini)
13.	Keramidas Christos	Associate Professor	Logistics (IHU, Katerini)
14.	Mirisidis Ioannis	Visiting Professor	Contractor

10. DOCTORAL STUDIES in the DEPARTMENT

Doctoral Studies in the Department of Mechanical Engineering aim at the promotion of knowledge through the production of original, integrated scientific research and lead to the acquisition of a Doctoral (Ph.D.) Degree. The Doctoral Degree is the highest academic Title, which certifies the acquisition of the research methodology and the substantial contribution of its owner to the development of science in the corresponding scientific field.

The Doctoral Studies Program of the Department of Mechanical Engineering (FEK 3475/21-08-2020) is organized in view of the Law 4485/2017. Those who meet the following conditions are entitled to apply for a Ph. D. Thesis in the IHU Department of Mechanical Engineering:

- They are graduates of Greek Universities or equivalent Institutes from abroad (based on a DOATAP decision) AND own a Postgraduate Diploma of a Greek University or an equivalent Institute from abroad or they own a single and indivisible Title of Studies at postgraduate level, according to Greek Legislation (see, e.g., article 46 of Law 4485/2017).

- The GPA of the Undergraduate Studies Degree is greater than or equal to "7.0" (seven). As an exception, a candidate Ph.D. student with a B.Sc. GPA less than "7.0" (seven) could be accepted in the Department, after a robust documentation of the Evaluation Committee and a decision of the Dept's Assembly.

- The GPA of the Postgraduate Studies Degree is greater than or equal to "8.0" (eight). Once again, as an exception, a candidate Ph.D. student with a M.Sc. GPA less than "8.0" (eight) could be accepted in the Department, after a robust documentation of the Evaluation Committee and a decision of the Dept's Assembly.

In any case, excellent knowledge of the English Language is required, which it can become evident by one of the following ways (PD 50/2001): (a) The candidate owns the Certificate of Proficiency in English Language from the University of Cambridge and/or Michigan, or (b) he or she owns the Greek State Certificate of level Γ2, or (c) he or she scored a 550/677 in TOEFL exams or a 6.5 in the IELTS Academic exams, not earlier than two years ago, or (d) the candidate Ph.D. student owns a B.Sc. Degree and / or a M.Sc. Diploma from an English-speaking Institute of the Tertiary Education Level, or (e) has a certificated teaching work in an English-speaking Institute of the Tertiary Education Level for at least one (1) academic year, or, finally, (f) is a distinguished candidate, such as, for example, one with a large number of publications in English, etc..

The time required for obtaining the Doctoral Degree is at least three (3) calendar years, counting from the date of appointment of the associated Advisory Committee. The maximum time for completing the Ph.D. Thesis is six (6) years, which can be extended (through annual

extensions) for two (2) more years, after an application of the Ph.D student and a reasoned decision by the Assembly of the Department.

More information can be found on the Department's website, at the electronic address http://mech.ihu.gr .

11. SERVICES and STUDENT WELFARE OFFICES

11.1 European Programmes Office (Erasmus)

The LLP/ERASMUS (Lifelong Learning Programme/ERASMUS) is an ambitious educational Programme of the European Union – the most successful so far – that gives the opportunity to higher-education students to carry out part of their studies (or to perform their Internship) in another European Institute. On the other hand, the Faculty Members have the opportunity to teach in another country, while, as far as the rest of the Academic Staff is concerned, they can participate in training programs.

By participating in the ERASMUS Programme, students acquire skills that enhance their future employability, while the educational staff improves their career prospects. The Higher Education Institutes involved, internationalize their campuses, introduce new teaching methods and new services, create management capacity, enhance their research activities, and create links with international companies.

The aim of the ERASMUS Programme is to improve the quality of the European Higher Education Level, to strengthen its European dimension, to encourage mobility and access for all to education.

The ERASMUS Programme started in 1987 in the field of education. Until 2011, the Programme involved 33 countries, namely, the 26 member states of European Union (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Greece, Spain, France, Ireland, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovak Republic, Finland, Sweden), along with the United Kingdom, the three (3) countries of the European Economic Area (Iceland, Norway, and Liechtenstein), and, since 2011, also Croatia, Turkey, and Switzerland.

E R A S M U S is the acronym for European Region Action Scheme for the Mobility of University Students. It was named after the philosopher, theologian, and humanist of the 15th Century Erasmus of Rotterdam (1465-1536). Erasmus spent all his fortune at the University of Basel and became the frontrunner for mobility scholarships.

IHU owns the ERASMUS Extended University Charter with code: 31754-IC-2007-1-GR-ERASMUS-EUC-1 and Institution code GSERRES 01.

11.2 Library

The Library of Serres Campus is housed in a three-floor building right across the Administration Building of the Engineering School of IHU. It covers a total area of 2500 m^2. The library includes more than 20,000 titles of books (foreign and domestic), journals, newspapers, as well as a collection of literature books and CD-ROMs. The books are classified according to the DDC system, 21st edition.

Lending a book to a student or a tutor, means that he or she can use it exclusively for fifteen (15) days, and it is marked on his/hers lending card, which is provided by the Library.

There is also a photocopier available to students for a limited number of copies from the Library material. The following sections operate in the Library:

1. Lending Department
2. Information Department
3. Electronic Documentation Bulletin Department
4. Audiovisual Media Department.

The Library of Serres Campus operates every working day, all year round, according to the following operating hours:

- September – June: 8:30 a.m. to 8:00 p.m.
- July – August: 8:30 a.m. to 2:00 p.m.

Library Address:
IHU Serres Campus - Library,
Terma Magnesias Str.,
62124 Serres, Greece.
Tel: 23210-49265, 23210-49269
Fax: 23210-45405

email: admin@lib.teiser.gr
website: http://lib.teiser.gr

11.3 Students' Restaurant

In the Serres Campus the students have the ability of dining, three times a day, in a well-equipped restaurant. All students of the Serres Campus have the right to free meals, depending only on their family income, which should not exceed 45,000 € per year.

Relevant information is provided by the office of the Students' Club, which is located on the ground floor of the Library building.

11.4 Students' Dormitory

The students of Serres Campus usually dwell in residences of their own choice. The University provides free housing (housing allowance due to lack of Student Residence) to eligible students, under the conditions set by the relevant legislation. In the area of the Serres Campus, there is a hostel for foreign students of the ERASMUS Program, consisting of twelve (12) double rooms and three (3) suits for invited Professors.

It is worth to point out that, the Greek State grants an annual housing allowance of 1,000 € to the eligible students (i.e., those who fulfill the conditions set by the Law 3220/2004). The associated certificate is provided by the Secretariat of the Department.

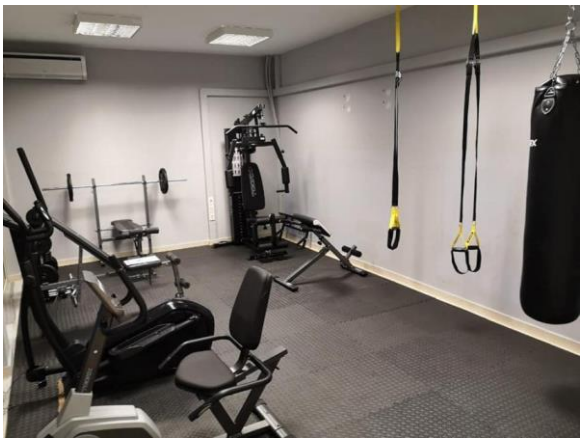
11.5 Student Health Care Service

All students have the same rights to health and insurance. Upon their registration, in each and every student a special health booklet is given, which guarantees free medical and pharmaceutical care. The nearest hospital is only 2 km away from the Serres Campus.

11.6 The University Gym

The facilities of the Gymnasium of Serres Campus gives the opportunity to all students and the Academic Staff to exercise. The following are available at the Gymnasium:

- Weight-lifting room
- Gymnastics gym
- Rooms with ping-pong tables
- Sauna



In addition, students can take part in the programs of learning traditional or/and modern dance and yoga training, as well as in the programs of basketball, football, volleyball, table tennis (ping-pong), shooting, aerobics, and self-defense.

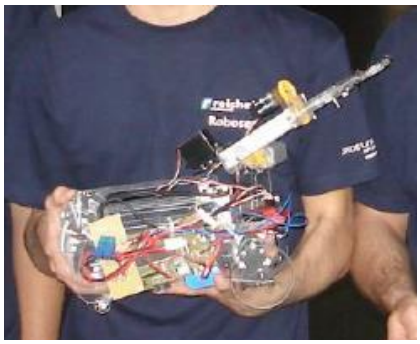
11.7 Sports and Cultural Activities

All students, upon their registration in the Departments of Serres Campus, automatically become members of the corresponding Students Association, through which they are represented. The Association calls for meetings of the Students Assembly at regular intervals, where issues that concern them are discussed. The elections are held once a year and on a date common for all the Universities in Greece. Students Association also organizes trips and visits of educational or recreational character. There are also sections of theater, music, and cinema.

In this context, the Mechanical Engineering Department has participated in the following acts:

1. ROBOSER

In the 18th International Robotics Competition "Design Challenge 2012", which took place on May 7 and 8, 2012, at Jade Hochschule in the city of Wilhelmshaven, Germany, our team won the 1st Prize for Designing a Remote-Controlled ROBOT. Our team received commendable comments and as far as the ROBOT itself is concerned, which was characterized as the first - throughout the 18 years of the competition - that is a complete solution, ready for production (i.e., TRL 8).



2. TEICM Racing Team

TEI CM Racing Team is a team of the Mechanical Engineering Department that was established in 2016 and loves motor sports. Its goal was the construction of a single-cylinder motorcycle, in order to participate in the European tournament FIM Supermono Cup 2017. The FIM Europe

Supermono Cup is a European event of ten races similar to MotoGP, where four-stroke single-cylinder racing motorcycles participate. The Team managed to develop a single-cylinder motorcycle with a thermal engine, which won the 4th and 6th place in the Greek Motorcycle Championship in 2017 and 2018, respectively.

3. REM-IHU

REM-IHU Team was established in 2020 and is an evolution of the TEI CM Racing Team. Accordingly, the design of the fairing and the scissors of the moto was kept, while the thermal engine was replaced by an electric motor!.. The Team participated in the Moto Student 2023 competition and took the 12th position among 47 international teams.

The International Competition MotoStudent is one of the most pronounced student competitions. The goal of the students is to apply all the knowledge acquired during their studies to a real industrial product, designing, calculating, and constructing a real prototype motorcycle, which is accordingly evaluated and tested at the Circuit FIR Motorland Aragón, Spain.

11.8 Network Operations Center (NOC) – Electronic Services

IHU@Serres has created, maintains, and constantly evolves a high-speed Data Network that extends exclusively within the premises of the Institute. The Data Network connects each IHU Department with Greek and international Networks, and the Internet. Through the Data Network, a set of network services are provided to all members of the academic community with the aim of supporting and promoting education, research and administrative function of the Institution.

The aim of IHU through the Network Operation & Management Center (NOMC) is the uninterrupted provision of high-quality services to the academic community, and the introduction and familiarization with cutting-edge technologies.

The activities of NOMC can be classified into five (5) categories:

1. Installation of new sections of cable system, active elements and software of network systems and applications.
2. Maintenance of the cable system, active elements, and software.
3. Management of cable nodes, active elements and applications.
4. Provision of value-added network services to IHU and the wider academic community.
5. Training the members of the academic community on network issues and more specifically on the use of the Data Network of IHU and the offered services.

12. REFERENCE to DEPARTMENT and UNIVERSITY REGULATIONS

To make things easier for the students of the IHU Department of Mechanical Engineering, below, please find a list of hyper-connections to the various regulations valid in the Department and/or the University, namely,

IHU Internal Regulations Rule (in Greek): ΕΦΗΜΕΡΙΔΑ ΤΗΣ ΚΥΒΕΡΝΗΣΕΩΣ (ihu.gr)

Dept's Internal Regulations Rule (in Greek): 1._Εσωτερικός_Κανονισμός_Τμήματος.pdf (ihu.gr)

Dept's Studies Regulations Rule (in Greek): 4._Κανονισμός_Σπουδών.pdf (ihu.gr)

Diploma Thesis Regulations Rule (in Greek): 5._Κανονισμός_Διπλωματικών.pdf (ihu.gr)

Internship Regulations Rule (in Greek): 6._Κανονισμός_Πρακτικής_Άσκησης.pdf (ihu.gr)

Mobility Regulations Rule (in Greek): 7._Κανονισμός_Κινητικότητας.pdf (ihu.gr)

Complaints Regulations Rule (in Greek): 8._Κανονισμός_Διαχείρισης_Παραπόνων.pdf (ihu.gr)

For more information, please visit our website at:

- ✓ Τμήμα Μηχανολόγων Μηχανικών – Τμήμα Μηχανολόγων Μηχανικών (ihu.gr)

13. APPENDIX: COURSES OUTLINE

The courses are presented by Semester and Sector of Studies, briefly for each course, with the course description and syllabus.

13.1 1st Semester Courses

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0101	**SEMESTER**	1st
COURSE TITLE	**Mathematics I – Calculus of One Variable**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g., lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	5	7.5
COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Functions: Definitions. Domain, range, even and odd function, composite and inverse function, types of functions - polynomial, exponential, logarithmic, trigonometric, hyperbolic, and their inverses. Graphical representation of a function. Parametric representation of a curve. Limits: Limit and continuity of a function. Derivatives: Definition of derivative. Geometric interpretation of derivative. Rate of change. Derivatives of basic functions, derivation of composite, implicit and inverse function, logarithmic derivation. Differential of a function. Applications of derivatives: Rolle's theorem and mean value theorem, function study - extreme values, monotonicity intervals, inflection points, curvature intervals, asymptotes of curve. Solving limits with de l' Hospital's rule. Taylor-Mc Laurin expansions. Indefinite integrals: Basic methods of integration - integration by substitution, integration by parts, Other methods of integration. Definite integrals: Definitions. Fundamental theorem of integral calculus. Mean value theorem of integral calculus. Applications of definite integrals - arc length of curve, area of plane region, work of force, work of reversible change. Generalized integrals: 1st, 2nd, and 3rd kind. Methods of solution. Cauchy's principal value.

