Technological Education Institute of Serres

Department of Mechanical Engineering

STUDENTS GUIDE

Academic Year 2011 - 2012

SERRES, JUNE 2011

CONTENTS

PREFACE

This guide outlines the curriculum of the Department of Mechanical Engineering for the academic year 2011 - 2012, providing at the same time an overview of the structure and the action of the Department. The information contained in the study guide make it a valuable resource for students of the Department. Especially for first-year students, we hope that this guide will provide the means to easily familiarize themselves with the academic environment in which they study.

On the occasion of our first contact with them through this study guide, we would like to warmly congratulate them for their selection and admission to the Mechanical Engineering Department of TEI Serres, while welcoming them to this modern and growing tertiary educational institution of our country. We hope that our students-during their studies- experience this institution in a creative way.

Dear Students, we aim at your gaining all the necessary scientific tools -during your studies- for subsequent professional career as accomplished engineers in order to contribute to the technological development of our country and the prosperity of our society. Attending classes, participating in workshops and in all educational activities of the Department of Mechanical Engineering, interacting with your fellow students and collaborating with members of the academic staff, but also intervening creatively in all aspects of our academic community, will make you obtain the necessary scientific knowledge , critical and creative thinking that will help you later in your career.

This study guide will help you learn more about the department where you study and its activities, and will inform you about all the opportunities offered by the Department and the Institution in order to help you organize your studies the best possible way.

Finally, we would like to assure you that all members of the Academic personnel in collaboration with the Scientific and Laboratory Associates of the Department of Mechanical Engineering, and all members of the Technical and Administrative personnel serving there, will support you throughout the whole of your studies. We wish you a good start with power and willingness to work and progress in the new academic year.

The Head of the Department
Kostas KLEIDIS
Assistant Professor

CITY OF SERRES

1.1 Geographical and demographic data

The prefecture of Serres is one of the 7 prefectures of Central Macedonia. Being the eastern side of Central Macedonia, it extends from south of Strymon Gulf till the Greek-Bulgarian border in the north. From the east side, Serres borders with the prefectures of Drama and Kavala, and from the west with prefectures of Thessaloniki and Kilkis. The prefecture of Serres has a 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 west of the mountainline Kerkini - Vertiskos - Kerdylion and east of the mountains Orvilou - Menikio, southeast of Pangee, while to the north, stands the mountain of Lailia. The prefecture of Serres crosses the river Strymon, which stems from Bulgaria and flows into the Strymon Gulf, having its principal tributary Aggitis in the eastern part of the county.

The total of the county is 3,790 square kilometers, which means approximately 4% of the territory of Greece. 41% of the county is agricultural land, which determines the main occupation of the inhabitants of the area. The prefecture of Serres is administratively divided into seven municipalities (Municipality of Serres, Sintiki, Visaltia, New Zihni, Heraclea Amphipolis and Emmanuel Pappas).

1.2 Historical data

The city of Serres, built in one of the most troubled crossroads of Europe, having been crossed by countless armies and peoples, is one of the few cities of the much afflicted Greek area that has managed to maintain uninterrupted from the dawn of history till today. It first appears in city history 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, the Roman Titus Livius calls it Siras. Finally, Stephen of Byzantium wrote: “Siris in Paeonia” and “ Siriopaiones”. The oldest epigraphic monument that still preserves the words: “ Sirraion city” is of the Roman epoch and is now in the Archaeological Museum of Serres. The name Serrai starts to be mentioned from the 5th century DC. The name Siris perhaps derives from the word Sirios, which means sun.

During the 5th century AD, Serres is mentioned as the seat 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 space defined 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 I conquered Serres. A few years later in 1221, the Despot of Epirus, Theodore, received but in 1230, the Bulgarian Tsar John II recaptured Serres. The Bulgarian commander Dragotas was forced to temporarily surrender the city to

the emperor Nicaea John Vatatzi after a sudden attack in 1245, but won it back again in 1345 until it was temporarily conquered by the Turks in 1373 and then 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 and the city suffered more from the activities of the Bulgarians after 1872. In 1912 it was occupied by the Bulgarians, who abandoned on June 29, 1913 before the advancing Greek army, having first burned. Captured again in the first World War by Germans and Bulgarians, and remained to them until 1918, finally freed and has since followed the course of the rest of the country to progress in modern history.

1. DESCRIPTION OF THE T.E.I. OF SERRES

2.1 General Information

In 1983, the TEI of Serres was founded initially with two Faculties. One was the Faculty of Applied Technology to which the Department of Engineering is integrated. The TEI of Serres belongs to the Greek Tertiary Education System and is integrated to the Technological Sector of higher Education. It is a state Institute which is self-governed subject to the state law (1404/1983) as in force after the reform of Higher Education (2916/2001, 3549/2007) and to the internal regulation while it materializes every Greek citizen's right to free education.

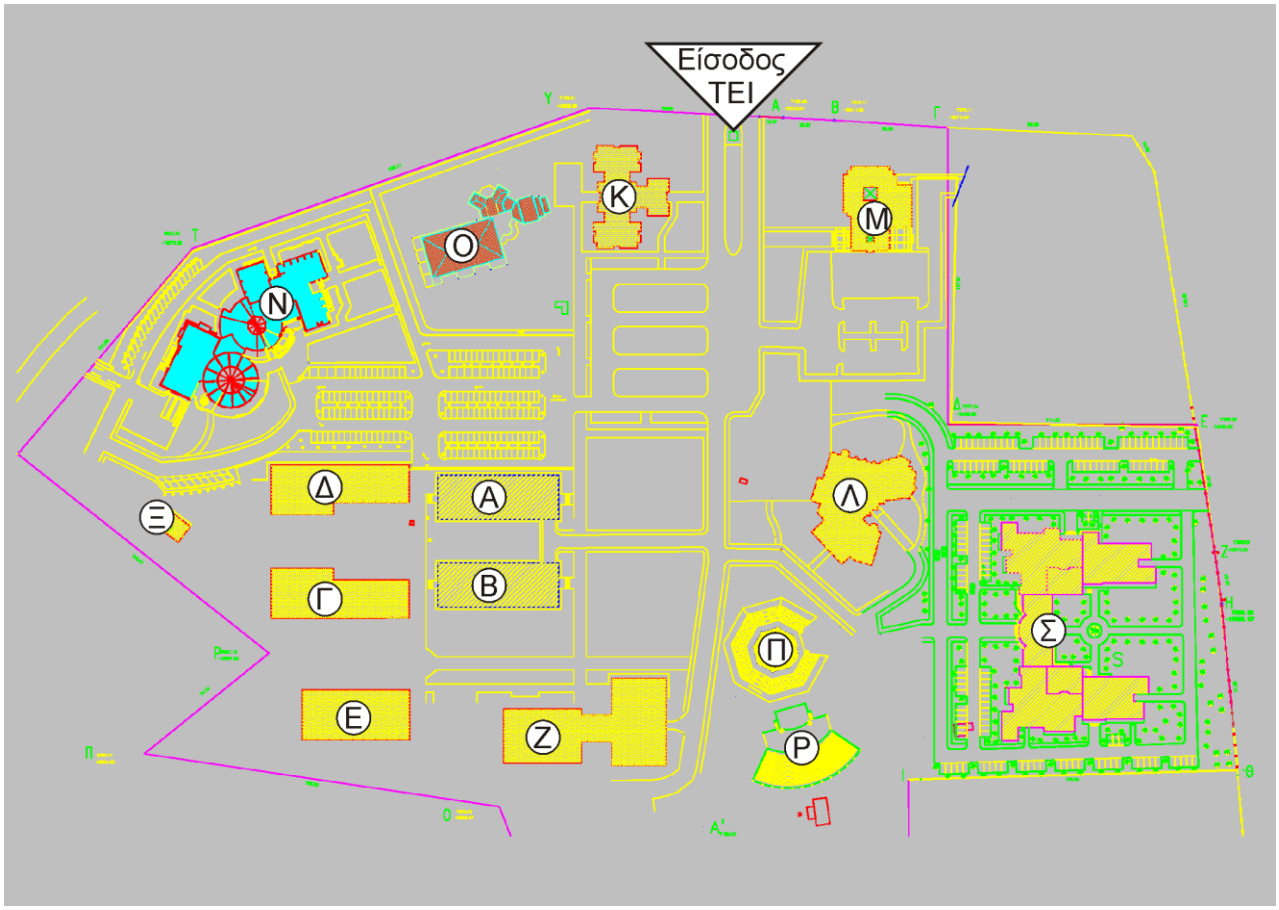
In September 1993, the T.E.I. was moved to its new premises which are located southeast of the town center, an independent campus stretching over an area of 82000m2 in modern buildings and a beautiful surrounding.

The building complex of the Institution consists of the following buildings:

1. Two buildings with teaching rooms and four auditoriums (Buildings A, B)
2. Four buildings housing laboratories, two amphitheaters and the Professors' offices (Buildings Γ, Δ, E, Z)
3. A building complex housing the Departments of Information & Communications and Geomatics & Surveying (Building Σ)
4. The T.E.I. Administration Building housing the Secretariats of all Departments as well as the rest of the services (Building K)
5. The Lending Library (Building M)
6. Fully equipped gym (Building Δ)
7. Conference Centre with two auditoriums and a conference room (Building Λ)
8. Auditorium of 1000 seats (Building P)
9. Multipurpose Building (Building O)
10. Student Club (Building N)
11. Canteen (Building Π)

To meet the educational and research needs, the Department of Engineering obtains classrooms and laboratory spaces in buildings B, Γ and Δ.