Linear Algebra: Polynomials: Basic concepts, division of polynomials, finding roots - real and complex roots. Complex Numbers: Basic concepts. The complex plane. Representations of complex numbers. Operations with complex numbers. Vectors: Basic concepts and rules for handling vectors, operations

between vectors, the inner product of vectors, the outer product of vectors, applications. Matrices: Basic definitions, types of matrices and applications, operations between matrices, matrix multiplication, identity matrix, inverse matrix, unitary matrix, similarity of matrices, finding inverse matrix by row operations. Eigenvalues and eigenvectors of a matrix. Diagonalization of matrices. Determinants: Basic properties, calculation of determinant of invertible matrix. Linear systems: Solving linear systems - by Kramer's method, by the method of the inverse matrix.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0102	**SEMESTER**	1st
COURSE TITLE	**Physics I – Dynamics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction: Rules for handling vectors, derivatives and integrals.

Kinematics and Dynamics of the material point: Newton's laws, simple motions, work, energy, power, momentum, conservation principles of energy - momentum.

Dynamics of Rigid Body: translational and rotational motion around a fixed axis and a fixed point, general spatial motion, inertia tensor, angular momentum, conservation principles.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0103	**SEMESTER**	1st
COURSE TITLE	**Mechanical Drawing**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course,*		**WEEKLY TEACHING HOURS**	**CREDITS**

give the weekly teaching hours and the total credits		
Tutorials (Theory)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

1. Introduction to Mechanical Design, Drawing tools and paper, Drawing legend, Scales, Types of lines, Writing letters and numbers, Folding drawing papers, Parts list.

2. Drawing geometric shapes. Regular polygons inscribed or circumscribed in a circle. Ellipse, Archimedean spiral, helix. Drawing geometric constructions.

3. Drawing basic, partial, auxiliary, special views. Representation of object in views. Drawing views of reduction, limit positions, small slopes.

4. Rules for placing dimensions on symmetrical and non-symmetrical shapes. Observations and examples for the placement of dimensions

5. Full sections, half-sections, compound and partial section, inclination. Details and general observations for the drawing of the sections. Drawing from axonometric drawings and templates of the necessary views, sections, etc. Placement of dimensions and machining symbols.

6. Surface qualities and machining symbols. Tolerances of form and position. Examples of assemblies.

7. Intersections and developments. Developments of sheet metal, prismatic, cylindrical, conical, pyramidal, spherical pieces. Drawing developments of sheet metal constructions.

8. Representations of threads, screws, nuts - Representations of springs, gear wheels, standardized components. Assembled mechanical devices.

Execution of exercises, on an individual level or small groups, in the individual sections, delivery and evaluation of them.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0104	**SEMESTER**	1st
COURSE TITLE	**Introduction to Materials Science**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

i. Nature, structure and properties of materials.

ii. Crystal structure of Metals.

iii. Mechanical behavior of Metals.

iv. Phase equilibrium diagrams of Alloys.

v. Plastics and Ceramic materials.

vi. Nature of Materials (structure of matter, chemical compounds, chemical bonds).

vii. Structure of solids (crystalline solids, crystal systems, planes, axes, points and directions).

viii. Metals (crystalline structure, crystallization of metals, defects of their structure).

ix. Mechanical properties of materials (deformations, strength, creep, brittleness, wear and hardness).

x. Mechanical behavior of metals (stress and strain, tensile test, necking, recrystallization, fatigue).

xi. Electrical properties of metals.

xii. Thermal properties of metals.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0105	**SEMESTER**	1st
COURSE TITLE	**Technical Terminology – English**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Teaching in English and Greek language Exams in English language		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		

COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

1. Words and phrases in English that relate to the science of Mechanical Engineering.

2. Vocabulary enrichment: Use of words that match each other (collocation), compound words, opposites, synonyms, derivatives, etc.

3. Academic writing: The appropriate use of connectors for writing an academic text such as a scientific paper or an essay related to Mechanical Engineering, summarizing and drawing conclusions, the difference in style between a formal letter and a reply to an email message etc.

4. Structure of oral and written speech on topics of specialization. Practice using foreign texts and concepts of relevant terminology with the aim of correct use of corresponding bibliography.

13.2 2nd Semester Courses

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0201	**SEMESTER**	2nd
COURSE TITLE	**Mathematics II– Calculus of Several Variables**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g., lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Functions of several variables: Domain and geometric interpretation. The concept of curvature. Systems of curvilinear coordinates. Sphere, ellipsoid, cone, paraboloid, hyperbolic surfaces. Partial derivatives: First and second order - mixed derivative. Geometric interpretation. Physical interpretation. Partial derivatives of simple, composite, and implicit functions. The concept of the Jacobian. The total differential. Extreme values of functions of several variables - maxima, minima and "saddle" points. Extrema under conditions. Lagrange multipliers. Vector Analysis: Scalar and vector fields. Directional derivative. Gradient, divergence and curl. Physical interpretation. Conservative fields. Double integrals: Domain of integration. Solution of double integral in Cartesian and polar coordinates. Applications of double integrals - volume of solid body, moment of inertia. Triple integrals: Domain of integration. Solution of triple integral in Cartesian, cylindrical, and spherical coordinates. Curvilinear integrals: Methods of calculation and applications. Circulation of field - Work of force. Surface integrals: Methods of calculation. Gauss - Ostrogradsky theorem. Stokes theorem.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT
LEVEL OF STUDIES	UNDERGRADUATE

COURSE CODE	ΓΥ0202	**SEMESTER**	2nd
COURSE TITLE	**Physics II –Electromagnetism**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I, Dynamics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction: elements of vector analysis, complex numbers. Electrostatics (Coulomb's, Gauss's Laws): electric field, potential, analytical calculation of potential and intensity of electric field of simple geometric charge distributions, capacitance, dipoles, energy of charge distribution, electric field as carrier of electric energy. Dielectrics: electric displacement, dielectric polarization, energy density within dielectrics, piezoelectricity. Thermoelectric Phenomena. Study of Direct Current Circuits (Ohm's Law, Kirchhoff's Rules). Mechanisms of Conductivity of Solids & Fluids: conductors, insulators, semiconductors, dependence of conductivity on temperature - superconductivity, dependence of conductivity on factors.

Electrodynamics (Ampère's, Biot-Savart's, Faraday's Laws): magnetic field, analytical calculation of magnetic field intensity from simple arrangements of current-carrying conductors, Lorentz force, induction, magnetic materials, alternating currents, study of alternating current circuits with complex numbers. Electromagnetic waves.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0203	**SEMESTER**	2nd
COURSE TITLE	**Computer Aided Design (CAD) I**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Mechanical Drawing		

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/course/view.php?id=45

SYLLABUS

Introduction to Mechanical Design with the Aid of Computer: Types of coordinates (Cartesian, Polar coordinates, with relative or absolute declaration). Definition of edges (Straight, circle, ellipse, Bezier & B-Splines curves). Definition of surfaces (Flat, Linear, Rotational, Bezier & B-Splines). Definition of solids.

Two-dimensional design: Definition of coordinate system and design planes. Definition and creation of geometric entities. Additional design capabilities. Editing and modifying commands of the characteristics of geometric entities. Dimensioning. Management of drawings and printing of them.

Three-dimensional design: Basic principles of geometry of three-dimensional space. Coordinate systems. Techniques for creating solid models. Additional design capabilities. Parameterization of geometric features. Creation of assembly from individual components. Automatic creation of construction drawings from the three-dimensional model. Management of three-dimensional model for communication with CAE systems.

Preparation of mechanical drawings with the aid of Computer in two-dimensional and three-dimensional design environment.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0204	**SEMESTER**	2nd
COURSE TITLE	**Mechanics I–Statics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Dynamics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction to vector calculus / Coplanar forces / Center of gravity of a body / Beams - Diagrams

[N], [Q], [M] / Moments of inertia of section / Frames / Networks / Arches / Flexible carriers - cables / Friction / Composite carriers / Carriers in Space

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0205	**SEMESTER**	2nd
COURSE TITLE	**Computer Programming, I**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction to Matlab environment, Description of the environment, Basic mathematical operations, Variables Functions of the command window (Command Window), Number formatting (format), Help options, Creation of simple and special types of matrices, Operations with matrices (Addition - Subtraction - Multiplication - Division of matrices and elements, Deletion of columns and rows). Special functions: Inverse and Transpose matrix, Raising matrix to power, Creating a unit matrix of order n, matrix of order n consisting only of zeros and only of units, magic matrix of order n, Euler angles. Graphical representations of simple functions. Graphical representations of trigonometric, logarithmic functions. More settings (editing graphical representations). Saving graphical representations. Polynomials: Roots of polynomials, Calculation of polynomial values, Multiplication / Division between polynomials. Derivation of polynomials. Polynomial approximation. Interpolation with third-order sp-lines, Third-order interpolation, Symbolic representation of variables. Limits. Derivatives and Integrals Graphical representations of symbolic functions.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0206	**SEMESTER**	2nd
COURSE TITLE	**Labour Safety – Ergonomics**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY**	**CREDITS**

if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits	**TEACHING HOURS**	
Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background	
PREREQUISITE COURSES:	-	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	OXI	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/	

SYLLABUS

Organization of occupational safety / Hazardous working conditions.

Electrical installation safety / Fire safety / Transport and storage safety.

Special topics of various machines and installations.

Accident management / Laws, statistics and organizations related to occupational safety and accidents.

Concept of environment and its protection / Ecological - socio-economic burden from pollution and private-economic cost of decontamination.

Determination of acceptable level of pollution. Regulations and legislation.

Aerosols and other gaseous industrial pollutants.

Mechanical equipment for decontamination.

Liquid waste.

General about biological treatment (BOD, COD, biochemical reactors).

Primary cleaning, secondary cleaning / Tertiary cleaning.

Sludge disposal - Energy utilization (biogas production).

Material recovery / Treatment of waste from special industries / Solid waste / Methods of disposal, energy utilization and material recovery.

Other forms of pollution.

Pollution of large systems.

Natural self-cleaning and artificial cleaning / Simulation and models.

13.3 3rd Semester Courses

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0301	**SEMESTER**	3rd
COURSE TITLE	**Mathematics III – Differential Equations**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I, Mathematics II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Differential equations (DE) of 1st order: General solution, partial solutions, orthogonal trajectories. Existence theorem of Cauchy's solution. Types: Separable variables. DE reducible to separable variables. Homogeneous DE of 1st order. DE reducible to homogeneous. Linear DE - The method of Lagrange's variable coefficients. The DE of Bernoulli. The DE of Riccati. Complete DE of 1st order. The Euler integral factor. Solutions with tricks.

Differential equations (DE) of 2nd order: General solution, partial solutions. Solution of linear DE of 2nd order with variable coefficients. The Wronski determinant. Transformations of the dependent and independent variable. Reduction of the order of a DE of 2nd order. Solution of linear DE of 2nd order with constant coefficients. The general solution of the homogeneous. The general solution of the complete.

Linear systems of DE of 1st order: The method of elimination. The method of eigenvalues. Models in matrix form. Normal form and the transition matrix.

Introduction to DE with partial derivatives. Applications for Engineers.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT
LEVEL OF STUDIES	UNDERGRADUATE

COURSE CODE	EY0302	**SEMESTER**	3rd
COURSE TITLE	**Thermodynamics I**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Dynamics, Mathematics II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Basic Concepts: Thermodynamic state variables and process variables, state equation of ideal gases, absolute temperature. 1st Law of Thermodynamics: formulation for closed and open systems of steady flow, calculation of work and heat. 2nd Law of Thermodynamics: cyclic processes, Carnot cycle, entropy, dissipation work. Applications of the 1st and 2nd Law: ideal gases, gas engines: compressors, gas turbines (Joule and Ericson cycles), piston engines of internal combustion (Otto, Diesel and Seiliger cycles). Vapors: characteristic quantities of steam, tables and diagrams of steam - Mollier h-s diagram, cycles of power generation plants with steam (Clausius-Rankine), refrigeration cycles (compression and absorption).

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0303	**SEMESTER**	3rd
COURSE TITLE	**Computer Aided Design (CAD) II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	CAD I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Includes the teaching of the principles and techniques of representation of mechanical connections, e.g., screw connections, welds, etc., as well as their symbols. The teaching of the principles, techniques of representation and symbols of the various methods of welding, the representation of gear wheels, as well as pulleys and sprockets. The way of using tables of standardized elements (rolling bearings, sealing elements, screws, nuts, washers, etc.) is presented.

Within the framework of the course's lectures, two-dimensional and three-dimensional design of a series of tests and mechanical components takes place, as well as a complex exercise of developing a mechanical device using standardized components and mechanical connections, such as, for example, a single-gear reducer. At the same time, the construction drawings of the involved components are developed in detail, the summary drawing of the whole device, the list of parts, etc.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0304	**SEMESTER**	3rd
COURSE TITLE	**Mechanics II – Material Strength**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Mechanics I - Statics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

1. Basic concepts of materials mechanics. Stress-strain diagrams
2. Axial tension - compression
3. Biaxial tension - compression
4. Plane stress and plane strain
5. Moments of inertia of arbitrary section
6. Bending of beam
7. Elastic line
8. Torsion of beam

9. Buckling
10. Double and asymmetric bending
11. Composite stress
12. Energy methods
13. Solution of hyperstatic carriers

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0305	**SEMESTER**	3rd
COURSE TITLE	**Computer Programming II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I, Mathematics II, Computer Programming I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Programming in Matlab environment: Symbolic representation of variables. Algorithms - Commands. Special functions: Roots of algebraic equations, Series, Limits, Derivatives and Integrals. Special topics in Matlab: Finding roots of polynomial and nonlinear equations (analytical and graphical method). Numerical interpolation. Numerical differentiation and integration of functions. Solving integrals in power series form. Numerical solution of first order differential equations. Applications in Dynamics and E/M.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0306	**SEMESTER**	3rd
COURSE TITLE	**Production Management**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**

	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Product Design,

Production capacity design,

Work Study,

Site selection,

Spatial planning,

Forecasting methods,

Inventory planning and control,

Production planning.

13.4 4th Semester Courses

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0401	**SEMESTER**	4th
COURSE TITLE	**Numerical Analysis**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I, Mathematics II, Mathematics III		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Computational errors: Basic concepts, types of errors, error propagation in numerical calculations. Approximate expressions of functions: The coincident polynomial and the polynomials of Taylor and Mc Laurin. Applications to numerical methods of solving problems - integration of functions in non-closed form. Numerical solution of algebraic equations: Finding roots - method of regula falsi, method of Newton-Raphson. Numerical interpolation: Linear interpolation, complete interpolation with Newton's method. Double linear interpolation. Numerical differentiation: Linear differentiation, complete differentiation with the help of Newton's coincident polynomial. Numerical integration: Trapezoidal method, Newton-Cotes method. Numerical solution of first order differential equations: Euler's method, Taylor's method, Runge-Kutta method of 2nd and 4th order.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0402	**SEMESTER**	4th
COURSE TITLE	**Fluid Mechanics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**

Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background	
PREREQUISITE COURSES:	Mathematics II, Mathematics III, Thermodynamics I	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/	

SYLLABUS

Fluid Mechanics: Basic properties of fluids. Systems of units and dependence between units. Basic equations of Fluid Mechanics: Conservation of Mass (continuity equation), Conservation of Linear and Angular Momentum (2nd law of motion of Newton), Conservation of Energy (1st thermodynamic axiom), State Equations. Hydrostatics: Point pressure and distribution with fluid depth, pressure measurement & manometers, absolute, relative and atmospheric pressure, static & dynamic pressure, forces on flat (vertical, horizontal & inclined) and curved surfaces, buoyancy. Basic Fluid Mechanics: Acceleration of fluid element - 2nd Law of Newton, Bernoulli equation, static, dynamic & total pressure, velocity measurement with Pitot-Static tube, applications of Bernoulli equation, energy line & piezometric line, deviations from Bernoulli equation. Kinematics of Fluids: Velocity Field (flow description by Euler or Lagrange, 1D, 2D & 3D flow, steady & unsteady flow, streamlines, streaklines & pathlines), Acceleration Field (the material derivative, unsteady phenomena, convection phenomena), Control Volume, Reynolds Transport Theorem (steady & unsteady phenomena, the theorem for moving control volumes, selection of control volume). Dimensional Analysis and Similarity, Buckingham Theorem. Definition and physical interpretation of the Dimensionless Numbers of Fluid Mechanics (Reynolds, Mach, Froude, Weber, etc.). Analysis of forces and flow of elementary fluid particle and derivation of the differential equations of fluid motion (Navier-Stokes). Analysis and interpretation of the various terms of this equation. Flow in Closed Conduits: Laminar & turbulent flow, flow at the entrance of the conduit, pressure & shear stress, fully developed laminar flow, fully developed turbulent flow, transition from laminar to turbulent flow, turbulent shear stress, velocity distribution in turbulent flow, dimensional analysis of flow in closed conduits, linear losses, local losses.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0403	**SEMESTER**	4th
COURSE TITLE	**Engineering Materials Technology**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		3	4.5
COURSE TYPE *general background, special background, specialised general*	Special background		

knowledge, skills development	
PREREQUISITE COURSES:	Introduction to Materials Science
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

i. Characteristics of the most important Mechanical Materials.

ii. Properties of the most important Mechanical Materials.

iii. Applications of the most important Mechanical Materials.

iv. Methods of preparation or production of Mechanical Materials.

v. Phase equilibrium diagrams of the most important Mechanical Materials.

vi. Methods of determination and control-characterization of Mechanical Materials.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0404	**SEMESTER**	4th
COURSE TITLE	**Machining Technology I**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Mechanical Drawing		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Measurements: General elements about measurements. Basic approach to the measurement system (basic parts). Measuring instruments - definitions (accuracy, correctness, fidelity, range, repeatability, reproducibility, resolution, sensitivity, reliability). Specifications of measuring instruments, operating principles. Measurement standards (basic and productive units of SI). Measurement errors (absolute, relative). Causes of errors. Classification of errors (systematic, random, composite). Tolerances, fittings,

length standards, dimension and angle control. High precision measurements (hierarchy of standards, certified reference materials, traceability). Basic concepts around verification.

Workshop: Raw materials, specifications, order. Phase diagram of construction works. Technical specifications, tool order, standardization. Modern tools - equipment.

Foundry: Raw materials, specifications, order. Models of castings. Tools and basic casting operations. Molding and various casting methods. Mechanical molding. Processing of cast objects, control of castings.

Welding: Electric welding, oxy-fuel welding, TIG, MIG, MAG welding. Oxy-fuel cutting. Soft soldering.

Pipe work: Raw materials, specifications, order. Tools, machines. Pipe networks, network control. Pipe colors-Symbols.

Elasturgy: Raw materials, specifications, order. Machines tools and measuring instruments. Technical characteristics, operating principles, maintenance. Shaping and cutting of elastics.

Workshop Safety: About accidents. Regulation for the smooth operation in the laboratory. Obligations of employers and employees. Machine safety and safe use of tools and devices. Safety signage according to National Legislation and Community Directives.

Laboratory Exercises (every 3 weeks of classes):

Exercise in length measurements with high-resolution measuring instruments. Checking dimensions and surfaces of ready-made mass-produced mechanical products.

Construction of a two-piece assembly with a tolerance of ±0.1 mm.

Mechanical molding and metal casting.

Construction of a typical pipe network with steel pipe and copper pipe.

Welding of three pieces with arc welding and TIG.

Welding of elastics with oxy-fuel welding.

Oxy-fuel cutting of metals.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0405	**SEMESTER**	4th
COURSE TITLE	**Machine Elements I**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Mechanical Drawing		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		

COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Standardization of components: Dimensional tolerances, fits. Dynamic loading. Safety factor. Materials: failures, basic properties, selection criteria.

Fusion welds: advantages-disadvantages, seam shapes, gap shapes, seam thickness, strength test, examples of correct welded constructions. Pressure welds: connection shape, strength test, examples of correct constructions.

Elements of the technique of rivets and their mechanical behavior. Connections with pins.

Screws: General description, relation of tightening torque - axial force and its applications. Tightening screws: pre-tension and operating forces, cold settling, adjustment of the tightening torque, specifications of good operation of the screw connection, strength test. Applied screws, elastic washers. Motion screws.

Axles - spindles: Shape, function, dimensioning. Strength test of spindles: Dynamic loading, equivalent stress, size factor, surface factor, shape factor, support factor, safety against dynamic fracture and against plastic deformation. Deformations and vibrations of spindles. Wedges, polyspines. Fixed and movable spindle joints, clutches.

Rolling bearings: Types of bearings and properties of each type. Fixed-mobile bearing action, floating bearing action, bearing action with pre-tensioning, bearing failures, static strength test, calculation of life duration, examples of bearing assemblies.

Laboratory Exercises (every 3 weeks of classes):

Application of the theory both in the strength test of components and in their dimensioning. Disassembly of simple mechanical constructions, free body diagrams of the components, power flow in the schematic design of the construction.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0406	**SEMESTER**	4th
COURSE TITLE	**Production Units Administration**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	3	4.5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Mathematics I, Production Management		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO	NO		

ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Introduction: Economic unit - Businesses - Distinctions between them. Production system and business environment. Wealth, cost, depreciation, break-even point, efficiency, productivity. Cost standards.

Basic principles of Operations Research: Maximization of profit and minimization of cost (Linear Programming - the graphical method and the Simplex method). Product distribution and inventory management (Transportation models). Personnel management (The Hungarian method).

Industrial Business: The characteristic elements of modern industrial businesses, basic functions of the industrial business, productivity - efficiency, forms and systems of industrial production, industrial buildings, spatial planning of production systems. Production design. Organization and control of production and distribution of products. Quantitative methods of decision making.

13.5 5th Semester Courses

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΓΥ0501	**SEMESTER**	5th
COURSE TITLE	**Statistics & Probability Theory**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:	Mathematics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Combinatorial Analysis (Permutations, Repeated Permutations, Combinations, Arrangements, Repeated Arrangements, Repeated Combinations). The principle of Enumeration. Examples.

Basic concepts of Statistics (Random Variable, Population, Sample). Methods and Organization of Sampling.

Descriptive Statistics. Classes - Frequencies - Cumulative and Relative Frequency. Statistical Tables and Graphs.

Parameters of Central Tendency (Arithmetic - Geometric - Harmonic mean, Mode and Median. Properties. Parameters of Dispersion (Variance and Standard Deviation). The same parameters in data given in Classes. Transformations and their properties. The Z transformation.

Probabilities (Experiment of chance, Sample space, Simple Event, Event). Reminders from Set Theory, Venn diagrams, proofs of properties. The concept of Probability and its properties. Probability Exercises. Conditional Probabilities. Properties. Bayes' Theorem.

Probability Distribution Functions in Discrete Random Variables (Definitions, Symbols, Mathematical Expectation - Variance and their properties, Cumulative Probability). Binomial Distribution. Poisson Distribution. Examples.

Probability Distribution Functions in Continuous Random Variables (Definitions, Symbols, Mathematical Expectation - Variance and their properties). The Uniform Distribution.

Polynomial and Exponential Probability Distribution Functions. The Normal Distribution and the

Standard Normal Distribution. Examples. The Student Distribution (t-Distribution). Estimation (Sampling Distributions for the Mean, for Differences of Means and for Ratios. Central Limit Theorem (C.L.T.). Confidence Intervals for the Mean. Confidence Intervals for the Difference of the Means. Regression (Linear, Exponential and Logarithmic) and Correlation.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0502	**SEMESTER**	5th
COURSE TITLE	**Thermodynamics II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Mathematics I, Thermodynamics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Gas mixtures: mass, mole, volume percentages. Ideal gas mixtures: calculation of internal energy, enthalpy, entropy, mixing entropy. Gas and vapor mixtures, moist air: absolute and relative humidity, specific enthalpy, applications in air conditioning: h-x diagram of Mollier. Combustion: combustion equations, calculation of required air, composition, quantity and volume of flue gases, as well as combustion temperature, solid, liquid and gaseous fuels. Calculation of air ratio based on the composition of flue gases. Calculation of combustion efficiency. Flows: continuity equation, momentum theorem, dependence of flow velocity on pressure and cross-section of the duct, nozzles and diffusers, applications in propulsion systems.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0503	**SEMESTER**	5th
COURSE TITLE	**Electrical Technology & Electronics**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
Tutorials (Theory)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	Physics II - Electromagnetism
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

- Introduction - Electric Circuits. Basic electrical quantities. Active and passive elements.
- Ohm's law, Kirchhoff's laws.
- Basic electric circuits with series or parallel connection of elements. Voltage divider and current divider.
- Methods of analysis of electric circuits, principle of superposition.
- Thevenin and Norton theorems, Source Transformation - Theorems of Millman and Kenelly.
- Alternating currents. Representation of sinusoidal quantities with vectors.
- Power of alternating current in a dipole with resistive, inductive or capacitive resistance.
- Three-phase systems, three-phase power, Compensation of electrical installations

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0504	**SEMESTER**	5th
COURSE TITLE	**Machine Elements II**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
Tutorials (Theory)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	Machine Elements I
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

TRANSMISSION SYSTEMS OF MOTION

1. Motion transmission system with toothed wheels. General. Geometry of gear drives, materials of construction of toothed wheels, methods of construction of toothed wheels, machining of toothed wheels, construction errors. Displacement of pitch, loads of toothed wheels. Methods of calculation of toothed wheels. Spur gears with straight teeth. Geometry, stresses, methods of calculation and dimensioning.

Spur gears with helical teeth. Geometry, stresses, methods of calculation and dimensioning.

Bevel gears with straight teeth. Geometry, stresses, methods of calculation and dimensioning.

Bevel gears with helical teeth. Geometry, stresses, methods of calculation and dimensioning.

Worm gear pair. Geometry, stresses, methods of calculation and dimensioning.

2. Motion transmission system with belts. General. Geometry of belt drives, materials of construction of belts and their pulleys, construction errors. Slippage of belts, tension of belts. Methods of calculation of belt drives.

Motion transmission with flat belts. Geometry, stresses, methods of calculation and dimensioning.

Motion transmission with trapezoidal belts. Geometry, stresses, methods of calculation and dimensioning.

Motion transmission with toothed belts. Geometry, stresses, methods of calculation and dimensioning. High torque toothed belts HTD.

3. Motion transmission system with chains. General. Geometry of chain drives, materials of construction of the toothed wheels of the chains, materials of construction of the chains, types of chains. Construction errors. Loads of chains. Methods of calculation of chain drives

Motion transmission with chains. Geometry, stresses, methods of calculation and dimensioning.

SLIDING BEARINGS

Description of sliding bearings. Geometry in general. Mode of operation. Calculation of velocities, hydrodynamic wedge. Lubricants used. Methods of calculation and dimensioning.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0505	**SEMESTER**	5th
COURSE TITLE	**Machine Dynamics & Vibrations**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Dynamics, Mathematics I, Mathematics III		
LANGUAGE OF INSTRUCTION	GREEK		

and EXAMINATIONS:	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Theoretical part: (a) Vibration of dynamic systems with one degree of freedom. Analysis of Mechanical Systems: introduction, means of elastic deformations. Free vibration without damping: translational vibration, rotational vibration. Free vibration with damping: translational vibration, rotational vibration, categories of damping. Forced Vibration: equation of motion, forced vibration with negligible damping, response to harmonic excitation. Applications: selection of machine foundation characteristics, operating principles of instruments for measuring oscillatory quantities. (b) Vibration of dynamic systems with multiple degrees of freedom. Systems without damping: formulation and solution of eigenvalue problem, determination of response. Systems with damping: the Caughey method, the Duncan method, systems under harmonic excitation. Practice Exercises: Computational exploration of the oscillatory behavior of mechanical systems through simulation in Matlab environment, as well as using suitable experimental setups. Measurement and estimation of the basic quantities of vibration, experimental verification of laws, derivation of relations between quantities using experimental data.

13.6 6th Semester Courses

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0601	**SEMESTER**	6th
COURSE TITLE	**Heat Transfer**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Thermodynamics I, Thermodynamics II, Fluid Mechanics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction to the basic concepts and mechanisms of Heat Transfer.