LAYOUT OF THE T.E.I. OF SERRES



2.2 Structure and Academics

According to law 1404/83 each T.E.I. is subdivided into Faculties, covering a range of related technological fields, so that the coordination which is necessary for the teaching activities and the overall function of the T.E.I is ensured.
The T.E.I. of Serres runs today three Schools, each of which is subdivided into Departments which constitute the basic academic units, cover the cognitive field of a science and lead to the corresponding degree. The Schools with the corresponding departments in the TEI of Serres are the following:

1. The Faculty of Applied Technology (FAT) consists of the following Departments:
   i. Mechanical Engineering
   ii. Civil Engineering (CE)
   iii. Information and Communication Sciences
   iv. Geomatics and Surveying

2. The Faculty of Administration and Economics (FAE) which is subdivided into the following Departments:
   i. Accounting
   ii. Business Administration

3. The Faculty of Fine Arts and Design consists of the Departments:
   i. Interior Architecture, Decoration and Design

The function of all the above mentioned Departments is supported by the Foreign Languages and Physical Education Department of the T.E.I. of Serres.

Each **Faculty** is administered by the Board of Directors and its Director.

The **School Board** consists of:
- The Director of the School
- Heads of departments and
- the students' delegates

The **administration of the Department** is exercised by:
- The General Assembly,
- The Council and
- The Head of Department.

The General Assembly consists of the Educational Personnel members of the Department and students' representatives.
The Board consists of the Head of the Department, the heads of the Sections, a students' representative and a representative of the Special Technical Staff (STS) when discussing matters concerning members of the S.T.S.

The members of the Section are the General Assembly and the responsible section.
The G.A. is composed of the E.P members of the Section and students' representatives.

2. PERSONEEL OF THE DEPARTMENT OF ENGINEERING

The staff of the Department of Engineering is divided into Educational Personnel (E.P.), Special Technical Staff (S.T.S.) and Administrative Personnel (A.P.) with relevant responsibilities. Members of the E.P. of the Department fall into four ranks: Professors, Associate Professors, Assistant Professors and Lecturers and their teaching is supported by temporary teaching staff that is the Scientific and Laboratory Associates.

EDUCATIONAL PERSONNEL **DEPARTMENT OF ENGINEERING**				
s/n	**NAME**	**POSITION**	**SPECIALTY**	**OFFICE TEL.** **Email**
1.	Gkotsis Paschalis	Professor	Applied Mechanics and Dynamics of Mechanical Engineering	2321049203 pkgotsis@teiser.gr

2.	David Konstantinos	Professor	Machine tools-Machining Technology	2321049157 david@teiser.gr
3.	Moisiadis Anastasios	Professor	Lifting and Transportation Machines-Machine Components	2321049270 amois@teiser.gr
4.	Hasapis Dimitrios	Professor	Physics-Thermodynamics	2321049153 dcasap@teiser.gr
5.	Katsanevakis Athanasios	Associate Professor	Energy Systems-Thermal Machines	2321049213 kats@teiser.gr
6.	Pantazopoulos Athanasios	Associate Professor	Computer Science	2321049221 infolab@teiser.gr
7.	Sofialidis Dimitrios	Associate Professor	Fluid Mechanics and Hydrodynamic Machinery	2321049180 sofialidis@teiser.gr
8.	Kleidis Konstantinos	Assistant Professor	Applied Mathematics	2321049219 kleidis@teiser.gr
9.	Themelis Dimitrios	Application Instructor	Electrical Engineer	2321049260 dthem@teiser.gr
10.	Markou Athanasios	Application Instructor	Mechanical Engineer	2321049271 amark@teiser.gr
11.	Moschidis Nikolaos	Lecturer	Msc. Mechanical Engineer	2321049218 nmoschidis@teiser.gr
12.	Stoilas Georgios	Application Instructor	Mechanical Engineer	2321049220 gstoil@teiser.gr

SPECIAL TECHNICAL STAFF **DEPARTMENT OF ENGINEERING**	
NAME	**SPECIALTY**
Evelzaman Ioannis	Engineer-Mechanical
Liousa Xarysoula	Foreman–Chemist
Basios Athanasios	Foreman–Electrician
Parashou Theodoros	Engineer–Mechanical
Tsoutsanis Anastasios	Foreman– Mechanical

ADMINISTRATIVE STAFF **DEPARTMENT OF ENGINEERING**		
s/n	**NAME**	**SPECIALTY**
1.	Papaoikonomou Sofia	Head of Secretariat
2.	Istrafidou-Pouliou Erifili	Secretary
3.	Koulogiannis Christos	Secretary

Address : TEI of SERRES
Department of
Engineering
Magnεsia Terminal
P.O. Box 62124 Serres

Tel. : 23210-49125
FAX : 23210-49285
Email : mech_eng@teiser.gr
http://engineering.teiser.gr/

3. INFORMATION ON THE ORGANIZATION OF STUDIES

4.1 Duration of Studies

The minimum possible duration of Studies is 8 semesters and includes seven semester programs of tuition and the eight semester of elaboration of Practical Training, during which, the Dissertation Project can be fulfilled.

The maximum duration of study may not exceed the minimum number of semesters required to obtain the Degree, according to the indicative Curriculum, increased by 100%. In exceptional cases it is possible by decision of the Assembly of TEI and after of fully justified recommendation of the General Assembly request the Department, and a request application from the Student, to extend the maximum attendance of the applicant, for up to two (2) additional semesters.

Following a written request to the Secretariat of the Department, students have the right to discontinue their studies in the Department of Mechanical Engineering (suspension), for as many semesters (consecutive or not) they want, but not more than 8 semesters. After the interruption of studies, students return to the Department.

4.2 Registration

Students become those who register in the Department of Mechanical Engineering, STEF / TEI of Serres after passing the introductory examinations for higher education, by transfer or by classification (as graduates of other departments or faculties) in accordance with the existing regulations.

The records of the newly imported Students take place within the time limits set each time by the Ministerial Decisions.

For the registration, the student or a legally authorized person shall submit to the Secretariat of the Department the following documents:

1. Application for registration (issued by the Secretariat)
2. Responsible Declaration that the student is not registered in another department or faculty of higher education (provided by the Secretariat)
3. Certified copy of High School Graduation Diploma or Diploma of T.E.E.
4. Access Certificate (for graduates of Unified of General High school)
5. A certified copy of ID card
6. (3) photos

4.3 Statement of courses – Subscription Renewal

About two weeks after the start of each semester, Students must submit a **statement of courses**, which will include the courses of choice to participate in the current semester.

This is done through the Electronic Secretariat of TEI of Serres, using the electronic address (www.egram.teiser.gr).

Students can declare courses with restrictions on teaching hours as described below:

typical semester	**class hours per week**
A΄	Compulsory modules only those of the A' semester
B΄	36
Γ΄, Δ΄, E΄	35
ΣΤ΄	38
Z΄ and more	44

With this statement, each student acquires the right:
- To receive the teaching aids (books, notes, etc.)
- To participate in the examinations of the selected courses.

Students who did not renew their registration for two (2) consecutive or three (3) non-consecutive Semesters, lose the ability to continue studying at the Technological Institute of Serres and are deleted from the records of the Department of Mechanical Engineering.

4.4 Teaching aids

Teaching is supported by relevant text books or notes that are issued free to Students through the online service EVDOXOS (www.eudoxus.gr). Every student by an online selection of courses submitted each semester in the portal system "EVDOXOS" indicates the textbooks they want to receive. In order for the course selection to be realized, the Student access codes are required (username - password) issued to registered students from the Secretariat of the Department and are used for the electronic services of the Institution. The Student enters a central site of the Central Information System (CIS) where he becomes certified. There is informed of the approved course Textbooks of the Department and selects the Textbooks he is entitled to. Then the student receives directly from the CIS an SMS and an e-mail with the PIN, and receives the selected Textbooks at the Book Shop in the basement of the Central Library of TEI working days and hours upon demonstration of the Student Card (Pass).

4.5 Courses of Study

a. **The Studies at the Department** include 40 courses (see Curriculum) and are organized according to:
- The semester courses, which are divided into mandatory, elective compulsory and optional, and
- The direction chosen by the Student.

The mandatory courses are courses which each student must attend.
The elective compulsory courses are courses chosen by students from a list of several courses.

b. **The educational process** of each course includes one or more of the following formats: Theory, Exercises – Acts, Laboratory. The students attend all courses of their curriculum, according to their statement.
If the number of teaching hours is completed in a course (throughout the semester), is for any reason, less than 2 / 3 of the allocated time in the curriculum, then this course is considered not to have been taught. This determination is done at the end of the semester with act and responsibility of the Head of the Department.
c. **Teaching Units:** Each course of the Curriculum of the Department of Engineering is characterized by a number of Teaching Units (TU), which reflect the workload (WL) required to complete an Academic Program goals by each Student.
d. **Course Rating:** The score in all subjects is expressed as a numerical scale of zero to ten (0 - 10), based on the degree of success of five (5).
In particular, for the successful completion of the laboratory course or the laboratory part of a combined course requires the student to be conducted successfully in 80% of exercises completed during the semester. In the last week of the semester, additional laboratory and practical exercises may be carried out for students who have failed or absent for up to 30% of the exercises carried out, until they meet the required rate of 80%, following a decision by the relevant course Sector.
The grade of the laboratory or the laboratorial part of the mixed course is, depending on the nature of the course, the average of all individual grades of exercises that the Student has successfully carried out or the examination grades that are conducted partially or finally in all of the course material of the workshop.
In case of failure in any eventual final examinations there is a possibility of direct final examination in subsequent semesters.
The final grade of the theoretical course or the theoretical part of a combined course, is the grade of the final examination of the course.
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 class, with rates ranging between 0,40 and 0,60 and have a sum of one (1). This allocation is determined by the hours and conditions of teaching and the nature of each part of the course.