- Heat transfer by conduction: Fourier's law, Thermal conductivity of solids, liquids and gases, Steady one-dimensional heat transfer in a plane wall, cylindrical wall, spherical wall, composite walls in series and parallel connection.
- Heat transfer by convection: Newton's law, Flow of viscous fluid, Introduction to the concept of thermal boundary layer, Methodology of solving convection problems, Use of dimensionless numbers, Forced convection over flat plates and inside - outside ducts of cylindrical or other cross-section, Free convection in infinite - finite space.
- Heat transfer by radiation: Stefan-Boltzmann law, Planck distribution, Absorption and emission of electromagnetic radiation, Methods of calculating heat fluxes exchanged by radiation, Wien's law, View factors, symmetry rules, superposition, reciprocity.
- Heat exchangers: Types of heat exchangers, Types of flows in heat exchangers, Heat transfer coefficient, Calculation of required heat exchange area in exchangers, Calculation of mean logarithmic temperature difference, Number of transfer units (NTU), Heat transfer during phase change: boiling - condensation.
- Combined heat transfer problems in complex geometries.
- Finned surfaces and fins, Transient thermal conduction
- Applied examples of Heat Transfer in industrial applications and buildings.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0602	**SEMESTER**	6th
COURSE TITLE	**Electric Engines**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	Physics II - Electromagnetism, Electrical Technology & Electronics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Basic concepts and phenomena of electromagnetism. Direct current machines, generators and motors: operating principle, constructional elements, voltage, internal torque, behavior for different types of excitation, under load. Alternating current machines, synchronous and asynchronous. Sinusoidal distributed vacuum magnetic fields, magnetic fields in machines with multiple magnetic poles, internal constructional elements. Synchronous machines: constructional and operational characteristics, synchronization and start-up for generator and motor. Asynchronous machines: advantages, operating principle and characteristics of induction machine, start-up and speed control of asynchronous motors.

Generators & direct current motors: Connections, conversion, characteristics, selection, faults, speed regulation of direct current motors, WARD-LEONARD system. Synchronous generator & motor: Connections, conversion, characteristics, selection, faults, power factor correction. Asynchronous short-circuited rotor motor: Start-up methods. Asynchronous ring motor: Characteristics, measurement of losses and efficiency. Installation and connection of motor. Asynchronous single-phase motors (with resistance - with capacitor): Start-up methods - Change of direction of rotation. Operation of three-phase motors as single-phase - Change of direction of rotation

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0603	**SEMESTER**	6th
COURSE TITLE	**Internal Combustion Engines**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
Tutorials (Theory)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Operating principles, classification and description of ICE elements. Structure, composition and materials of ICE. Thermodynamic cycles of operation, gasoline engines, diesel engines and accessories. Constructional and operational parameters: torque, mean pressure, work, power, various degrees of efficiency, consumption. Conventional fuel supply systems for gasoline and diesel engines. Thermochemistry of air-fuel mixtures. Study of theoretical cycles of operation with air and with air-fuel mixture. Conventional and alternative fuels. Lubricants. Gas exchange process: volumetric efficiency, flow through valves, residual exhaust gas, scavenging, flow through ports, supercharging. Fuel delivery regulation: mixture requirements, mixture formation, carburetor, injection systems in Otto and Diesel engines. Combustion in Otto and Diesel engines: normal and knock combustion, fuel quality, octane number, cetane number. Operational characteristics of Otto and Diesel engines, naturally aspirated and supercharged. Pollutant formation and pollution control technologies. Measurement techniques in ICE. Energy behavior of ICE, heat transfer, thermal calculation of engine, supercharging. Selection criteria of ICE, faults, maintenance. Special types of ICE. Vehicle systems that carry ICE.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0604	**SEMESTER**	6th
COURSE TITLE	**Metrology – Quality Control**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
Tutorials (Theory)	4	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	CAD II
LANGUAGE OF INSTRUCTION	GREEK

and EXAMINATIONS:	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Introduction to the concept of Quality. Presentation of modern quality control methods with special emphasis on statistical quality control techniques, acceptance quality control, production process control and quality improvement in the design phase. Analysis of the ISO 9000:2008 series of standards, ISO 17025 and ISO 22000.

Physical quantities and measurements (Distinction of quantities, systems of units, error theory, measurement uncertainty, instrument calibration). Dimensional Metrology. Geometric characteristics of technological surfaces. Symbolism. Measurement of straightness, flatness, perpendicularity. Measurement systems of sphericity, circularity, cylindricity. Angle measurement. Thread measurement. Dimension and tolerance control using CMM measuring machines.

Fundamental concepts of measurement systems, Sensor characteristics, Position and displacement measurements, Level measurements, Temperature measurements, Density and pressure measurements, Flow measurements, Speed and acceleration measurements, Force and torque measurements, Magnetic field measurements, Weak and high current measurements, Touch sensors, Optical quantity measurements, Acoustic quantity measurements.

Multiplexing and sampling arrangements in measurement systems using sensors, ADC and DAC converters, Signal adaptation techniques and arrangements, Basic concepts of signal processing, Data collection, display and recording systems.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EY0605	**SEMESTER**	6th
COURSE TITLE	**Management & Implementation of Technical Projects**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

The course is implemented through lectures and active participation in solving practice problems, as well as by writing a relevant topic with a practical dimension.

Principles of team management, the characteristics of the leader, team member relations, team spirit/individual effort, methodologies for evaluating human resources, team member selection, skills and weaknesses. Economic management of the project, vouchers, cash, inflows / outflows, accounting systems, legislation, methodologies for economic monitoring of the project. Safety during the implementation of technical work, description of accidents, prevention methodologies, legislation, plan & health and safety sheet of the project. Time scheduling of the project diagrams PERT & GANT, critical path, project completion time, probabilities, project phases, resources for the implementation of the project, application in Microsoft Project.

The course is examined through the elaboration of a work, in which each student must shape the framework of implementation of a technical project, applying what he learned.

13.7 7th Semester Courses

MANUFACTURING SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0701	**SEMESTER**	7th
COURSE TITLE	**Machining Technology II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	Machining Technology I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Theoretical Part:

A) MECHANICAL PROCESSES WITH MATERIAL REMOVAL: Metal cutting, cutting conditions, cutting tool materials, cutting forces and power, quality of machined surfaces by cutting.

B) LATHES: Basic parts of a parallel lathe, holding objects on the lathe, tools and cutting conditions on the lathe, types of turning, hydraulic copiers.

C) MILLING MACHINES: General, UNIVERSAL milling machines, cutting tools, cutting tool materials, cutting conditions, gear cutting (divider)

D) DRILLING MACHINES: General, types of drills, drill cutting tools, cutting conditions.

E) DRILLS:. General, types of drills, drill cutting tools, cutting conditions.

F) PLANERS: General, basic parts and operation of transverse planer, cutting conditions, work performed on the planer.

Laboratory Exercises (every 3 weeks of classes):

Training in the handling and operation of conventional machine tools (lathe, milling machine, drilling machine, drill, planer), performing a set of different exercises. Training in theoretical subjects related to the technology of machining with material removal. The selection of the exercises is such that, in order to be

implemented, each student must make use of almost all the possibilities of the conventional machine tools, not only getting a taste of the process of making a piece, but also with the questions that arise during his effort, to give answers, to fully understand the difficulties of the machining sequence, and to form an opinion on the machining flow. Thus, in the end, he is ready as an Engineer to guide the respective machine tool operator.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0702	**SEMESTER**	7th
COURSE TITLE	**Electrical & Mechanical Installations**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Description of the installation of mechanical elevator in buildings. Requirements of the regulations, new regulation ELOT 81.20. Development of the issue of calculations, technical description and required drawings in a complete study of the installation.

Description of the installation of hydraulic elevator in buildings. Requirements of the regulations, new regulation ELOT 81.50, usual practice and peculiarities. Development of the issue of calculations, technical description and required drawings in a complete study of the installation.

Description of the water supply and sewerage installation in buildings. Requirements of the regulations, usual practice and peculiarities. Development of the issue of calculations, technical description and required drawings in a complete study of the hydraulic installation.

Description of the natural gas installation in residential buildings and industries. Requirements of the regulations, usual practice and peculiarities. Development of the issue of calculations, technical description and required drawings in a complete study of the installation.

Description of the electrical installation in buildings. Requirements of the regulations, usual practice and peculiarities. Grounding installation. Development of the issue of calculations, technical description and required drawings in a complete study of the electrical installation.

Description of the installation of electric substation in buildings. Requirements of the regulations, usual practice and peculiarities. Development of the issue of calculations, technical description and required drawings in a complete study of the installation.

Description of the fire safety installation in all types of buildings. Requirements of the regulations, usual practice and peculiarities. Development of the issue of calculations, technical description and required drawings in a complete study of the installation.

Description of the lightning protection installation in buildings. Requirements of the regulations, usual practice and peculiarities. Development of the issue of calculations, technical description and required drawings in a complete study of the installation.

Description of the environmental impact studies for various installations. Requirements of the regulations. Development of the issue of calculations, technical description and required drawings in a complete environmental impact study.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0703	**SEMESTER**	7th
COURSE TITLE	**Finite Elements I**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	Computer Programming, I & II, Statics, Strength of Materials		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Theoretical Part:

1. Introduction. The Rayleigh - Ritz method. The Galerkin method.
2. One-dimensional problems. Axial tension. Rod in torsion. Development of stiffness matrices.
3. Networks. Development of the stiffness matrix.
4. Beams and frames. Calculation of stiffness matrices. Equivalent nodal loads of the element.
5. Two-dimensional problems. Triangle with constant strain
6. Quadrilateral and triangular elements of higher order. Numerical integration.
7. Symmetric bodies of revolution with symmetric loads of revolution.

8. Solids in space. Isoparametric elements.

9. The dynamics of mechanical structures.

10. Field problems. The Galerkin method. Heat transfer.

11. Problems with constraints on the boundary conditions.

Laboratory Exercises (every 3 weeks of classes):

Applications of computational stress - strain analysis of mechanical structures with the finite element method (FEA) using suitable software PC, ANSYS classic.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0704	**SEMESTER**	7th
COURSE TITLE	**Casting & Welding**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	Materials Technology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Casting of materials. Phenomena during solidification and crystallization of the material. Castability of materials. Casting methods. Feeding systems of molten metal. Metallographic and non-destructive testing of castings. Types of connections. Thermal source of welds. Heat flow density. Thermally affected zone. Advantages and disadvantages of welds. Weldability of materials. Fusion welds. Pressure welds. Heterogeneous welds.

Symbolism of welds. Preparation of the ends of the pieces to be welded. Quality control of welds. Criteria for selecting the welding method. Safety measures during welding.

ENERGY SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0701	**SEMESTER**	7th
COURSE TITLE	**Automation Control**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Concept of Automation - introduction to SAE - Examples from the practice of technology. Mathematical models of SAE calculation - use of Laplace transform & transfer functions - Boole algebra and matrices. Application of structural diagrams and signal flow diagrams in the analysis of automations. Constituent units of electrical automations. Design and synthesis of electrical automations. Constituent units of pneumatic - hydraulic automations. Design and synthesis of pneumatic - hydraulic automations. Constituent units of electronic automations.

Areas of interest and applications of sensors. Types and characteristics of sensors (Proximity detection, linear and angular displacement sensors, acceleration, deformation, force, pressure, flow, temperature, distance sensors). Data acquisition devices. A/D converters. Analog sensor interface with PC. Signal reception. Data processing of measurements. Measurement errors.

Microcontrollers (micro-controller). Programmable logic controllers (PLC). Industrial networks and SCADA systems. PC connection with measuring devices for the collection and processing of signals in real time and then control device based on the continuously measured quantities. Supervision and monitoring in real time the operation of industrial units-installations. Integrated solutions for industrial automation.

Laboratory Exercises (every 3 weeks of classes):

Design, synthesis and application of automations with:

- Hydraulic systems
- Pneumatic systems

- Electrical systems
- Combinations thereof using PLC.

Laboratory applications using sensors for receiving and processing measurement signals in the control of simple mechanical applications:

- Measurements and temperature control.
- Measurements and pressure control.
- Measurements and control of linear - angular displacement of axis.
- Applications for proximity detection of inductive, capacitive sensors.
- Programming microprocessors and PLCs as parts of industrial automations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0702	**SEMESTER**	7th
COURSE TITLE	**Vehicle Motion Systems**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:	Internal Combustion Engines		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Types and structure of vehicles, engine and power transmission systems. Suspension and wheels. Steering system. Braking system. Formation and control of pollutants: nitrogen oxides, carbon monoxide, unburned hydrocarbons, particles, exhaust gas treatment. Catalytic converters and emission control systems. Dynamometers and simulation of operation in laboratory conditions. Measurement and assessment of environmental performance of vehicles. Vehicle diagnosis and monitoring systems. Energy behavior of vehicles. Vehicle operation support systems. Safety systems. Autonomous Driving Systems. Hybrid vehicle technology. Electric vehicle technology. Hydrogen and fuel cell technology. Autonomous driving.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)

ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0703	**SEMESTER**	7th
COURSE TITLE	**Renewable Energy Sources**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:	Thermodynamics I, Heat Transfer, Fluid Mechanics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Course objective: The ability to understand the phenomena related to renewable energy sources and their conversion into useful work. The calculation of the potential of renewable energy sources. The calculation of the environmental impacts from the use of RES.

Course description:

The course is implemented through lectures and active participation in solving problems of practice on laboratory devices. General for RES, possibilities and limits of use of RES, coverage of energy needs with RES, problems and current efforts for their exploitation. Fundamentals of wind energy, wind characteristics, boundary layer, wind energy, anemological measurements, Betz limit, types of wind turbines (W/T), W/T efficiency, main parts of W/T, wind farms, analysis of forces on W/T blades, airfoils, calculation of annual generated energy, economic component of wind energy, fundamentals of solar energy, solar radiation, solar constant, characteristics of solar radiation outside and inside the earth's atmosphere, position and motion of the sun in relation to an observer on the surface of the Earth, direct and diffuse solar radiation, methods and instruments of measurement, calculation of solar radiation, flat solar collectors, operating principles, energy balance, performance characteristics, selective surfaces, concentrating solar collectors, efficiency degrees, photovoltaic elements (P/V), performance characteristics P/V, ways of connecting P/V, efficiency degrees, hydroelectric power plants, types of hydroelectric power plants, calculation of generated energy from hydroelectric power plants, biomass, combustion, pyrolysis, gasification, biofuels, small hydroelectric projects, types of turbines, calculation of generated energy from hydroelectric power plants, economic data on RES investments.

Laboratory Exercises (every 3 weeks of classes):

Measurement of wind power potential, operation characteristics of a small laboratory W/T and calculation of its efficiency, effect of the angle of attack of the blades on the characteristics of the W/T, measurement of operating characteristics P/V in the laboratory and outdoors, measurement of the effect of connection P/V, energy balance in solar collectors, visit to a facility producing energy from RES.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0704	**SEMESTER**	7th
COURSE TITLE	**Advances in Fluid Mechanics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:	Fluid Mechanics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Boundary layer theory in laminar and turbulent state. Transition of laminar boundary layer to turbulent. Boundary layer and pressure gradient (limited and non-limited flows). Separation and reattachment of boundary layer. Exact equations of boundary layer. Approximate equations of boundary layer.
- Hydraulic shock theory. Conditions for the formation of hydraulic shock and its approximate equations for finding the variation of pressure and velocity in closed conduits. Protection from hydraulic shock.
- Compressible flow theory and basic thermodynamic relations governing it. Compressibility conditions and Navier-Stokes equations for compressible flow.
- Flow in open straight conduits with constant slope. Flow equations for subcritical state. Reference for critical and supercritical flow and hydraulic jump. Application to channels of simple and complex cross-section. Conservation equations of mass and momentum for steady flow in open conduits.
- Deepening in turbulent flow. Reynolds analysis and formulation of time-averaged Navier-Stokes equations for mean flow. Reynolds stresses and their significance depending on the type of flow. Energy balance of turbulent kinetic energy as a function of distance from the wall. Production and dispersion of turbulence for various basic flows. Reference to turbulence modeling along mixing length Prandtl and turbulent viscosity Boussinesq.

13.8 8th Semester Courses

MANUFACTURING SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0801	**SEMESTER**	8th
COURSE TITLE	**Elevating & Conveying Machines**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Intermittent operation load handling facilities (overhead cranes).

Description of the lifting system of the facility. Wire ropes, pulleys, drums, motors, brakes.

Description of the travel system of the facility of the carrier and the overhead crane. Rolling wheels, motors, brakes, links.

Description of the steel structure of the facility, which is either shaped as a solid or a lattice structure.

Detailed calculation of all the above elements based on the applicable regulations (correspondingly DIN and Eurocode 3).

Description of the safety measures of a facility as well as the measures that ensure the continuity of the operation of the facility until the next scheduled maintenance.

Description of special Lifting Machines, such as winches, jacks, etc.

Continuous operation load handling facilities (conveyor belts).

Description of the installation of a conveyor belt. Support rollers, drive and return drums, cleaners, material guides, motors. Types and types of conveyor belts. Belt tensioning system. Metal construction supporting the conveyor belt.

Development of the calculation method of the installation according to the applicable regulations.

Processing of design study of load handling installation with the corresponding calculations and

drawings.

Calculations of structures with dynamic loading based on load groups and Palmgren - Miner principle. Grouping of loads with Markov tables.

Description of the installation of a tower crane.

Calculation of a tower crane based on the applicable regulations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0802	**SEMESTER**	8th
COURSE TITLE	**Metal Forming**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Theoretical part: Mechanical properties of metals. Plasticity theory. Yield criteria. Standard mechanical tests for determining characteristic properties of bulk metals. Effect of temperature and anisotropy of materials on plastic deformation. Forming tools. Classification of forming processes. Technological elements of the processes: forging, rolling, drawing, extrusion, stamping, shearing, deep drawing, and bending. Basic knowledge of operation and technological elements of hydraulic and mechanical presses. Defects of processed pieces, Residual stresses. Friction, wear and lubrication of tools in forming processes. Numerical methods for simulating forming processes of solid material and alloy with plastic deformation. Design and construction of cutting and forming molds.

Laboratory Exercises (every 3 weeks of classes): Calculation of the basic parameters of the above forming processes of mechanical pieces with plastic deformation of material.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT
LEVEL OF STUDIES	UNDERGRADUATE

COURSE CODE	KK0803	**SEMESTER**	8th
COURSE TITLE	**Industrial Robotics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Constructions Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Historical overview. Areas of interest and applications of Robotics. Robot structure. Robot categories. Degrees of freedom. Kinematic analysis of spatial mechanisms. Homogeneous transformation matrices. Denavit-Hartenberg method. Solution of forward and inverse kinematics problem of serial robotic mechanisms. Dynamic analysis of spatial mechanisms.

The mechanical part: Degrees of freedom. Geometric shapes of robotic arms. Workspace of industrial robots. Euler and RPY orientation angles. Wrist, Gripper. Gripping mechanisms. Driving mechanisms of robotic systems: Pneumatic, Hydraulic, Electric actuators. DC motors, stepper motors, servo motors: Types, drive-control. Sensors suitable for robotic systems. Coordinated control of joints. Trajectory control of the end-effector. Optimization algorithms (deterministic, stochastic, evolutionary-genetic) of end-effector trajectory, with obstacle avoidance and collision control of intermediate members, optimization of placement position of piece.

Performing laboratory exercises using an industrial robotic arm. Motion control using a controller, offline control in a graphical environment using code, in various coordinate systems (joints, base, end-effector).

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KK0804	**SEMESTER**	8th
COURSE TITLE	**Machine Tools - CIM**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general*	Sector background (Constructions Sector)		

knowledge, skills development	
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Overview of machine tools, Static, dynamic and thermal analysis of machine tools, Constructional elements of machine tools, Motors, Shafts, Controllers- position encoders, Electrical and electronic devices of machine tools, Automatic control systems - Numerical control of machine tools, Systems for holding and loading the pieces to be processed, Diagnostic control of machine tools, Action of machine tools to avoid transmission of oscillatory excitations from and to the environment, Accuracy of CNC machine tools, Accuracy measurements of machine tools according to ISO 230, Standardized tests for acceptance control of digitally guided machine tools.

Production systems with digitally guided machine tools. CIM production systems. Standardized ways of interconnecting components of CIM systems. Placement of machine tools. Cutting tool handling.

Custom-made clamping devices. Transport devices. Principles of assembly systems. Digitally guided measuring machines (CMM). Non-conventional technologies of production systems. Reverse Engineering, Rapid prototyping, Rapid tooling.

Laboratory Exercises (every 3 weeks of classes):

Practice with the use of PC and suitable CAM software in the shaping of mechanical objects with the help of digitally guided machine tools. Automatic creation of machine code from the CAD geometric model. Post-processors. Communication between PC and CNC-Machine tool.

ENERGY SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0801	**SEMESTER**	8th
COURSE TITLE	**Heat – Ventilation – Air Conditioning**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general*	Sector background (Energy Sector)		

knowledge, skills development	
PREREQUISITE COURSES:	Fluid Mechanics, Heat Transfer
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

- Building insulation elements, Calculation and verification of thermal insulation adequacy of structural elements, Insulation materials and their construction applications, Calculation of heat losses and ways to reduce them, Thermal bridges and their calculation, Equipment and devices of heating systems, Energy balance of buildings.
- Description, study and calculations of the basic heating systems. Reference to the modern advanced systems of the above installations with examples of their application.
- Insulation - heating applications and preparation of integrated studies.
- Basic refrigeration cycle with vapor compression, Building air conditioning, air quality elements, thermal comfort and well-being, introduction to air conditioning systems, Psychrometry (states and changes of air), Cooling Load Calculation, Duct Networks, fan selection, Description, study and calculations of the basic air conditioning systems (Central units, semi-central units, split systems, cooling with Fan Coils), Reference to the modern systems of air conditioning installations.
- Solution of numerical problems of a part or whole of small real installations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0802	**SEMESTER**	8th
COURSE TITLE	**Steam Boilers - Steam Turbines & Energy Systems**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:	Thermodynamics I, Heat Transfer, Fluid Mechanics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Course objective: The ability to understand the phenomena related to the production and use of thermal energy and its conversion to work. The energy calculation of the elements that make up the units of production, use and conversion of thermal energy to work. The calculation of the environmental impacts from the production and use of energy.

Course description: The course is implemented through lectures and active participation in solving problems of practice in the laboratory. The topics covered are:

Fundamentals of Engineering Thermodynamics, state variables, states of water and steam, combustion, basic combustion equations, calculations of air supply for combustion, composition of flue gases, carbon dioxide production, environmental impacts from the production and use of energy, fuels, types of burners, description and operation of steam generators, energy balances in heat exchangers and boilers, heat transfer in basic parts of the steam generator, chimney, calculation of dew point of flue gases, steam pipe networks, elements of steam networks, calculation of pressure losses, heat losses, steam traps, condensate networks, constructional elements of networks, water treatment for use in boilers, safety regulations for boiler operation, basic principles of operation of steam turbines, flow calculation in blades, velocity triangles, thermodynamic calculation, action and reaction turbines, calculation of turbine efficiency, power generation cycles RANKINE cycle, energy balances in power generation cycles, calculation of efficiency, methods of improving efficiency, cogeneration of electricity and heat, Brayton cycle, combined cycles, alternative methods of electricity generation, future directions.

In the laboratory the following experiments are carried out on the laboratory device for producing superheated steam up to 400 kg / h and electric power up to 15 kW:

Energy balance boiler, flue gas analysis, heat loss from insulated pipe, energy balance in steam turbine, energy balance in condenser exchanger, calculation of RANKINE cycle efficiency. At the same time the experimental results are compared with the results of the theoretical calculations in order to acquire by the students the perception of the correlation of the physical phenomena with the methodologies of the calculations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0803	**SEMESTER**	8th
COURSE TITLE	**Turbomachinery**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:	Fluid Mechanics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		

IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

- Introduction & Categories of Turbomachines and their use according to their type.
- Reference and analysis of basic parameters of Turbomachines (flow, head, power, efficiency) and their connection with dimensionless numbers. Creation and functionality of characteristic curves of Turbomachines.
- Dimensional Analysis of Turbomachines and use of the laws of similarity in the reduction of the characteristic curves to different number of revolutions and / or machine diameter.
- Presentation and analysis of the special form of the equations of Fluid Mechanics, as they are applied to Turbomachines. Calculation of the various degrees of efficiency of Turbomachines (hydraulic, mechanical, total, etc.).
- Characteristic operating curves of Turbomachines and characteristic curve of network operation and calculation (graphical and mathematical) of their intersection point (operating point).
- Connection of Turbomachines in parallel & in series.
- Theory of Two-Dimensional Blades and velocity triangles of axial and centrifugal Turbomachines.
- Design, operation and use elements of pumps.
- Design, operation and use elements of fans and propellers.
- Design, operation and use elements of compressors.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EK0804	**SEMESTER**	8th
COURSE TITLE	**Techniques & Measurements of Natural Processes**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Sector background (Energy Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Definition and examples of processes. Elements of heat transfer (conduction, convection in steady state) and thermodynamic aids of heat exchangers without phase change. Mass and energy balances. Description, classification, general calculation algorithm of exchanger - regulations and standardization. General description of steam generation boilers - main units. Fuels and their preparation, burners for large steam generation boilers. Radiation heat exchangers - calculation and dimensioning. Energy losses of large boilers and efficiency degrees. Calculation of resistance of closed vessels and their components. Regulations. Mechanical separation processes. Types of filters. Measurement methods in processes and mechanical devices. Handling and calibration of instruments. Pollution measurement.

13.9 9th Semester Courses

MANUFACTURING SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA09E1	**SEMESTER**	9th
COURSE TITLE	**Structures Failure Analysis**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction to failure analysis, Life cycle of a component / machine, Operating time of a component / machine, Definition and objective, Failure investigation process, Categories of failure mechanisms, Basic causes of failures, Techniques and tools for failure analysis, Failure diagnosis tools, Non-destructive tests, Destructive tests, Elements of Fracture Mechanics, Fractography, Microscopic structure analysis with optical and electron microscopy, Macro- and micro-fractography of fracture surfaces- fatigue, Mechanical tests, Chemical analysis, Tests in simulated operating conditions, Corrosion, Interaction of corrosion-fatigue, Hydrogen embrittlement. Liquid Metal Embrittlement, Interpretation of results and terminology, Recommendations, Report of the failure analysis.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA09E2	**SEMESTER**	9th
COURSE TITLE	**Mechanical Design – Optimization**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures,*		**WEEKLY TEACHING**	**CREDITS**

laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits	**HOURS**	
Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)	
PREREQUISITE COURSES:	Mathematics II, CAD I, CAD II, Numerical analysis	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/	

SYLLABUS

MECHANICAL DESIGN

Methods of development and design of products. The criteria of selection and control. Basic principles of calculation. From the initial idea to the construction of a mechanical product.

OPTIMIZATION

Structural optimization. Topological optimization. Schematic optimization.

Objective function and constraints. Mathematical formulation of optimization problems of constructions.

Simple techniques of optimization for functions of one and many variables. Method of direct substitution, method of constrained variations, method of Lagrange multipliers.

Linear optimization problems. The Simplex method. First and second phase. Revised Simplex method. Dual Simplex method.

Nonlinear systems. Methods of optimization of one dimension.

Methods of direct and indirect search. Transformation techniques.