4.6 Examinations

As for the courses taught in each semester according to the Curriculum, (Fall or Spring), there is one examination period and one iterative whose duration is three weeks.
In Winter Semester the corresponding examination period takes place after the end of courses of the semester, while the repetitive takes place in September.
In Spring Semester the corresponding examination period takes place after the end of courses of the semester in June, while the repetitive takes place in September.
In these examinations, each Student is eligible to participate in the examinations only for the courses selected and stated at the beginning of the semester.
A student, who has been graded with a degree greater than or equal to five (5) during the first examination period, can't participate in the second repetitive examination period.

4.7 Sectors - Directions

After the Fifth Semester, Students are required to choose the "Direction of Study" they wish to follow, between the courses of the two Sectors:

- Manufacturing Sector, offering Speciality courses, such as: Experimental Strength of Materials, Machine Tools, Lifting and Transportation Machines, Design of Mechanical Engineering Construction, CAD / CAE, Production Systems - Robotics, Foundries Welding, Mechanical Configurations, etc.
- Energy Sector, offering Speciality courses like Industrial Refrigeration, Techniques of Natural Processes, Hydrodynamic Machines, Steam Turbines and Steam Boilers, Internal Combustion Engines II, Heating-Cooling -Air Conditioning II, Computational Methods in Fluid Dynamics and Heat Transfer, Environmental Technology etc.

The choice of the Course Field that the Student wishes to follow is made through a written request, issued by the Secretariat of the Department.

If a student that has already stated to follow a specific Sector, considers a change of direction of Studies, may do so, by a written request to the Secretariat of the Department. With this change, the Student must complete all courses of the chosen Field of Study, while, the courses that may have been completed in the previous Field of Study, are converted into optional and are not taken into account for the final grade and the reception of the Degree.

The two Sectors – directions of Studies refer to specific areas of the cognitive object of the same Department, thus, do not differentiate the professional rights of the Graduate of the Department.

4.8 Practical training

In the global educational system when it is about applied science, a period of placement of students, is provided, in the respective positions of the departments in which they study. As far as TEI, this process has the following characteristics:

- It lasts 24 weeks and (together with the Thesis) it typically staffs the last Semester (8th)
- It is supervised by both a Tactical Member and the enterprise in which the practice takes place, which means leadership and control
- It is institutional, which is evidenced by the insurance to Social Security, but,
- It does not make up for working experience, since it’s part of the course.

1) Purpose of the practical training

The purpose of practical training of students of the Department of Engineering is to practice the study, calculation, design, development, construction, operation and maintenance of machinery and mechanical engineering installations, in general and also production and energy management. Additionally, through practical training, students become familiar with the working environment, within which are obliged to deal (in real time) the real problems that the companies are facing.

Specifically, the Practical Training concerns the following areas:

a) Study (of calculation and design) engine data and total using classical and modern methods using the PC.
b) Study mechanical engineering installations and industrial manufacturing systems.
c) Monitor, organize, control and construct machinery and installations in classical and modern methods using the PC.
d) Operate, monitor, support and repair of damaged machinery and installations.
e) Production organization, quality control and managing units of industrial production.
f) Control of end products and procedures for safe operation, environmental protection and quality assurance.
g) Laboratory measurements and experiments in all areas of specialty.
h) Design, develop, install and operate of power production systems by exploiting renewable sources of energy.
i) Work in laboratories of Higher Educational Institutes.

2) Workplaces for Practical Training

In particular, the Practical Practice can be carried out:
a) In public services, public companies, as well as in companies of public utilities.
b) In private companies producing goods in preference to companies manufacturing mechanical equipment.
c) In private or public laboratories and engineering offices.
d) Generally in companies or production units and / or large size service providers, that have remarkable mechanical equipment or alternative design study activity in the areas of specialty.

3) Practical Training Program

The Supervisor of Practical Training, in cooperation with the responsible Supervising Engineer of each unit or service or company that "hosts" the Practical Training distributes the time of Training in all parts of the unit so that the trainee Student can gain experience covering the greatest possible part of the knowledge areas listed in the first section of the outline. For this purpose, at the discretion of the Committee for Practical Training, it is possible to move Students to different units.

Practical Training of Students of the Department of Mechanical Engineering STEF / TEI of Serres in the profession is compulsory, and is a part of their studies. As mentioned above, the Practical Training is included in the eighth semester, provided that the student has successfully completed (147) hours of the curriculum.

The workplace for the conduct of student Practical Training can be held either in public or private sector, as well as in Technical Institutes and / or businesses within the European Union under the program Leonardo.

In order for the Student to start Practical Training, the relevant application must be submitted to the Secretariat, and if found eligible, the Student receives the relevant documents (announcement of Practical Training, booklet of Practical Training, (3) copies of the Practical Training apprenticeship).

If during the Training the trainees find that they do not deal with subjects of their specialty, they may declare in writing to the officers, who will decide if they need to modify the training.

To complete the Practical Training, the involved Student fills to the Department an application for approval of Practice ,the booklet of Practical Training and stamps of the Social Security Institution (IKA).

The Practical Training of the Students is remunerated in accordance to the existing terms. Currently, part of the fee comes from the ESPA.

4.9 Dissertation Project

Students of the last typical (eighth) semester are required to prepare a Dissertation Project based on the subject that has to do with modern research, production and / or service offering. This work presented before a three-membered Committee, comprising of members of the Education Personnel Department, which decide about its grade. The Dissertation Project is characterized with twenty (20) teaching units (TU).

For the elaboration of the Dissertation Project, if necessary, premises and equipment of the colleges are been used, as well as any necessary financial means of the TEI.

Members of the academic staff of the Department of Mechanical Engineering through the Secretariat of the Department, suggest subjects for Dissertation Projects, which are to be approved (or not) by the respective Sector of Courses (Energy - Construction - Infrastructure) and reported promptly to students.

Common Dissertation Project can be assigned to a group of up to three (3) Students, with simultaneous distribution of work for each student.

To be valid, any delegation of Dissertation Project, students who will undertake the elaboration are required to submit to the Secretary of the Department of the **OUTLINE**, which is countersigned by the supervising Instructor of the Department and approved by the General Assembly of the relevant Sector (Energy - Construction - Infrastructure).

The duration of elaboration of the Dissertation Project cannot exceed four (4) semesters. In case the time limit is exceeded, the student is assigned with a new Dissertation Project topic.

Upon completion of the Dissertation Project, and after the approval of the supervisor, it is submitted through the protocol, to the Department, an application requesting for presentation attached with four copies (hard copies) of the Dissertation Project, and another one in electronic format (CD). This process should take place in at least ten (10) days before the presentation of the Graduate.

If a Dissertation Project is considered incomplete, it is being referred for additional processing, thus, the submission process and the presentation is repeated.

4.10 Graduation Certificate – Detailed Grading (Transcripts) – Direction of Study

All graduates of the Department of Mechanical Engineering STEF / TEI of Serres, receive, without any discrimination the Certificate of Graduation which serves as a copy of the degree and bears the title "Graduate of Mechanical Engineer".

The Direction of Study that each Student followed does not appear in the Certificate of Graduation.
In the Transcript, which can take any alumnus are shown in detail all the attended courses,. From this certificate it is shown the individual Curriculum for each graduate and the Direction that followed.

4.11 Degree Grade – Announcement of Graduate

The score in all subjects is reflected in the numerical scale of zero to ten (0 - 10), based on the degree of success of five (5). All grades are calculated and recorded to the nearest two decimal to the nearest whole number.

The Grade of the Degree is exported to within two (2) decimal places, resulting from the formula:

$$B = \frac{\delta 1\beta 1 + \delta 2\beta 2 + ... + \delta \nu \beta \nu}{\delta 1 + \delta 2 + ... + \delta \nu}$$

where b1, b2, ... Bn is the grades of all courses attended by the student and d1, d2, ... being, the corresponding credits.

The courses include both Practical Training and the Dissertation Project along with the number of credits that correspond.

The Graduate of the TEI of Serres, is designated Graduate, once completed all the necessary requirements (Courses, Dissertation Project, Practical Training), and especially from the date on which the last requirement is submitted via protocol by the Secretariat of the Department.

Grade Classification:

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

4.12 Professional Rights

On the basis of qualifications resulting from graduation, the graduates of the Department of Mechanical Engineering STEF / TEI of Serres can work (primarily) as:

- **Self-employed**, dealing with:

  - Elaboration of engineering studies, such as H/M studies in the premises (buildings, industrial buildings, licensing of industrial facilities, studies-surveillance-implementation)

  - Contractors for technical projects of public and private

- Studies of mechanical manufactures (industrial applications, etc.)

- Technical consultant services to industry (work safety, quality certification, etc.)

- Agents – Craft

- **Employees**, in industry and other businesses. Specifically:

  In Businesses:

  The Department's graduates are working in technical, construction companies, consulting and trading companies, and generally any kind of business requiring technical support.

  In Industry:

  The department's graduates are working in the production process, overseeing the operation of machinery, maintenance of equipment, as well as in areas of Management and Organization, dealing with quality control, sourcing and improving the facilities.

- **Public servants**, in the technical departments of local authorities in the Prefectures and Regions, as well as organizations of the wider public sector, utilities, etc.

- **In Education:**

  - With regard to **secondary education,** this involves teaching in Technical Professional Schools (prerequisite to achieve this is to attend - for an extra year - in ASPAITE).