Geometric programming. Dynamic programming. Stochastic programming. Modern methods of optimization.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA09E3	**SEMESTER**	9th
COURSE TITLE	**Electric, Hydraulic & Pneumatic Motion Systems**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g., lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

- Analysis of basic principles and elements of Electrical, Hydraulic and Pneumatic motion systems.
- Design and analysis of the basic Electrical, Hydraulic and Pneumatic motion systems and their respective circuits and examples of them.
- Description and presentation of technologies based on energy transfer through Electrical, Hydraulic and Pneumatic motion systems, comparison of motion and control technologies
- Static and dynamic description of a mechanical motion, characteristics and curves of torque and performance of driving devices,
- Load-motor coupling, description of the concept of transmission, gearbox,
- Motion systems and applications,
- Driving engines, description of structure and functional characteristics of electric, hydraulic and pneumatic motors.
- Regulation and supply devices, power supply circuits of electric motors, rectifying devices and power management devices,
- Pneumatic structural elements. Control of pneumatic systems,
- Basic hydraulic structural elements and circuits,
- Electropneumatic advanced circuits and applications in industry,
- Methods of control of motion systems.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA09E4	**SEMESTER**	9th
COURSE TITLE	**Materials & Environment**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Introduction to Materials Science		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO	NO		

ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

i. Environmental impacts from the use of materials in the atmosphere, soil and subsurface of the Earth and in the aquatic world (oceans, seas, lakes, rivers, etc.).

ii. The various types of pollutants and how they can be significantly reduced by using new techniques of material production and modern materials such as nanomaterials, polymers, etc.

iii. Methods of recycling materials and their applications in the various types of materials.

iv. Studies of environmental impacts of the use of various kinds of materials in the various production processes and applications.

v. Use of materials for reduction and immobilization of environmental pollutants.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA09E1	**SEMESTER**	9th
COURSE TITLE	**Nanotechnology**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Various techniques of Lithography (Optical, Nanoimprint, Electron Beam, X-rays, etc.).
- Processes of fabrication of high-frequency transistors and their applications.
- Methods of fabrication of semi-transparent silicon solar cells with high efficiency.
- Methods of fabrication of various types of sensors and their applications.
- Techniques of deposition of thin nanofilms and coatings and their applications.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA09E6	**SEMESTER**	9th
COURSE TITLE	**Materials & Mechanical Design**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	CAD I, CAD II, Electrical & Mechanical Installations		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

i. The various modern software (Software) design, e.g., SolidWorks and simulation (simulation) for the preparation of the required E/M design studies, the advantages and disadvantages in relation to the materials used and their applications.

ii. Techno-economic methods of design of mechanical products & devices and optimization of the whole production process with emphasis on the quality of production, the safety of work and use of the products produced, with reference to the technical materials used, their properties and their applications.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB09E1	**SEMESTER**	9th
COURSE TITLE	**Computerized Numerical Control (CNC) Machining**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	CAD I, CAD II, Machine Tools - CIM		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO	YES		

ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Theoretical part: Introduction to the programming of machine tools with digital guidance (numerical control), Numerical control systems, Coordinate systems, Interpolation methods of coordinates for the digital guidance of machine tools, Programming language EIA/ISO (G-code), Automatic machining cycles, Tool management and compensation, CLDATA file structure, Post-processors, Communication between PC and digitally guided Machine Tool. Practical Exercises: Learning programming EIA/ISO (G-code) for conducting machining operations of mechanical parts on digitally guided machine tools, performing laboratory applications of turning and milling operations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB09E2	**SEMESTER**	9th
COURSE TITLE	**Mechatronics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Mechatronics: subject matter, content, purpose

Mechatronic System: model, information and energy flow, the interfaces.

Functional Subsystem: systems architecture, task management, time and ports

Communication: general structure, serial communication (asynchronous, SPI, I2C), examples of serial communication

Sensors: general structure, digital sensors, analog sensors, examples of sensors

Actuators: general structure, binary actuators, analog actuators, examples of actuators (AC/DC motors, stepper motors, servo motors, BLDC, PMSM, linear motors, hydraulic systems)

Programming: program structure, processing (code, comments), library element management, in

programming languages C++ and Python (Arduino and Raspberry).

Applications of mechatronics of mechanical interest (production, quality control, vehicles and automotive industry), Intelligent control of mechatronic systems (hierarchical, hybrid, fuzzy and neural control).

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB09E3	**SEMESTER**	9th
COURSE TITLE	**Finite Elements II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Mechanics II, Finite Elements I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Methods of exchanging geometric and technological data between CAD and CAE systems. Checking and creating topology of geometric data in CAE systems. Types of finite elements. Creation of 3D finite element mesh and mesh quality control. Definition of boundary conditions and loads. Forms of analysis with the finite element method (static, dynamic, thermal, combined, linear & non-linear). Applications of finite element systems for stress and strain analysis. Analysis of results, optimization of model geometry. Practical Exercises: Application of the modules of the theoretical part through examples and applications of design and optimization of mechanical parts and constructions using CAE systems. (Software ANSYS WORKBENCH).

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB09E4	**SEMESTER**	9th
COURSE TITLE	**Experimental Strength of Materials**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**

	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Mechanics II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Theoretical part:

Analysis of the behavior of materials in the elastic region, in the plastic region and in fracture. Distinction of the behavior of materials between ductile and brittle. Mathematical formulation of the behavior of materials both for the linear/elastic region and for the non-linear region.

Tensile test: Description of tensile device - execution of experiment. Types of tensile diagrams. Determination of characteristic points of diagram and related properties of material for ductile and brittle fracture. Compression test: Description of device, Drawing of diagram, Evaluation of results. Bending test: Critical bending load, evaluation of results. Torsion test: Description of device, Drawing of torsion diagram. Bending test: Measurement of deflections due to bending, evaluation of results. Strain measurement: Measurement of strains and maximum stresses using strain gauges, Hardness measurement test: The Brinell method. The Rockwell hardness test method. Charpy impact test, Fatigue test: Description of methods - execution of experiment and evaluation of results. Non-destructive testing of materials: Description of methods and devices and analysis of results.

Study of the mechanical behavior according to the theory of plasticity (non-linear behavior) of metallic materials/constructions. Calculation of stresses, strains and residual stresses (residual stresses) due to complex loads.

Practical Exercise:

Description of experimental device and procedure for the following tests. Use of experimental data from students, plotting experimental results and evaluation of mechanical properties of materials of respective specimens.

- Tensile test
- Compression test
- Bending test
- Torsion test
- Bending test
- Hardness measurement test
- Charpy impact test
- Fatigue test
- Non-destructive testing of materials

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB09E5	**SEMESTER**	9th
COURSE TITLE	**Mechanics of Composite Materials**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Mechanics II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Definition of composite materials, phase components, classification, Ashby diagrams, application areas, SWOT analysis, Matrix materials with emphasis on thermoplastic and thermosetting matrices, Reinforcement - role, important types of reinforcement - construction, modification, characterization, Interface - Interphase: Definition, role, impregnation, adhesion mechanisms, modification methods, Manufacturing technologies with emphasis on composites with polymer matrix (continuous and short fibers, particulate and nanocomposites). Selected other methods for the manufacture of composite materials, Non-conventional composites, Biological composites, Micromechanics of composites (density, mechanical properties, thermal properties, load transfer), Macromechanics of composite materials (elastic deformation, elastic analysis of tensors - layer - multilayer). Nanoporous and lamellar materials. Nanocomposite materials of clays / polymers. Other lamellar materials: graphite, MoS2. Fullerenes. Carbon nanotubes. Inorganic nanotubes.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB09E6	**SEMESTER**	9th
COURSE TITLE	**Reverse Engineering & Rapid Prototyping**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

Definition and historical evolution of Reverse Engineering. Analysis of technologies: Differences - Advantages - Disadvantages. Management of scanned geometry data: Point-cloud, Meshing. Process of reconstructing CAD model based on the physical model using three-dimensional scanning of its geometry. Creation of three-dimensional geometry files with meshing of surfaces, stereolithography format (STL), using optical scanners, laser beam scanners, digital tomography and digitally guided measuring machine (CMM). Methods of reconstructing three-dimensional CAD model and comparing them. Uses of reverse engineering in industrial production and research. Case studies.

Necessity of prototype construction and methods of construction. Advantages of Rapid Prototyping (RP) Methods and their applications. Rapid Prototyping Technologies: Stereolithography (Stereolithography, SLA), Sintering of powders with the help of focused laser beam (Selective Laser Sintering, SLS), Sintering of metallic powders by Laser (Direct Metal Laser Sintering DMLS or Selective Laser Melting SLM), Sintering of powders by spraying resin (3D Inkjet Printing or 3D Printing or Binder Jetting), Sintering of photosensitive resins (Solid Ground Curing, SGC), Deposition of molten thermoplastic filament (Fused Deposition Modeling, FDM), Prototype construction with successive layers of sheets (Laminated Object Manufacturing, LOM). Rapid Tooling Construction (molds and dies) with direct and indirect technologies of Rapid Tooling Construction (Rapid Tooling, Investment Casting). Rapid prototyping machines. Case studies.

ENERGY SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA09E1	**SEMESTER**	9th
COURSE TITLE	**Environmental Technology**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

The impacts of human activity on the environment, environmental balance, the concept of sustainable development. Measurement of gaseous pollutants, systems for capturing gaseous pollutants, systems for chemical treatment of gaseous pollutants, applications. Filters, cyclones, absorbers, design of gas purification systems. Methodologies for calculating emissions of gaseous pollutants. Emission factors. Emissions of pollutants from stationary combustion sources: Electricity generation, industry, small combustion sources (crafts, central heating). Emissions of pollutants from road transport: Road transport emissions and related vehicle technologies, application of COPERT 4 software, scenarios for reducing carbon dioxide emissions from transport, electric, hybrid vehicles, use of biofuels. Emissions of pollutants from other transport: air transport, trains, shipping, machinery and vehicles "off-road". Liquid waste and main causes of production. Treatment of liquid waste, biological treatments, aerobic and anaerobic treatment systems. Solid waste and main causes of production. Measurement of solid waste, systems for retention and cleaning of solid waste, systems for chemical treatment of solid waste, applications. Landfills, thermal treatment of waste. Recycling. Principles of recycling, waste management systems.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA09E2	**SEMESTER**	9th
COURSE TITLE	**Industrial Refrigeration and Cooling**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Thermodynamics I, Heat-Cooling-Climate		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction to the basic concepts and arrangements of Industrial Refrigeration.

• Refrigeration theory, Refrigeration cycles and arrangements, Basic calculations in theoretical and real cycle,

• Refrigeration units with mechanical compression of saturated vapor, Effect of evaporation and condensation temperature and pressure, Calculation of refrigeration cycle efficiency coefficient, COP, Calculation of refrigeration power and compressor power.

• Description of the operation of refrigeration cycle arrangements, Evaporators, Compressors, Condensers, Heat exchangers.

• Optimized refrigeration cycle with mechanical compression of vapors, Use of heat exchangers for subcooling - superheating of saturated vapors.

• Refrigerants and Refrigerant Mixtures, Assessment of their thermodynamic and environmental behavior, Presentation of properties and characteristics of CFCs, HCFCs, HFCs, zeotropic and azeotropic mixtures, inorganic refrigerants, Coding of refrigerant nomenclature

• Direct and indirect cooling systems, Secondary refrigerants.

• Cooling with two working media, Absorption and steam injection refrigeration units.

• Description of the operation of combined refrigeration cycles, Refrigeration devices of two-stage and multi-stage compression.

• Solution of numerical problems of a part or whole of small real installations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA09E3	**SEMESTER**	9th
COURSE TITLE	**Flow Networks**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Fluid Mechanics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Course objective: To acquire the basic knowledge and skills to study and calculate flow networks with

applications in industry and the domestic sector.

Course description: The course is implemented through lectures, active participation in solving practical problems, and implementation of projects with practical dimension.

The subjects covered are:

Description of flow networks, materials and components, pressure losses, Reynolds number, Moody diagram, approximate relations, pressure losses in incompressible flow, application to fire-fighting networks, gas networks, pressure losses in compressible flow, application to natural gas networks, regulation of internal installations of natural gas distribution, thermal loading, duct networks, hydraulic diameter of conduit, fans, application to air conditioning duct networks.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA09E4	**SEMESTER**	9th
COURSE TITLE	**Computational Methods in Fluid Dynamics & Heat Transfer**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Numerical Analysis, Fluid Mechanics, Heat Transfer		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Course objective: To acquire the basic knowledge and skills to study and calculate flow networks with applications in industry and the domestic sector.

Course description: The course is implemented through lectures, active participation in solving practical problems, and implementation of projects with practical dimension.

The subjects covered are:

Description of flow networks, materials and components, pressure losses, Reynolds number, Moody diagram, approximate relations, pressure losses in incompressible flow, application to fire-fighting networks, gas networks, pressure losses in compressible flow, application to natural gas networks, regulation of internal installations of natural gas distribution, thermal loading, duct networks, hydraulic diameter of conduit, fans, application to air conditioning duct networks.

• Transport equation: reference to the mechanisms of conduction, diffusion and source. Presentation

of Navier-Stokes equations (continuity and momentum) and energy and explanation of the different terms.

• Brief presentation of Numerical Analysis. Solution of algebraic systems. Linearization of algebraic equations. Numerical error.

• Approximation of derivative with Taylor series. Forward, backward and central differentiation. Truncation error.

• Discretization, computational grid and boundary conditions.

• Industrial application of Computational Fluid Dynamics with demonstration of real implemented projects.

• Examples of flow cases with solution in excel or in commercial package of Computational Fluid Dynamics:

• One-dimensional, steady heat transfer in a rod (solution with calculations and in Excel):

• One-dimensional, unsteady cooling/heating (point) body (solution with calculations and in Excel).

• Solution in Excel with trial-and-error of the combustion equation of hydrocarbons of type CαHβOγ with air. The calculations will take into account a given over-stoichiometric ratio λ, the temperature of the oxidizing air and the variation of the heat capacity of the gases with temperature to calculate the content of the combustion gases and the adiabatic combustion temperature.

• Solution of two-dimensional boundary layer, laminar and turbulent flow, with negative and positive pressure gradient, detachment and reattachment.

• Solution by Runge-Kutta method of a suitable problem (e.g., particle trajectory within a given fluid flow) with excel.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA09E5	**SEMESTER**	9th
COURSE TITLE	**Transport Phenomena**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Fluid Mechanics, Heat Transfer, Thermodynamics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

• Definition of the phenomena of mass, heat and momentum transfer.

• Molecular transport and transport coefficients as physical properties of fluids.

• Generalized balance and the concepts of production/destruction, accumulation/removal.

• Transport by conduction. Reference to turbulent flow and its effect on transport, compared to laminar flow.

• Integral analysis of balance with examples. Methods of analysis, dimensionless numbers and their significance.

• Application of transport analysis to mixing.

• Application of transport analysis to steady flow in conduits.

• Application of transport analysis to bodies within the flow.

• Application of transport analysis to unsteady flow in conduits.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB09E1	**SEMESTER**	9th
COURSE TITLE	**Gas Turbines & Aero-engines**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Fluid Mechanics, Heat Transfer, Thermodynamics I		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction, basic concepts and operation elements of gas turbines and aircraft engines.

• Description, operation analysis and thermodynamic cycle analysis of gas turbines and aircraft engines.

• Theoretical cycles, Efficiency degrees, Real cycles.

• Description of industrial gas turbines and aircraft engines, Types, uses and operating principles.

• Description of basic arrangements of aircraft engines (turbojet, turbofan, turboprop) and thermodynamic cycles for various applications. Design and development of modern propulsion engines.

• Analysis of the design and use of the various elements of the turbomachines.