  - With regard to **higher education**, this involves working in colleges, as Technical Staff, and after taking the Postgraduate Diploma of Specialization may work as Lecturers.

POWERS AND FUNCTION OF SECRETARIAT

The Secretariat of the Department is responsible for academic and administrative issues.

Available to students every working day and only between 11:00 am until 13:00 am, at the secretariat's offices that are in the Administration Building (Building K) ground floor.

Academic issues regard:

- Student Subscriptions,
- Issuing vouchers student ticket (pass),
- Maintaining Student record which includes transcripts, subscription renewals every semester and information concerning scholarships,
- Issuing licenses and certificates,
- Applications for designation of Graduates,
- Forms for Practical Training,
- Compilation of Student record according to their statement of courses, which will include the courses of choice to participate in the current semester,
- Student Deletions that have two consequent non renewals of subscription or three not consequent renewals of subscription,
- Subscription announcements,
- Execution of transfers for beneficiary Students,
- Attendance interrupt requests.

For the registrations, transfers and classifications of the newly imported students in the Department of Engineering apply the following:

The **Subscription Renewals – Statements of Courses** can be done only through the e-secretariat with the beginning of classes every semester for approximately ten days. Every student has his own personal code, taken from the Secretariat of the Department, with which states the courses electronically.

Upon receipt by the Ministry of Education, Lifelong Learning and Religious Affairs, of the successful candidates lists, the **deadline for subscription** in the Department is set which is common to all TEI of the country. The deadline is subversive, which means that being overdue results in losing the right to subscribe. Newcomers subscriptions take place in September.

Between the **1st** and **15th** of **November students must submit the relevant applications for**:

— **transfers** for financial, social, health reasons etc., as well as for students who are members of 3 membered or larger families , according to Law.

— **classification** of Graduates of higher education.

4. AIM OF THE PROGRAM OF STUDY

The Program of Study aims to cover the following sectors of cognitive object of Engineering:

- Obtaining essential background knowledge in the basic courses of Natural and Positive Sciences, so that it's possible to supervise the constant technological development, as well as the assimilation and active attendance in the growth of new technologies,
- Calculation, designing and manufacture of individual elements that composes a mechanical group,
- Technology of used materials in the manufactures, interventions in their structure and their application,
- Technology of weldings,
- Configuration and calculation of systems of distribution of charges,
- Classic and modern methods of processing during manufacturing,
- Methodology of designing and improvement of manufactures,
- Metrication, methods of control of manufactures,
- Qualitative control and manufacturing quality assurance,
- Study and manufacture of mechanical installations in buildings,
- Economical-technical analysis, organize and administrate the constructional and productive processes,
- Study and planning of systems for exploitation of renewable sources of energy,
- Sources of environmental pollution, technologies for environmental protection - pollution control,
- Technology for measuring electric and non-electric magnitudes, in energy systems and environmental studies,
- Planning, manufacture and operation of systems of heating, refrigeration and air conditioning,
- Techniques, development and production improvement of various energy saving products and resolution of relative problems,
- Energy installations designing in buildings and industries,
- Study, operation and maintainance of energy transforming systems,
- thermal and hydrodynamic machines,
- Technology and vehicle dynamics, classic and alternative fuel technology, classic and synthetic lubricants, tribology,
- Inquiring methodology, faculty of collection and data analysis, as well as composing techno-economical studies and complex workarounds,
- Capability of applying the acquired knowledge on suitable practical exercise in working environments.

The content of Study of the Engineering Department, STEF/TEI of Serres, has been formed so as to completely cover the cognitive subject of the Science of Engineering, which in the study concerns the designing, the growth, the manufacture and operation of machinery (and/or installations), as well as production systems and energy management, taking into consideration the economy, social acceptance and respect to the environment.

The Curriculum fully covers the tendency for specialization and deepening in modern cognitive fields by having Infrastructure Direction courses for the study, design, development, manufacture and operation of machinery, devices and industrial production installations, as well as Energy Direction courses, for the operation of production systems and energy management. It also includes courses of Business Administration, Economy, Technical Legislation and Work Safety covering fields that refer to Economy and Business Administration.

The present Curriculum of the Department of Engineering ensures the Graduates with the appropriate cognitive background and the necessary skills needed for a successful professional course. The high percentage of absorbency of the Department's graduates (86%) in the professional field the previous years ensure the aforementioned fact. It is considered certain that the experience of the Department as well as its facilities, that constantly modernize, together with the elements of the new curriculum, will improve even more the view of the Department and the educational work that it provides.

5. PRESENTATION OF THE CURRICULUM

The duration of Study in the Engineering Department is eight semesters. During these semesters, the Studies include theoretical teaching, laboratorial exercises, tutorials, seminars, visiting production areas and elaboration of mechanical studies.

The structure of the Curriculum of the Department falls into three groups of courses:

- The group of Courses of General Infrastructure (CGI), which among others includes Physics, Mathematics, Computer Science etc.
- The group of Courses of Special Infrastructure (CSI), which among others includes Engineering, Materials Technology, Mechanical Design, Machine Elements, etc. and aims to prepare students in key subject areas of Computer Science Engineering.
- The group of Courses of Speciality (SC), that belongs to the Circle of Specialization of the studies of the Department. The Speciality courses are divided into two main directions of study, the **infrastructure** and the **energy sector**.

In the Manufacturing Sector the Speciality Courses that are offered are: Machine Tools, Mechanical Installations, Design, Lifting and Transportation Machines and Welding Techniques.

In the Energy Sector the Speciality Courses that are offered are: Hydrodynamic Machines, Heating-Cooling-Air Conditioning, Steam Turbines-Steam Boilers, Internal Combustion Engines and Renewable Energy.

The curriculum contains the titles and numbers of Mandatory (M) and Compulsory Elective (CE) courses as well as the Teaching Units (TU).

CURRICULUM

1st Semester

s/n	Title	CAT	M/CE	TH	L	PE	HT	WL	TU
1	Mathematics I	CGI	M	3	0	2	5	11	6,5
2	Physics I	CGI	M	3	2	1	6	12	7,0
3	Introduction to Materials Science	CGI	M	3	0	0	3	9	5,5
4	Introduction to Computers and Programming	CGI	M	1	3	1	5	7	4,0
5	Mechanical Design I	CGI	M	1	3	0	4	6	3,5
6	Feasibility Analysis	CAELH	M	2	0	0	2	6	3,5
	Total			**13**	**8**	**4**	**25**	**51**	**30**

2nd Semester

s/n	Title	CAT	M/CE	TH	L	PE	HT	WL	TU
1	Mathematics II	CGI	M	3	0	2	5	11	6,5
2	Physics II	CGI	M	3	2	0	5	11	6,5
3	MechanicsI	CGI	M	4	0	2	6	14	8,0
4	Computer Programming	CGI	M	1	3	1	5	7	4,0
5	Computer aided Design	CSI	M	0	3	0	3	3	1,5
6	Organization and Management of Industrial Enterprises	CAELH	M	2	0	0	2	6	3,5
	Total			**13**	**8**	**5**	**26**	**52**	**30**

3rd Semester

s/n	Title	CAT	M/CE	TH	L	PE	HT	WL	TU
1	Numerical Analysis	CGI	M	2	2	0	4	8	5,0
2	Mechanics II	CSI	M	3	0	2	5	11	6,5
3	Mechanical Design II	CSI	M	1	3	0	4	6	3,5
4	Technology of Mechanical Engineering Materials	CSI	M	2	2	0	4	8	5,0
5	Thermodynamics	CSI	M	3	0	2	5	11	6,5
6	Work Safety and Environmental Protection	CAELH	M	2	0	0	2	6	3,5
	Total			**13**	**7**	**4**	**24**	**50**	**30**

4th Semester

s/n	Title	CAT	M/CE	TH	L	PE	HT	WL	TU
1	Oscillations and Machine Dynamics	CSI	M	2	2	0	4	8	5,0
2	Machine Elements I	CSI	M	3	2	0	5	11	6,5
3	Electrical and Electronic	CSI	M	2	2	0	4	8	4,5
4	Machining Technology I	CSI	M	1	4	0	5	7	4,0
5	Fluid Mechanics I	CSI	M	3	2	0	5	11	6,5
6	Technical Legislation	CAELH	M	2	0	0	2	6	3,5
	Total			**13**	**12**	**0**	**25**	**51**	**30,0**

5th Semester

s/n	Title	CAT	M/CE	TH	L	PE	HT	WL	TU
1	Heat Transmition	CE	M	2	0	1	3	7	4,0
2	Machine ElementsII	CE	M	3	2	0	5	11	6,5
3	Electromechanical Installations	CE	M	2	2	1	5	9	5,5
4	Machining Technology II	CE	M	1	4	0	5	7	4,0
5	Electrical Motors	CE	M	2	2	0	4	8	5,0
6	Internal Combustion Engines I	CE	M	2	2	0	4	8	5,0
	Total			**12**	**12**	**2**	**26**	**50**	**30,0**

6th Semester

s/n	Title	CAT	M/CE	TH	L	PE	HT	WL	TU
1	Heating –Cooling– Air Conditioning I	SM	M	2	3	1	6	10	6,0
2	Industrial Automation	SM	M	3	2	0	5	11	6,5

3K	Machining Processes with digital guidance	SM	M	2	3	0	5	9	5,5
4K	Computational Methods for Construction	SM	M	2	2	1	5	9	5,5
3^{E}	Fluid Mechanics II	SE	M	2	2	1	5	9	5,5
4^{E}	Renewable Energy Sources	SE	M	2	2	1	5	9	5,5
5	1^{o} COURSE OF SECTOR SELECTION	SC	CSI	3	2	0	5	11	6,5
	Total K			**12**	**12**	**2**	**26**	**50**	**30**
	Total E			**12**	**11**	**3**	**26**	**50**	**30**

OPTIONAL COURSES of the MANUFACTURING SECTOR (6^{th} Sem.)									
s/n	**Title**	**CAT**	**M/CE**	**TH**	**L**	**PE**	**HT**	**WL**	**TU**
1	Experimental Strength of Materials	SM	CSI	3	2	0	5	11	6,5
2	Industrial Measurements - Automation Control	SM	CSI	3	2	0	5	11	6,5

OPTIONAL COURSES of the ENERGY SECTOR (6^{th} Sem.)									
s/n	**Title**	**CAT**	**M/CE**	**TH**	**L**	**PE**	**HT**	**WL**	**TU**
1	Industrial Refrigeration	SE	CSI	3	2	0	5	11	6,5
2	Techniques of Natural Processes	SE	CSI	3	2	0	5	11	6,5

7^{th} Semester

COURSES of the MANUFACTURING SECTOR									
s/n	**Title**	**CAT**	**M/CE**	**TH**	**L**	**PE**	**HT**	**WL**	**TU**
1	Machine Tools	SM	M	3	2	0	5	11	6,5
2	Lifting and Transportation Machines	SM	M	3	3	0	6	12	7,0
3	2^{o} COURSE OF SECTOR SELECTION	SM	CSI	2	3	0	5	9	5,5
4	3^{o} COURSE OF SECTOR SELECTION	SM	CSI	3	2	0	5	11	6,5
5	4^{o} COURSE OF SECTOR SELECTION	SM	CSI	2	0	1	3	7	4,5
	Total			**13**	**10**	**1**	**24**	**50**	**30**

OPTIONAL COURSES of the MANUFACTURING SECTOR (7^{th} Sem.)									
3A	CAD/CAE	SM	CE	2	3	0	5	9	5,5
3B	Design of Mechanical Engineering Constructions	SM	CE	2	3	0	5	9	5,5
4A	Production Systems – Robotics	SM	CE	3	2	0	5	11	6,5
4B	Foundries – Weldnings	SM	CE	3	2	0	5	11	6,5
5A	Mechanical Configurations	SM	CE	2	0	1	3	7	4,5
5B	Heat and Surface Treatment of Metals	SM	CE	2	0	1	3	7	4,5

COURSES of the ENERGY SECTOR									
s/n	**Title**	**CAT**	**M/CE**	**TH**	**L**	**PE**	**HT**	**WL**	**TU**
1	Hydrodynamic Machines	SE	M	3	2	0	5	11	6,5
2	Steam Turbines and Steam Boilers	SE	M	3	3	0	6	12	7,0
3	2^{o} COURSE OF SECTOR SELECTION	SE	CE	2	2	0	4	8	5,0
4	3^{o} COURSE OF SECTOR SELECTION	SE	CE	3	2	0	5	11	6,5
5	4^{o} COURSE OF SECTOR SELECTION	SE	CE	2	2	0	4	8	5,0
	Total			**13**	**11**	**0**	**24**	**50**	**30**

OPTIONAL COURSES of the ENERGY SECTOR (7th Sem.)									
s/n	**Title**	**CAT**	**M/CE**	**TH**	**L**	**PE**	**HT**	**WL**	**TU**
3A	Internal Combustion Engines II	SE	CE	2	2	0	4	8	5,0
3B	Electrical Motors II	SE	CE	2	2	0	4	8	5,0
4A	Computational Methods in Fluid Dynamics and Heat Transfer	SE	CE	3	2	0	5	11	6,5
4B	Heating – Cooling – Air Conditioning II	SE	CE	3	2	0	5	11	6,5
5A	Environmental Technology	SE	CE	2	0	2	4	8	5,0
5B	Organization, Management and Implementation of Technical Project	SE	CE	2	0	2	4	8	5,0

8th Semester

s/n	**Title**	**M/CE**	**TH**	**L**	**PE**	**HT**	**WL**	**TU**
1	Practical Training	M					30	10
2	Degree Project	M		4			20	20
	Total						50	30

CGI	Courses of General Infrastructure
CSI	Courses of Special Infrastructure
SC	Speciality Courses
SE	Specialty Courses of the Energy Sector
SM	Specialty Courses of the Manufacturing Sector
M	Mandatory
CE	Compulsory Elective
CAELH	Courses for Administration, Economics, Legislation and Humanities
TH	Theory
L	Laboratory
PE	Practical Exercises
HT	Hours in Total
WL	Workload
TU	Teaching Units

6. COURSE OUTLINE

The courses of each semester and direction of study are being described.
The description of the course uses the following symbols:

(M) Mandatory
(CE) Compulsory Elective (the student must choose between two courses.)
TH for Theoretical teaching Hours per week
L for Laboratory Teaching hours per week
PE Practical Exercise per week (counterbalanced with Theory)
HT for Hours of Teaching in Total of the course per week
TU Teaching Units

1st Semester

Title	**Mathematics I**
Category	**CGI**
Type	**Theoretical**
Hours per week	**5 (3TH+2PE)**
TU/ ΦΕ	**6,5 / 11**
Typical semester	**1**
Course level	**C**

Course purpose: The acquisition of basic theoretical knowledge of mathematical calculus and its use in solving Engineering and Scientific problems. The Department of Engineering Students begin their "journey" in the world of logic and numbers by studying the basic concepts of Calculus of Functions of One Variable, and those of Linear Algebra.

Course objectives: After successfully completing the course, students should:

In Variable Calculus:

- ⇨ know the basic concepts relating to variable functions (definition of domain, domain range, even and odd functions, complex and inverse function), as well as the various kinds of their portrayals (polynomial, exponential, logarithmic, trigonometric , hyperbolic, etc.).
- ⇨ manage adequately the concepts of limit, incremental change (differential) and derivative.
- ⇨ solve problems of complex, interlaced and inverse functions, as well as logarithmic differentiation.
- ⇨ study functions with the help of derivatives (extreme values, monotonicity intervals, bends, spaces of curvature) and solve exercises of limits by using the de l 'Hospital rule.
- ⇨ develop functions in power series around some point in their domain, according to the Taylor and / or Mc Laurin method.
- ⇨ know, when adequately implemented, the basic methods of integration (such as integration by substitution, integration by parts) of indefinite integrals.
- ⇨ calculate definite integrals and the quantities related to their applications (area of plane quotation, work force, work with irreversible change, etc.).

In Linear Algebra:

- ⇨ know the basic concepts of polynomials and to perform, with success, operations between them with a focus on dividing polynomials and finding their real and their complex roots.
- ⇨ manage the basic concepts of vectors and to perform operations between them, with emphasis on the calculation of the inner and outer product and their applications.
- ⇨ know the basics on tables (basic definitions, transactions between them, identity table, inverse table, similar tables, grammopraxeis and finding of the inverse table) with emphasis on the squared tables of dimensions 3 and 4.

- ⇨ manage adequately the properties of determinants and to be able to calculate inverse table determinants.
- ⇨ solve linear systems 3x3 and 4x4, using the Kramer method, as well as the inverse table method.

Course description:

Variable Calculus: Functions: definition of domain, domain range, and fully redundant connection, composite and inverse function, types of functions - polynomial, exponential, logarithmic, trigonometric, hyperbolic and reverse them. Limits. Derivatives: Derivatives of basic functions, differentiation complex, interlaced and inverse function, logarithmic differentiation. Applications of derivatives: Rolle's theorem and mean value, function study - extreme values, monotonicity intervals, bends, spaces of curvature. Limit resolution by the rule of de l 'Hospital. Taylor and Mc Laurin expansions. Indefinite integrals: Methods of integration - integration by substitution, integration by parts. Defined integrals, fundamental theorem of integral calculus. Applications of definite integrals: Area of plane quotation, work force, work with reversible change.

Algebra: Polynomials: Basic concepts, division of polynomials, finding roots - real and complex roots. Vectors: Basic concepts and rules for handling vector operations between vectors, the inner product of vectors, the outer product of vectors and applications. Tables: Basic definitions, types of tables and applications, transactions between tables, table multiplication, identitarian table, inverse table, similar tables. Determinants: basic properties, calculation of reversible determinant of reversible table. Linear Systems: Solving linear systems 3x3 and 4x4 - the method of Kramer, the method of the inverse table.

Title	**Physics I**
Category	**CGI**
Type	**Mixed**
Hours per week	**6 (3TH+1PE+2L)**
TU / ΦΕ	**7 / 12**
Typical semester	**1**
Course level	**M**

Course purpose: The transmission of basic theoretical knowledge in the field of Physics and particularly in the field of Mechanics and Heat, the acquisition of experience in the experimental investigation of natural phenomena and statistical processing of measurements.

Course objectives: After successfully completing the course the students should:

- ⇨ be able to utilize the theoretical foundation of physics, especially that of Engineering and Heating, for a deeper understanding of special infrastructure and specialty courses and corresponding to the requirements of

modern technology for continuous lifelong learning. ⇨ also be able to perform simple measurements of physical quantities and process their measurements.
Course description: **Theoretical part:** Introduction: rules for controlling vectors, derivatives and integrals. Kinematics and Dynamics of material point: Newton's Laws, simple movements, work, energy, power, momentum, conservation principles of maintaining energy - momentum. Rigid Body Dynamics: transport and rotational motion, angular momentum, conservation principles. Mechanical Properties of Fluids: pressure - hydrostatic pressure, air, internal friction, flow of ideal fluids. Vibrations - Waves: free and forced oscillation, vibration composition, unabated downward oscillation. **Laboratory part:** Introduction - training in the theory of faults. Experimental investigation of various physical phenomena from the field of Engineering and Heating from two groups of students, graphical and / or analytical processing of measurements - draw general conclusions, estimation of the quantitative accuracy of the final results using the theory of faults. Deliver comprehensive work written by each student individually (theoretical background, experimental procedures, measurement protocols, graphs, evaluation measurements, comments - observations).