• Presentation of the operation of gas turbine and aircraft engine elements, Compressors (types and their basic characteristics), Combustion Chambers, Turbines (types and their basic characteristics), Gas turbine blades.

• Presentation of technological limits of the various types of engines. Assessment of the thermomechanical resistance of aircraft engines, Cooling of turbine blades.

• Optimization of thermodynamic cycles of gas turbines and aircraft engines, Cycles with reheating, intercooling, regeneration, Use of heat exchangers in gas turbines and aircraft engines.

• Study of design interventions that optimize the construction and operation of gas turbines and aircraft engines.

• Presentation and analysis of future design innovations and interventions.

• Variations and complex-combined installations and arrangements.

• Presentation of construction materials for gas turbines and aircraft engines.

• Presentation of fuels for industrial and aviation gas turbines, Pollution production from gas turbines and aircraft engines,

• Solution of numerical problems of a part or whole of small real installations.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB09E2	**SEMESTER**	9th
COURSE TITLE	**Electric Systems in Industry**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Electric Engines, Electrical Technology & Electronics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction - Basic principles of design and operation of electrical installations

Regulations & Standards of electrical installations

Safety of electrical installations and accident prevention

Characterization of installations and operating environment

Insulated conductors and cables

Determination of the cables/lines supplying loads based on thermal loading and allowable voltage drop

Switches and means of coupling and protection of LV

Connection of electric motors to the network and operation (coupling, starting, protection, etc.)

LV installations in industry

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB09E3	**SEMESTER**	9th
COURSE TITLE	**Electric Systems in Renewable Energy Sources**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Electrical Technology & Electronics, Renewable Energy Sources		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction - Basic principles of design and operation of electrical power generation systems from RES

PV technology (semiconductors, photovoltaic effect, PV element)

Devices and components of PV installations

Configuration of PV installation (number of collectors, arrangement, connection of PV collectors, compatibility check with inverter, Single-line and Polyline diagram of PV)

Calculations of PV installation (energy efficiency, wiring, voltage drop check, etc.)

Connection to the Network (coupling means, protection devices, MT substation, etc.)

Grounding and lightning protection

Economic data and evaluation of RES investments.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB09E4	**SEMESTER**	9th
COURSE TITLE	**Advances in Wind Energy**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Thermodynamics, Heat Transfer, Fluid Mechanics, Renewable Energy Sources		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Course objective: The ability to exploit the phenomena related to wind energy, in order to achieve efficient conversion of it into useful work and electricity production. The knowledge of the main parts of the wind energy utilization projects, as well as the basic calculations that concern them.

Course description: The course is implemented through lectures and active participation in solving practical problems. The subjects covered are:

Climatic parameters and their impact on wind energy, density, temperature, barometric pressure, wind measurements, turbulence, wind turbine categories according to standards, e.g., IEC61400, calculation of annual generated energy, shading models of wind turbines, shading loss calculations, offshore wind farms, offshore wind potential.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB09E5	**SEMESTER**	9th
COURSE TITLE	**Advances in Solar Power**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Heat Transfer, Heat-Cooling-Climate		

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

• Basic Principles of Solar Radiation and Geometry. Introduction to the characteristics of the solar radiation spectrum. Effect of the relative position of Sun - Earth on the intensity of solar radiation. Types of solar radiation (direct, diffuse, background). Methods for calculating the different forms of solar energy. Main gases of the atmosphere and their significance. Instruments for measuring solar radiation and its spectral distribution.

• Optimal inclination and orientation of surfaces for the exploitation of solar radiation. Techniques for maximizing - minimizing solar energy on surfaces of different orientations for instantaneous, seasonal or annual use.

• Conversion of Solar Energy directly into thermal - Solar Collectors of low and medium temperatures. Solar Ponds. Solar Flat Collectors. Solar Vacuum Collectors. Materials for collector construction. Calculation of instantaneous efficiency of solar thermal collectors (ISO9806-1). Concentrating Collectors

• Systems of Solar Thermal Systems of Low and Medium Temperatures. Solar Systems for Domestic Hot Water Production. Solar Systems for Space Heating and Domestic Hot Water (Combi). Solar Air Conditioning Systems (Combi+). Heat Storage

• Sizing of Solar Thermal Systems of Low and Medium Temperatures. The method of f curves. Introduction to dynamic sizing of solar thermal systems (TRSNYS - SAM)

• Conversion of Solar Thermal Energy into electrical - Solar Collectors of high temperatures. Introduction to concentrating systems. Trough systems - troughs. Fresnel systems. Central Tower systems. Solar Furnaces. Stirling systems. Rankine systems.

• Solar Thermal Systems for industrial/chemical processes. Conversion of Solar Energy into electrical - Photovoltaic Conversion. Introduction to semiconductor physics. p-n diode. Current-voltage characteristic curve of a p-n junction. Photovoltaic phenomenon. Electrical characteristics of photovoltaic element. Materials.

• Technologies of photovoltaic cells. Effect of temperature on the electrical characteristics of the photovoltaic element. Ways of connecting photovoltaic elements. Photovoltaic frames - nominal power, - standard operating conditions - efficiency and factors affecting it

• Photovoltaic Systems. Photovoltaic systems, characteristics, categories and composition. Stand-alone systems - coverage of daily energy requirements. Array efficiency - utilization factor. Types of Inverters. Storage and management of electric power from photovoltaic systems

• Electric accumulators and their characteristics. Determination of stand-alone system and energy cost. Sun tracking systems

• Sizing of Photovoltaic Systems. Dynamic simulation of pv systems (TRNSYS - SAM - PVSOL)

• Economic Analysis of Solar Systems - Net Present Value

• Environmental Analysis of Solar Systems - Life Cycle Analysis

• Integration of Solar Energy Conversion Systems into Buildings

13.10 10th Semester Courses

MANUFACTURING SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA10E1	**SEMESTER**	10th
COURSE TITLE	**Advanced Materials**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Introduction to Materials Science, Materials Technology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

i. Modern advanced processes for the production or preparation of advanced materials, e.g. powder metallurgy, sintering, foams, etc., their advantages and disadvantages and their applications.

ii. The different types of advanced materials (biomaterials, porous materials, composite materials, etc.) and how they can significantly contribute to the improvement of the mechanical strength of engineering structures, as well as other important properties, e.g., resistance to oxidation and corrosion, heat, etc. Applications in surgery, prosthetics and general modern medicine, in reducing emissions of various harmful environmental pollutants and other applications.

iii. Composition and structure of advanced materials and how they affect their properties.

iv. Modern methods of dealing with the defects that various advanced materials present, e.g. cracks, discontinuities, inclusions, pores, heterogeneities, lack of repeatability and isotropy, etc.

v. Modern methods of optimizing the properties of advanced materials, such as, e.g., in terms of surface and thermal treatments.

vi. Modern methods of testing the properties of various advanced materials, e.g., repeated impact method (impact testing), nanoindentation methods, X RAY Tomography, etc.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA10E2	**SEMESTER**	10th
COURSE TITLE	**Tribology – Lubricants**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

• Description of surface techniques and their tribological properties.

• Contact of bodies, Stribeck pressure, Hertz pressure, elastic deformation, developing stress field below the surface.

• Phenomena during the relative motion of cooperating surfaces, theories of dry friction, developing temperature field. Wear.

• Tribological properties of materials.

• Liquid lubricants, viscosity, grease.

• Failures of tribological systems.

• Hydrodynamic, elasto-hydrodynamic and thermo-elasto-hydrodynamic lubrication. Application to sliding, rolling, gear bearings. Lubrication systems.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA10E1	**SEMESTER**	10th
COURSE TITLE	**Modern Welding Technologies**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)
PREREQUISITE COURSES:	Casting - Welding
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

i. Modern advanced processes for the manufacture of welded materials, their advantages and disadvantages and their applications.

ii. Energy sources, e.g., electric, chemical (combustion of gas mixture), mechanical, etc., used in modern advanced processes for the manufacture of welded materials, their advantages and disadvantages and their applications.

iii. Modern methods of dealing with the residual stresses that remain inside the welded materials after the completion of the welding process.

iv. Modern methods of dealing with the defects that occur in the welds, e.g., cracks, discontinuities, inclusions, pores, etc.

v. Modern methods of non-destructive testing of the defects that occur in the welds, e.g., by ultrasound, electromagnetic fields, etc.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA10E4	**SEMESTER**	10th
COURSE TITLE	**Thermal & Surface Metal Treatment**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Materials Technology, Casting - Welding		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

i. Results of thermal and surface treatments of metallic materials.

ii. Mechanical surface treatments - Methods of application - Uses.

iii. Thermal surface treatments - Types - Applications.

iv. Coatings - Coatings: types, methods of application, uses.

v. Quality control of the results of thermal and surface treatments.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KA10E5	**SEMESTER**	10th
COURSE TITLE	**Dynamics of Systems**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Mathematics I, Mathematics II, Mathematics III,		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

i. Fundamental concepts of Dynamic Systems. Review of basic mathematical tools. Principles of mathematical modeling. Macroscopic models of processes. Dynamic behavior of typical processes. First-order systems. Connections of first-order systems. Second-order and higher-order systems. Systems with time delay. Mathematical methods of analysis of dynamic systems. Analysis of linear systems in the state space. State description of linear systems and calculation of the response with the method of the exponential matrix. State variable transformations. Input/output behavior in the time domain. Serial and parallel connection of linear systems under state description. State feedback and output feedback. State description of the closed-loop system. Controllability and Observability of Dynamic Systems. Analog state feedback, selection of gains for prescribed closed-loop eigenvalues. State estimation and state observers. Asymptotic stability of linear systems. Solution of linear differential equations with the method of Laplace transform. Transfer function. Poles and zeros. Input/output stability. Calculation of frequency response. Bode diagrams. Linearization of nonlinear dynamic systems. Local asymptotic stability. Lyapunov method. Control systems with feedback. Block diagram of control system. Block diagram reduction. Transfer functions of closed-loop systems. State description of closed-loop system. Analysis and design of control systems. Steady-state error - significance of

integral action. Sensitivity function. Stability analysis of closed-loop system. Algebraic stability criteria. Routh-Hurwitz stability criterion. Graphical Stability Criteria. Nyquist diagram. Nyquist stability criterion. Bode Stability Criterion. Gain and phase margins. Root locus diagram. Calculation of performance criteria for control systems and optimization.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB10E1	**SEMESTER**	10th
COURSE TITLE	**Analysis & Synthesis of Mechanisms**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Introduction to mechanisms: kinematic pairs, mechanism members, degree of freedom of mechanism.

Kinematic analysis of planar mechanisms: graphical and analytical methods for determining position-velocity-acceleration of mechanism members. Determination of forces and moments of planar mechanisms, calculation of frame stresses.

Mechanisms with four members, Mechanisms with toothed wheels, Mechanisms with guide curves, Mechanisms of periodic discontinuous transmission.

Computational analysis of mechanisms and simulation of their kinematic behavior, Design of mechanisms using CAD software, kinematic modeling of mechanism, analysis of kinematics and calculation of position-velocity-acceleration, optimization of geometry and orbital position, applications to classical and special mechanisms.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB10E2	**SEMESTER**	10th

COURSE TITLE	**Optimum Product Development**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	CAD I, CAD II, Industrial Robotics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Data collection for products under development. Market research. Product design requirements (functionality, cost, durability, ergonomics, aesthetics). Determination of alternative design solutions and their evaluation. Impact of processes and production methods on design and selection of the optimal design solution. Product modeling using solid and surface geometries, implementation of design requirements and design constraints. Support of the design, analysis and construction phases by CAD, CAE, CAM systems and experimental evaluation. Product life cycle and production cost. Intellectual property protection. Product and production methods optimization with criteria of cost, safety, strength, weight, life cycle using multicriteria objective function.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB10E3	**SEMESTER**	10th
COURSE TITLE	**Industrial Measurements – Machine Diagnostics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	Electromagnetism, Control Automation		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

The theoretical part of the course includes:

- Introduction to sensors and measurement and control systems, measurement systems, open and closed loop control systems.

- Characteristics of sensors and measurement systems (accuracy, errors, calibration, dead zone, slip, hysteresis, time, operating range, linearity, reliability, response, resolution, sensitivity).

- Signal adjustment and adaptation with passive circuit techniques: signal adjustment and adaptation, signal adjustment with potentiometer, signal adjustment with Wheatstone bridge, adaptation for maximum voltage transfer, adaptation for maximum power transfer with or without transformer.

- Signal adjustment and adaptation with active circuit techniques I: active circuits, operational amplifier, inverting and non-inverting amplifier, isolator, summing and difference amplifier, instrumentation amplifier.

- Signal adjustment and adaptation with active circuit techniques II: integrator, differentiator, current-to-voltage and voltage-to-current converter, voltage comparator, digital-to-analog converter, analog-to-digital converter.

- Temperature measurement: liquid and metal expansion thermometers, bimetallic thermometer, bimetallic thermostat, resistance thermometer (RTD), thermistor, thermoelectric phenomenon and thermocouple, radiation thermometers, optical filament pyrometer, infrared pyrometer.

- Motion measurement I: Introduction to the measurement of motion parameters (displacement, proximity, speed, acceleration, mechanical stress, weight), linear displacement measurement (clock micrometer, linear potentiometer, linear variable differential transformer - LVDT, variable area capacitor), angular displacement measurement (rotary potentiometer, incremental and absolute optical encoder).

- Motion measurement II: Tachometric generators, proximity measurement (microswitches, variable magnetic resistance sensor, Hall effect sensor, optical proximity sensors), acceleration measurement (seismic mass accelerometer, piezoelectric accelerometer), mechanical stress gauge, weight measurement (load cell, balance scale, spring scale with linear potentiometer).

- Level measurement: level measurement, observation tank, sounding rod, mechanical and electrical float meter, needle of variable capacity and conductivity, ultrasonic meter, bubble meter, level measurement with pressure sensors.

- Display and recording of measurement data: analog display devices, moving coil meter (instrument), resistance meter, moving armature meter, oscilloscope, digital display devices with light emitting diodes (LED) and liquid crystals (LCD).

- Data collection and processing systems I: basic concepts of data collection and processing systems for measurements, transmission systems for measurements, sampling, sampling and holding circuits, multiplexing and multiplexers.