Title	**Introduction to Materials Science**
Category	**CGI**
Type	**Theoretical**
Hours per week	**3TH**
TU / ΦΕ	**5,5 / 9**
Typical semester	**1**
Course level	**M**
Course purpose: The transmission of basic knowledge regarding: a) the nature, the structure and the properties of Materials, b) the crystalline structure of Metals and their mechanical behavior, c) equilibrium phase diagrams of Alloys d) Polymers and e) Ceramics.	
Course objectives: After successfully completing the course the students should know: ⇨ the chemical bonds and crystal structure of materials ⇨ the solidification process and possible defects of materials ⇨ the mechanical, electrical and thermal properties of metals ⇨ the creation of alloys and equilibrium phase diagrams ⇨ the characteristics and properties of ceramics, composites and plastics	
Course description:	

- ⇨ Nature of Materials (structure of matter, chemical compounds, chemical bonds).
- ⇨ Structure of solids (crystalline solids, crystal systems, levels, lines, signs and addresses).
- ⇨ Metals (crystalline structure, crystallization of metals, defects).
- ⇨ Mechanical properties of materials (deformation, strength, creep, fracture toughness, wear and hardness of materials).
- ⇨ Mechanical behavior of metals (voltage and deformation, tensile test, endotrachynsi, recrystallization, fatigue).
- ⇨ Electrical properties of metals.
- ⇨ Thermal properties of metals.
- ⇨ Alloys
- ⇨ Equilibrium phase diagrams.
- ⇨ Ceramics.
- ⇨ Composite materials.
- ⇨ Polymers.

Title	**Introduction to Computers and Programming**
Category	**CGI**
Type	**Mixed**
Hours per week	**5 (1TH+1PE+3L)**
TU / ΦΕ	**8 / 14**
Typical semester	**1**
Course level	**M**

Course purpose: The acquisition of basic knowledge about the structure of modern computers, modern operating systems and modern IT tools.

Course objectives: After successfully completing the course the students should:

- ⇨ have a reasonable knowledge of computer systems, mainly in network environments and the Internet, with modern computer applications, in modern operating systems.

Course description:

Theoretical part:
Historical development. The generations of computers. Introduction to key parts of the processor, memory analysis of ROM and RAM. Basic concepts of Windows. Data and Information. Representation of data, computer source codes, Structure and function of PC. Motherboards and expansion cards, cables and wiring, cable types, communication systems, central memory. Computer architecture. Key features of the processor. Peripherals. Compression-decompression of files. Protection from viruses. Work Environment Safety and Health. Copyright information and privacy.

Laboratory part:
Managing files and folders, copying files, file-objects. Introduction to Microsoft Word, formatting using word, print and print preview, tables and outlines, graphics

in word, paging techniques. Introduction to excel. Books and sheets, sheet structure, data sheets, formulations. Type in excel. Mathematical operators. Excel functions. Graphs and applications using excel. Introduction to PowerPoint. Create presentation. Formats in PowerPoint. Applications using PowerPoint.

Title	**Mechanical Design I**
Category	**CE**
Type	**Theoretical**
Hours per week	**4 (1TH+3L)**
TU / ΦΕ	**3,5 / 6**
Typical semester	**1**
Course level	**M**

Course purpose: The transmission of basic theoretical and practical knowledge of design based on the principles of Engineering.

Course objectives: After successfully completing the course, students should:

- ⇨ design and read construction designs of mechanical parts and brief machinery designs.

Course description:

Theoretical part:

- Introduction to mechanical project (cause and division). Instruments and drawing paper. Project legend. List of items. Scales of mechanical project. Types of lines. Writing letters and numbers. Folding projects.
- Geometric construction. Normal polygons registered in a circle. Construction of ellipse, Archimede's spiral, propeller.
- Overview of the construction projects. Central, parallel, orthogonal, parallel projection. View point, straight, flat, solid in one, two and three projection levels. Image object into faces.
- Rules for mounting dimensional symmetric and asymmetric shapes. Comments and examples for scale placement.
- Total cuts, semi-cuts, complex partial cut, sprawl. Details and general comments for cuts designing.
- Surface qualities and processing symbols. Tolerances and assemblies. Examples of connections.
- Types of designs. Scribble, concise and constructional project. Items catalog. Design number.
- Axis-metrical designs and dimension installation on them.
- Sheet-metal constructions. Sections of solid cylinders. Cut of cylindrical conductor from side plane, angle of cylindrical conductor, manufacturing a curve cylindrical pipe, fitting rectangular cut in a circular etc. Expansions of all of the above.

Laboratory part:

- Design of line species, letters and numbers.
- Design of geometric constructions.

— Design of axis-metrical drawings and standards of sides, cuts, sprawls. — Mounting dimensions and processing symbols. — Design axonometric drawings and installation dimensions. — Design Sheet-metal expansions. — Design sketches and dimension mounting. Design submission by each student individually every week.

Title	**Feasibility Analysis**
Category	**CAELH**
Type	**Theoretical**
Hours per week	**2TH**
TU / ΦΕ	**3,5 / 6**
Typical semester	**1**
Course level	**M**
Course purpose:	
Course objectives: After successfully completing the course, students should: ⇨	
Course description: — Definition of cost. — Elements of financial balance and time reductions economic fundamentals. — Cost of investment, cost indicators, methods of cost estimation. — Cost of production, total product cost. — Evaluation efficiency investments, neutral point, productivity. — Organizational patterns of production and their impact on cost. — Principles of linear-based and time-based scheduling. — Examples in construction and energy applications. — Developmental law.	

2nd Semester

Title	**Mathematics II**
Category	**CGI**
Type	**Theoretical**
Hours per week	**5 (3TH+2PE)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**2**
Course level	**M**

Course purpose: The study of complex mathematical concepts, such as those contained in the Calculus of Several Variables (in simple and vector expression) and Differential Equations, with applications relating to solving of Engineering and Scientific problems.

Course objectives: After successfully completing the course, students should:

In Calculus of Several Variables:

- ⇨ know the basic concepts regarding Functions of two and/or more variables (place of definition and geometric interpretation etc.).
- ⇨ know in depth the concept of some derivatives: First and second class as well as the corresponding «mixed» derivative.
- ⇨ solve problems of some derivatives of complex and implicit functions and problems of total differential functions.
- ⇨ manage problems of extreme values of functions of two variables with the help of some derivatives (maxima, minima and "saddle" spots).
- ⇨ know the basic principles of Vector Analysis and the concepts of *gradient*, *divergence* and *turn* of Vector Fields with special emphasis on their quantitative exploitation.
- ⇨ be able to resolve double integrals in Cartesian and /or polar coordinates. Applications of double integrals (volume of the solid body, moments of inertia, etc.).

On Differential Equations:

- ⇨ know the basic concepts of first order differential equations (general and partial solution, initial conditions).
- ⇨ solve various types of first order differential equations - differential equations with separated variables and discounted them, homogeneous differential equations and discounted to them, linear differential equations of first order, complete differential equations with the use (or not) of integral factors.
- ⇨ be able to solve problems of Physics and Technological Applications of differential equations of first order.
- ⇨ to manipulate adequately linear second order differential equations with constant coefficients and non-zero second member, emphasizing on their key features (complete and homogeneous differential equation, homogeneous classes of solutions, selecting a partial solution to the full, initial and boundary conditions).

Course description:

Calculus of several variables:
Functions of two variables: Place of definition and geometric interpretation.
Some derivatives: First and second class, mixed derivative. Some derivatives of complex and implicit functions. Total differential function of two variables. Extreme values of functions of two variables - maxima, minima and "saddle" spots.
Vector Analysis: Vector Fields - gradient, divergence and turn. Double integrals:

Place of integration, geometric interpretation. Resolving double integrals in Cartesian and polar coordinates. Applications of double integrals - volume of the solid body, moments of inertia.

Differential Equations:
First order differential equations: General and partial solution, initial conditions. Types of first order differential equations - differential equations with separated variables and discounted them, homogeneous differential equations and discounted to them, linear differential equations of first order, complete differential equations, integral factors. Physical and Technological Applications of differential equations of first order. Linear second order differential equations with constant coefficients and non-zero second member: Key features - complete and homogeneous differential equation, homogeneous classes of solutions, selecting a partial solution to the full, initial and boundary conditions.

Title	**Physics II**
Category	**CGI**
Type	**Mixed**
Hours per week	**5 (3TH+2PE)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**2**
Course level	**M**

Course purpose: The transmission of basic theoretical knowledge in the field of Physics and particularly in the field of Electromagnetics and Atomic Physics, gaining experience in experimental investigation of physical phenomena and statistical processing of measurements.

Course objectives: After successfully completing the course, students should:

- ⇨ be able to use the theoretical background of physics, particularly that of Electromagnetism and Atomic Physics, for understanding deeper the special infrastructure and speciality courses and for meeting the requirements of modern technology for continuous lifelong learning.
- ⇨ also be able to conduct simple measurements of physical quantities and process their measurements.

Course description:

Theoretical part:
Introduction: data vector analysis, complex numbers. Static Electricity (Laws of Coulomb, Gauss): electric field, dynamic, analytical calculation of the potential and electric field intensity distributions of simple geometric load capacity, dipoles, energy load balancing, electric field as a carrier of electricity.

Dielectric: electric displacement, dielectric polarization, energy density in dielectrics, piezoelectricity. Thermoelectric Phenomena. Study of circuits of direct current (Law Ohm, Rules Kirchhoff).

Mechanisms of Solid and Fluid Conductivity: conductors, insulators, semiconductors, conductivity dependence on temperature - superconductivity, conductivity dependence of the factors.

Electrodynamics (Laws Ampère, Biot-Savart, Faraday): magnetic field, analytical calculation of magnetic field of simple arrangements of current carrying conductors devices, Lorentz force, induction, magnetic materials, alternating current, alternating current circuit design with complex numbers.

Structure of matter: structure and spectra of the atom, interaction between matter and radiation, structure of nucleus, radioactivity, fission and fusion. Dosimetry.

Laboratory part:
Training in the theory of faults. Experimental investigation of various physical phenomena from the field of Electromagnetism and Atomic Physics from two groups of students, graphical and / or analytical processing of measurements - general conclusions, assess of the quantitative accuracy of the final results using the theory of faults. Deliver comprehensive work written by each student individually (theoretical background, experimental procedures, measurement protocols, graphs, evaluation measurements comments - comments).

Title	**Mechanics I**
Category	**CSI**
Type	**Theoretical**
Hours per week	**6 (4TH+2PE)**
TU / ΦΕ	**8 / 14**
Typical semester	**2**
Course level	**M**

Course purpose: Acquisition of basic knowledge on the subject of engineering of the non- deformed body of determinate entities. Calculation of composite sections. Study in the determinate plane and space: a) panels, b) bars and frames, c) cables and composite structures. Calculation of reactions, and diagrams of axial and crossed forces and moments.

Course objectives: After successfully completing the course, students should:

- ⇨ calculate the focus of a random cross section of a body.
- ⇨ solve in plane and in space, isostatic bodies, trusses, bars, frames, cables and composite bodies.
- ⇨ calculate the friction force in mechanical systems.

Course description:

1) Introduction to Vector Calculus
2) Forces of same level
3) Center body weight

4) Bars - Diagrams [N], [Q], [M]
5) Frames
6) Trusses
7) Bows
8) Flexible bodies - cables
9) Friction
10) Composite operators
11) Bodies in space

Title	**Computer Programming**
Category	**CGI**
Type	**Mixed**
Hours per week	**5 (1TH+1PE+3L)**
TU / ΦΕ	**4 / 7**
Typical semester	**2**
Course level	**M**

Course purpose: Knowledge of modern computer tools operation in applications related to the science of the Engineer.

Course objectives: After successfully completing the course, students should:

⇨ have basic programming knowledge in applications related to the science of the Engineer, as well as the logic of modern tools in the same applications.

Course description:

Theoretical part:
Creation of specific types of tables, operations tables (Add-Remove-Multiplication-Division of tables and data, Delete rows columns).
Special Features: Flip and Reverse table, Raise table to power, New Sequences: unit table of n order, the table of n order consisting only of zeros and only of units, magic table of n order. Determinants Angles of Euler. Graphical representations of simple functions. Graphical representations of trigonometric, logarithmic functions. More adjustments (editing of graphic representations). Saving the graphs. Roots of polynomials. Calculate value of polynomial, Multiplication / division between polynomials. Differentiation of polynomials. Polynomial Interpolation approach with third order splines, Interpolation of Third Class, Symbolic display of variables, Limits. Derivatives / Integrals, of Graphs symbolic functions.

Laboratory part:
Introduction: Introduction to the Matlab environment. Description of the environment variables. Basic mathematical functions. Variable Operations of the command window. Formatting Number. Special operations. Use of Help, Create simple and specific types of tables. Operations with tables (Add-Remove-Multiply-Division tables and data, Deleting columns and rows).
Exercises include: Special Features: Flip and Reverse Table, Table Raising to a power, Sequences, Create: unit table of order n, the table of order n consisting only of zeros and only units, table magic class n.

Exercises include: Determinants, Euler Angles, Graphs of trigonometric and logarithmic functions. More adjustments (graphics editing). Save the graphs. Exercises include: Roots of polynomials. Calculate of polynomial values. Multiplication / Division between polynomials.
Exercises include: Differentiation of polynomials. Polynomial approach. Exercises include: Polynomial Interpolation approach to third order splines. Interpolation of Third Class. Symbolic Boundaries display of variables. Limits. Derivatives / Integrals. Graphical representations of symbolic functions.

Title	**Computer aided Design**
Category	**CSI**
Type	**Laboratory**
Hours per week	**3L**
TU / ΦΕ	**1,5 / 3**
Typical semester	**2**
Course level	**M**

Course purpose: The acquisition of essential knowledge on the engineering design systems using Computers (CAD), and familiarity with using these systems for the preparation of construction and brief designs of mechanical parts and arrangements. During the course students will learn the principles and techniques of two-dimensional and three-dimensional engineering design.

Course objectives: After successfully completing the course, students should:

- ⇨ know the basic principles of two-dimensional engineering design of mechanical parts and arrangements using the Computer.
- ⇨ know the basic principles of three-dimensional design of mechanical parts and the creation of mounted arrangements with them.
- ⇨ be able to conduct, using the Computer, the construction and the brief designs of parts and arrangements both in a two-dimensional environment and in an environment of three-dimensional design.

Course description:

Introduction to computer aided mechanical design. Types of coordinates. Edge setting (straight, circle, ellipse, curved Bezier & B-Splines). Definition surfaces (flat, linear, rotation, Bezier & B-Splines). Definition of solids.
Two-dimensional design: Definition of coordinate system and level of design. Definition and creation of geometric entities. Additional design features. Editing commands, and modification of the characteristics of geometric entities. Dimensioning. Project management and printing them.
Three-dimensional design: Fundamentals of the three-dimensional geometry of space. Coordinate systems. Techniques for creating solid models. Additional design possibilities. Customization of geometrical features. Creating assemblies from individual components. Automatic generation of construction plans from the three-dimensional model. Management of three-dimensional model for communication CAE systems. Elaborating engineering designs using a computer in two-dimensional and three-dimensional environments design.

Title	**Organization and Management of Industrial Enterprises**
Category	**CAELH**
Type	**Theoretical**
Hours per week	**2TH**
TU / ΦΕ	**3,5 / 6**
Typical semester	**2**
Course level	**M**
Course purpose: The development of basic theoretical background on the theory of administration (management) and implementation of various organizational structures (business-organizations-modern industrial enterprises)	
Course objectives: After successfully completing the course, students should: ⇨ have acquired the necessary knowledge for the understanding of the basic administrative theories and methods and their possible use through modern techniques	
Course description: Introduction: Administration through centuries, the elements of Administration, what is public Administration. Economical unit-Business-discrimination of them. Production system and business environment. Industrial Company: The characteristics of modern industrial enterprises, basic functions of an industrial enterprise, productivity - effectiveness, human relationships, forms and systems of industrial production, industrial establishments. Formal organization - Administration Area - Corporate Bodies. Organization and control of factory production. The use of computers in the industry. Organize files, mail handling procedures. General economic concepts: Properties, costs, depreciation, dead point, efficiency and productivity. Definition standards of cost in general. Diseases of the administration, staff matters.	

3rd Semester

Title	**Numerical Analysis**
Category	**CGI**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU / ΦΕ	**5 / 8**
Typical semester	**3**
Course level	**M**

Course purpose: The presentation of the most common numerical methods and the developing of skills in handling incremental computational tools in solving Engineering and Scientific problems.

Course objectives: After successfully completing the course, students should:

- ⇨ know the basic concepts regarding the types of errors of calculations and their transmission in the numerical calculations.
- ⇨ use adequately the concepts of coincindencial polynomial, and polynomials of Taylor and Mc Laurin , with emphasis on their applications on numerical methods to solve problems (integration of functions on non-closed form etc.)
- ⇨ provide numerical solutions of algebraic equations (finding roots), using the regula falsi and Newton-Raphson methods.
- ⇨ solve problems of numerical interpolation between linear differentiations, or full differentiation by means of polynomial coincidencal of Newton.
- ⇨ execute numerical integration- by the trapezium and the Cotes method
- ⇨ provide numerical solutions of first order differential equations using the methods of: Euler, Taylor (up to 3rd order) and the method on the Runge-Kutta 2nd and 4th order.

Course description:

Theoretical part:
Errors of calculations: Basic concepts, types of errors, transmission errors in the numerical calculations. Approximate expressions of functions: The coincidencial polynomial and polynomials of Taylor and Mc Laurin, applications on numerical methods to solve problems - integration of functions on non-closed form.
Numerical solution of algebraic equations: Finding roots - method of regula falsi, method Newton-Raphson. Numerical interpolation: Linear interpolation complete interference with the method of Newton. Double linear interpolation. Numerical differentiation: Linear differentiation, full differentiation by means of polynomial coincidencal of Newton. Numerical integration: the trapezium method, method of Cotes. Numerical solution of first order differential equations: The method of Euler, the method of Taylor, the method on the Runge-Kutta 2nd and 4th order.

Laboratory part:
Development and programming algorithms optimally - that is, with the least possible computational time (hours CPU) and required space accessible memory (RAM).

Title	**Mechanics II**
Category	**CSI**
Type	**Theoretical**
Hours per week	**5 (3TH+2PE)**
TU / ΦE	**6,5 / 11**
Typical semester	**3**
Course level	**M**

Course purpose: Acquisition of basic knowledge on the subject of mechanics of materials. Calculation of the axial tension and shear forces, bending and torsion torques. Calculation of critical loads due to buckling. Energy methods of solving superstatical bodies.