- Data collection and processing systems II: serial and parallel connection of measurement systems with computer, direct connection, IEEE standards and RS232, analog and digital input-output cards, data collection in computer, software tools for data collection in industrial environment of processing and production control.

The laboratory part of the course (every 3 weeks) includes the following exercises:

Study of moving coil instrument (measurement of characteristic elements, extension of measuring scale, implementation of homometer, etc.), Study of temperature sensor characteristics (thermocouple, thermistor, RTD), Study of linear variable differential transformer (LVDT) and strain gauge (mechanical stress gauge), Study of analog-to-digital converters and vice versa (A/D converters), Practical exercises aiming at familiarizing with the Lab-View software tool programming in graphical environment and virtual instruments (virtual instruments), data acquisition cards for measurements (DAQ).

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)			
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	KB10E4	**SEMESTER**	10th	
COURSE TITLE	**Computational Metal Forming**			
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*			**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)			
PREREQUISITE COURSES:	FEM I, FEM II			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/			

SYLLABUS

Introduction to the theory of plasticity. Theory and criteria of yielding, maximum shear stress criterion (Tresca), equivalent stress criterion (von Mises). Concepts of forming and limit strain diagrams. Analysis of forming operations, ideal work method, limit analysis, upper and lower bound methods, slip-line method. Finite element method (FEM), Nonlinearities, geometric nonlinearity, material nonlinearity, Quasi-static analysis, Stereoplastic analysis, Formulation of the Updated Lagrangian method, Calculus of variations in boundary value problems of continuum mechanics, Boundary conditions, friction and contact of surfaces, Heat transfer analysis, Coupled thermomechanical analysis, Finite elements and discretization (Mesh and re-meshing), Solution of systems of nonlinear equations. Development and application of the FEM method in industrial forming applications.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	KB10E5	**SEMESTER**	10th

COURSE TITLE	**Bioengineering**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Manufacturing Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Human body - Geometry and materials: Head, Spinal column, Upper and lower limbs, Bones and musculoskeletal system, Joints and muscles, Respiratory system.

Main mechanisms - kinematics: Motions and displacements of the human body, Kinematics of the joints, Kinematics of the individual elements, Body balance during motion.

Simulation: Kinematic and dynamic analysis of upper and lower limb, Mechanical properties, Determination of the mechanical properties of the elements of the human body.

Deformable body mechanisms: Stresses - strains. Simulation of human body stresses using the finite element method. Simulation of members: upper limbs, spinal column, lower limbs, flow in the respiratory system.

Artificial materials and organs. Medical mechanical constructions. Imaging machines and biomedical machines.

Measurements of biomedical machines: Measurement methods, CT, MRI, Results, File formats, Visualization of measurements, Processing of measurements, Exploitation.

ENERGY SECTOR

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA10E1	**SEMESTER**	10th
COURSE TITLE	**Aerodynamics**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**

Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)	
PREREQUISITE COURSES:	Fluid Mechanics	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES	
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/	

SYLLABUS

- Basic elements of aerodynamics (forces, moments, pressure distribution around airfoil, types of drag).
- Basic characteristics of airfoils.
- Two-dimensional flow around airfoil. Stream function and vorticity. Vortical and irrotational flow, circulation around wing. Derivation of the Navier-Stokes equations and relation between flow deformation and viscous forces (friction).
- Inviscid flow theory and two-dimensional wing theory. The Kutta condition, circulation and vorticity. The thin airfoil theory. NACA 4-digit type airfoils.
- Viscous flow and boundary layer. Laminar flow, transition and turbulent flow.
- Aerodynamics during flight.
- Elements of vehicle aerodynamics.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA10E2	**SEMESTER**	10th
COURSE TITLE	**Multiphase Flows**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory)		4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Fluid Mechanics, Advances in Fluid Mechanics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Types of multiphase flows, continuous and dispersed multiphase flows.
- Interphase forces in continuous phases.
- Interphase forces in dispersed phases.
- Particle size (diameter) distribution.
- Liquid-gas flows in closed conduits.
- Fluid and solid particle flows in closed conduits.
- Flows with immiscible phases.
- Multiphase flows due to phase change (evaporation, boiling, condensation, melting, solidification).
- Applications of multiphase flows:
- Fluidized beds.
- Porous media and filters.
- Spraying and aerosol systems.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA10E3	**SEMESTER**	10th
COURSE TITLE	**Advances in Heat Transfer**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Heat Transfer		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Use of numerical methods of finite differences and finite elements in combined heat transfer problems for steady and unsteady conduction.
- Analytical and semi-analytical solutions of problems in specialized cases of heat transfer.
- Extraction of specialized correlations of heat transfer by conduction in special heat exchanger arrangements.
- Heat transfer in liquid metals and secondary working fluids in energy systems with increased

operating requirements.

- Analysis of innovative devices and elements of heat transfer optimization.
- Thermo-fluid mechanical analysis of heat transfer systems, evaluation of their performance and optimization in modern industrial applications of Mechanical Engineer and combined problems.
- Development of computational tools for the calculation of heat transfer in special applications of Mechanical Engineer.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA10E4	**SEMESTER**	10th
COURSE TITLE	**Combustion**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Thermodynamics I, Thermodynamics II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Combustion thermodynamics: Mass conservation and stoichiometry of mixtures, energy conservation in chemical reactions, Gibbs free energy, chemical potential and chemical equilibrium, combustion temperature. Chemical kinetics: Elementary reactions, propagation and branching, reaction rate, reaction rate constant, partial equilibrium and steady state, reversible and chain reactions, explosive limits, combustion mechanisms of various fuels, kinetics of pollutant formation. Transport phenomena: Kinetic theory of gases, flow quantity, dimensionless numbers, conservation equations, diffusion. Reactors: Constant volume, constant pressure, perfect mixing, plug flow. Premixed laminar flame: Laminar flame structure, flame propagation speed (Mallard and Le Chatelier), factors affecting the speed and thickness of the flame, extinction and ignition phenomena, stability limits. Diffusion flames: Damkoehler number, equivalent ratios, diffusion laminar flame structure, characteristic quantities.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT

LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EA10E5	**SEMESTER**	10th
COURSE TITLE	**Design of Elements for Thermal Turbomachines**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Energy transfer in thermal turbomachines with emphasis on gas turbines
- Aerodynamic-Thermodynamic interaction
- Three-dimensional velocity triangles with emphasis on axial turbomachines
- Design and performance prediction of axial flow turbines
- Design and performance prediction of axial flow compressors
- Design methods of radial flow thermal turbomachines
- Heat transfer by conduction in the cooling of thermal turbomachine blades
- Design of gas turbine blade cooling systems
- Heat exchanger design for thermal turbomachines
- Gas turbine start-up and control system principles
- Combustion systems

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB10E1	**SEMESTER**	10th
COURSE TITLE	**Buildings Energy Assessment**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		

PREREQUISITE COURSES:	Heat – Ventilation – Air Conditioning
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/

SYLLABUS

- Analysis of basic principles governing the energy behavior of buildings.
- Thermal energy losses in buildings. Thermal insulation.
- Use of computational tools with the aim of designing low-energy buildings for heating, cooling and lighting.
- Adaptation of the building to the built and natural environment.
- Thermal protection of the shell and utilization of the shell's thermal capacity.
- Dimensioning of openings
- Solar gains.
- Natural and artificial lighting.
- Ventilation.
- Optimization of ventilation, natural cooling and solar protection as means of reducing cooling requirements.
- Alternative heating and cooling options, with integration of RES systems into the building envelope.
- Updated legislation with analysis and interpretation for new and existing buildings.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB10E2	SEMESTER	10th
COURSE TITLE	**Processing & Management of Solid Waste**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

Specifications of environmentally friendly and economically sustainable solid waste management systems and the role of mechanical engineering in them. Solid waste: Origin and production, qualitative and quantitative characteristics, prevention, reduction, reuse. Treatment technologies and management practices: Waste transport, collection, transfer. Recycling, sorting methods, mechanical systems for separation and transport, examples of processes. Mechanical-biological treatment, anaerobic digestion and co-production of energy and secondary resources. Sanitary landfill, specifications, recovery and energy utilization of biogas. Thermal treatment: Furnace and process technologies, energy utilization, flue gas cleaning, residue management. Treatment of toxic waste. Decision making tools and their applications for solid waste: Life cycle analysis, multi-criteria analysis, geographic information systems, carbon footprint, material flow analysis.

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB10E3	**SEMESTER**	10th
COURSE TITLE	**Medium & High-Power Electrical Substations**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Electric Engines, Electrical Technology & Electronics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Introduction - Electric Power Systems
- MV Networks / Equipment for Coupling and Protection of the MV Network
- Time-current characteristics of the protection means
- Standardized MV supplies
- The Power Transformer (M/S)
- Materials and Devices of M/S MV
- Grounding in consumer substations MV
- Protection of M/S MV against overvoltages
- MV invoices, Calculation of Electric Energy Cost of Industrial Consumer

- Power Factor Correction
- Economic comparison of technical solutions

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	EB10E4	**SEMESTER**	10th
COURSE TITLE	**Electric Energy Storage & Demand Management**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Renewable Energy Sources, Electrical Technology & Electronics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Transformation of Electric Power Systems
- The need for electric energy storage
- Classification of electric energy storage methods
- Pumped storage, Flywheels, Compressed Air Systems
- Supercapacitors and Superconducting Magnetic Systems
- Batteries
- Hydrogen / Synthetic fuels
- Storage and electricity markets
- Economic evaluation of investment in energy storage systems
- The need for Demand Management
- Programs & Applications of Demand Management - Economic evaluation
- Smart Meters - Electric Vehicles - Smart Homes - Smart Grids

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT
LEVEL OF STUDIES	UNDERGRADUATE

COURSE CODE	EB10E5	**SEMESTER**	10th
COURSE TITLE	**Power Electronics & Applications**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Tutorials (Theory)	4	5
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized knowledge (Energy Sector)		
PREREQUISITE COURSES:	Electric Engines, Electrical Technology & Electronics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://elearning.cm.ihu.gr/		

SYLLABUS

- Introduction to Power Electronics: Power electronics technology, relation with other scientific fields
- Structure, characteristics and basic operating principles of the main semiconductor switching power devices (Power diodes, Thyristor, BJT, MOSFET, GTO, IGBT,...).
- Classification and basic operating principles of power electronic converters
- Circuits of uncontrolled rectifier devices (using power diodes): Topologies of single-phase and three-phase rectification.
- Controlled converters (using Thyristor): Topologies of single-phase and three-phase fully controlled converters, voltage and current waveforms, calculation of active and reactive power.
- Alternating current to alternating current converters: AC regulators with anti-parallel thyristors, cycloconverters.
- Direct current to direct current converters: Basic topologies of direct current to direct current converters (buck, boost).
- Direct current to alternating current converters: Topologies of single-phase (half-full bridge) and three-phase switching type inverter.
- Principles of Fourier analysis and calculation of harmonic components. Spectrum design. Calculation of active/reactive power, RMS value, total harmonic distortion and application to alternating current converters.

13.11 Diploma Thesis

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	0901 & 1001	**SEMESTER**	9th & 10th
COURSE TITLE	**DIPLOMA THESIS I & II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Average Individual weekly employment		30	15 + 15 = 30
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Annual (9th & 10th semester), Compulsory Course		
PREREQUISITE COURSES:	Depend on the Sector selected		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://mech.ihu.gr/courses/diplomatiki		

SYLLABUS

The Diploma Thesis is a compulsory course of the 5-year Study Program of the IHU Department of Mechanical Engineering, with a total duration of two (2) semesters, that is, it is carried out during the 9th AND 10th semester of studies. It is an original work, which is the product of bibliographic research and / or field research and concerns the application of the knowledge acquired in each Direction - Specialization.

The purpose of the Diploma Thesis is to familiarize students with the research process and to deepen the cognitive subjects of each Direction - Specialization, it is carried out under the supervision of the teaching staff of the Department. The Diploma Thesis is a basic obligation for obtaining the Diploma of the 5-year Study Program of the IHU Department of Mechanical Engineering. It is awarded 15 (during the 9th Semester) + 15 (during the corresponding 10th) = 30 (total) ECTS credits, that is, it requires a total workload of 390 + 390 = 780 hours. It is reminded that 1 DM = 26 hours of workload. The preparation of a Diploma Thesis is expected to help each student to develop the skills required to deal with complex studies and applications. More specifically, through the Diploma Thesis, the students are trained in order to:

- Design, plan, monitor, and control the progress of theoretical work or / and field work.
- Identify and use effectively information resources (Greek and international - electronic and not - bibliography).
- To use in combination the knowledge, tools, and techniques that he has been taught in each Direction - Specialization.
- To formulate his views and ideas with completeness and clarity.
- To present and support his findings and achievements in a purely scientific way.

13.12 Internship

GENERAL

SCHOOL	ENGINEERING of IHU (Serres Campus)		
ACADEMIC UNIT	MECHANICAL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	0905 & 1005	**SEMESTER**	9th or/and 10th
COURSE TITLE	**INTERSHIP I & II**		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
	Average Individual weekly employment	40:2 = 20	5 + 5 = 10
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Optional, it concerns Field Exercise that can be carried out during the 9th or / and the 10th Semester		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK - ENGLISH, No Exams are applied		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://mech.ihu.gr/courses/praktiki		

SYLLABUS

The students of the Department of Mechanical Engineering of the International Hellenic University, during their studies, can carry out Fieldwork, as defined by the relevant Undergraduate Program (FEK 2657 B / 01-07-2019). The preparation of the Internship is OPTIONAL and aims at:

The substantial contact of the students with the potential places of employment, with the aim of informing them about the structure and operation of the production or / and service units, for the social, economic & technological factors that affect the working conditions, as well as the active participation of trainees in the processes and methods of production or / and service provision.

The correlation of the theoretical scientific knowledge acquired during their studies with the problems of production.

The creation of a stable bond between the Department of Mechanical Engineering of the International Hellenic University and the relevant Student Potential with domestic and foreign Production, with the aim of creating a two-way relationship.

Specifically, as far as the students of the IHU Department of Mechanical Engineering are concerned, the purpose of their (optional) Internship is field work in the study, calculation, design, development, construction, operation and maintenance of machines, devices and mechanical installations, as well as energy production and management systems. Through the Internship, the students of our Department are expected to become familiar with the work environment, so that they are able to deal with real problems that concern businesses.