Course objectives: After successfully completing the course, students should:

- ⇨ know the basic concepts of mechanics of materials.
- ⇨ calculate superstatical bodies using energy methods.
- ⇨ calculate the critical loads due to buckling and the developing trends in construction due to compound stresses.

Course description:

1) Basic concepts of mechanics of materials. Diagrams s-e
2) Axial tension - compression
3) Two-axle tension - compression
4) Level of intensity and distortion levels
5) Inertia torques of random profile
6) Beam bending
7) Elastic Line
8) Torsion beam
9) Buckling
10) Double and assymmetric bending
11) Complex extress
12) Energy Methods
13) Superstatical bodies

Title	**Mechanical Design II**
Category	**CSI**
Type	**Mixed**
Hours per week	**4 (1TH+3L)**
TU / ΦΕ	**3,5 / 6**
Typical semester	**3**
Course level	**M**

Course purpose: The transmission of basic theoretical and practical knowledge of design according to the Engineering principles.

Course objectives: After successfully completing the course, students should:

- ⇨ be able to design and read construction designs and brief machinery designs.

Course description:

Theoretical part:

Displaying and symbolism of the cochlea-connections. Displaying and symbolism of the welds. Design and display of cogs, pulleys and sprockets. Design of comprehensive plans with the state of items (reducers, transmission). Design of construction plans.

Laboratory part:
Implementation of all modules of the theoretical part with appropriate exercises for each section. Design using a PC of a complex exercise for further training and evaluating the progress of students.

Title	**Technology of Mechanical Engineering Materials**
Category	**CSI**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU/ ΦΕ	**5 / 8**
Typical semester	**3**
Course level	**M**

Course purpose: The transmission of basic theoretical knowledge on the understanding of phase diagrams, the system of iron-carbon, ferrous and non-ferrous alloys as well as uses of the diagrams for the creation of new products that relate to the rate of change of the system's parameters.

Course objectives: After successfully completing the course, students should possess:

- ⇨ reading and using phase diagrams.
- ⇨ the correlation of heat treatments to the diagrams.
- ⇨ erosion, corrosion and protection of materials.

Course description:

Theoretical part:
Phase diagrams. The system of iron-carbon (Fe-C). Heat treatments of steel, charts of isothermic transformation. Steel alloys. Iron casts. Non-ferrous alloys (aluminum, copper, manganese, nickel, zinc). Processes of metals and alloys. Erosion and corrosion of materials.

Laboratory part:
Experimental laboratory exercises. Casting alloys, cutting and creating essays, comments essays in stereoscope, microscope and characterize them, experimental determination of tensile strength, hardness measurement and wear.

Title	**Thermodynamics**
Category	**SCI**
Type	**Theoretical**
Hours per week	**5 (3TH+2PE)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**3**
Course level	**M**

Course purpose: The transmission of basic theoretical knowledge in the field of technical Thermodynamics which consists the theoretical background of energy technology.

Course objectives: After successfully completing the course, students should:

- ⇨ acquire the necessary background in Thermodynamics for the better understanding of courses of specialty and the fulfillment of modern technology requirements for constant and lifelong learning.

Course description:

Basic Concepts: Thermodynamic statute sizes and process sizes, statute equation of ideal gas, absolute temperature.

1st Law of Thermodynamics: formulation for closed and open systems, calculation of production and heat.

2nd Law of Thermodynamics: cyclical processes, Carnot cycle , Entropy, scattering work.

Applications of first and second Law: ideal gases, compressors, turbines (circles Joule and Ericson), internal combustion piston engines (circles Otto, Diesel and Seiliger).

Vapor: water vapor profile figures, tables and charts steam- diagram h-s of Mollier, circles of power generation facilities with steam (Clausius-Rankine), cooling cycles (compression and absorption).

Mixed gas: ideal gas mixtures, mixtures of gases and vapors, moist air, h-x diagram of Mollier. Combustion.

Title	**Work Safety and Environmental Protection**
Category	**CAELH**
Type	**Theoretical**
Hours per week	**2TH**
TU / ΦΕ	**3,5 / 6**
Typical semester	**3**
Course level	**M**

Course purpose:

Course objectives: After successfully completing the course, students should:

- ⇨
- ⇨

Course description:

- — Organization of work safety.
- — Dangerous working conditions.
- — Safety of electrical installations.
- — Fire safety.
- — Safe handling and storing.
- — Special issues of different machines and installations.

- Dealing with accidents.
- Laws, statistics and organizations concerning work security y and accidents.
- Definition of environment and its protection.
- Ecological - socio-economic burdening of pollution and private-cost abatement of anti-pollution.
- Identifying acceptable levels of pollution. Regulations and legislation.
- Aerosols and other airborne industrial pollutants.
- Mechanical anti-pollution equipment.
- Liquid waste.
- Generally about biological treatment (BOD, COD, biochemical reactors).
- Primary purification, secondary purification.
- Tertiary purification.
- Disposal of sludge - Energy exploitation (biogas).
- Material salvaging.
- Waste treatment of specific industries.
- Solid waste.
- Methods of disposal, energy explitation and material salvaging.
- Other forms of pollution.
- Pollution of large systems.
- Natural self-cleaning and artificial cleaning.
- Simulation models.

4th Semester

Title	**Oscillations and Machine Dynamics**
Category	**SCI**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU / ΦΕ	**5 / 8**
Typical semester	**4**
Course level	**M**
Course purpose: The transmission of basic theoretical knowledge regarding Oscillations and Machine Dynamics and the obtaining of experience in computational and experimental investigation of oscillatory phenomena in order for the students to fulfill the demands of modern technology and the requirements of modern Masters studies, so as to be able to follow, apply and contribute to future technological evolutions.	
Course objectives: After successfully completing the course, students should: ⇨ study oscillation problems of simple and complex mechanical systems. ⇨ model the oscillatory behavior of mechanical systems. ⇨ solve equations of the mathematical model that describes the oscillatory. behavior of a mechanical system. ⇨ operate principles of measuring various sizes of oscillatory mechanical systems, educe general conclusions through graphic and/or computer processing of the measurements, estimate the quantitative accuracy of their	

final results and elaborate a relevant technical report.
Course description: **Theoretical part:** a) Oscillation dynamical systems with one degree of freedom. Analysis of Engineering Systems: introduction, means of elastic deformation. Free vibration without damping: transport vibration, rotation oscillation. Free vibration with damping: carrier oscillation, rotational oscillation, damping categories. Forced Oscillation: equation of motion, forced oscillation at subcritical damping, response to harmonic excitation. Applications: feature selection for machine foundation, operating principles of measuring oscillatory sizes. b) Oscillation of dynamical systems with many degrees of freedom. Undamped systems: preparation and resolution of current issue, determination of response. Systems with damping means: method of Caughey, method of Duncan, systems under harmonic excitation. **Laboratory part:** Computational investigation by students of oscillatory behaviorism of mechanical systems through the simulation environment of Matlab, but also using the appropriate testing arrangements. Measurement and assessment of the fundamentals of vibration, experimental law investigation, export relations between sizes using experimental data. Elaboration of work by the students (theoretical background, experimental procedure, graphs, evaluation measurements comments -observations).

Title	**Machine Elements I**
Category	**SCI**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU/ ΦΕ	**6,5 / 11**
Typical semester	**4**
Course level	**M**

Course purpose: Familiarization to the function, study and the calculation of connection and basic rotary movement elements.
Course objectives: After successfully completing the course, students should: ⇨ have acquired the necessary knowledge, experience and skills for the understanding, calculation and design of basic machine elements (connection and basic rotary movement elements). The explanation of these elements and practical exercises with them in laboratory for the acquisition of relevant experience.
Course description: **Theoretical part:** Standardization of parts. Dimensional tolerances, connections. Dynamic loading. Safety factor. Ingredients: injuries, basic properties, selection criteria.

Welding Melting: advantages, disadvantages, types of seams, types of clearances, seam thickness, control resistance, good examples of welded construction. Welding pressure: a form of connection, control resistance, examples of good construction.
Bolts: General description, relationship between tightening and torque - axial force and its applications. Constriction bolts: forces prestressing and operating, cold precipitation, adjusting the torque constriction, specifications of proper functioning of the bolt connector, resistance control. Applied bolts, rubber liners. Motion bolts.
Axes - Arbors: Form, operation, sizing. Check resistance airframe according to the technical guidance VDI-Richtlinie 2226: Dynamic loading, equivalent voltage, coefficient size, rate of surface, form factor, rate of supporting, safety against dynamic fracture and against plastic deformation.
Wedges, spline. Fixed and mobile link shafts, clutches.
Rolling bearings: bearing type and properties of any kind, fixed-mobile bearings, floating bearings, bearings with prestressing, damaged bearings, static strength inspection, calculation of lifetime, examples of assemblying bearings.

Laboratory part:
Repetition Engineering I II (ie, Statics Strength of Materials). Inspection of welding resistance. Dismantling a simple mechanical construction, component diagrams of free-body, power flow in the summary plan of the construction. Calculation of study (ie sizing) screw mechanism and motion, beams, shafts.
Semester project: given a sketch of a single machine, the description of the operation to be performed and key figures on its size. It is asked the "design study" of the machine: Sizing design of key components, their integration in a comprehensive plan, finding from the plan the scale derived from the limitations of assembling, inspecting the durability of components.

Title	**Electrical and Electronic**
Category	**CSI**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU / ΦΕ	**4,5 / 8**
Typical semester	**4**
Course level	**M**

Course purpose:

Course objectives: After successfully completing the course, students should:

- ⇨
- ⇨

Course description:

Theoretical part:
Analysis of electric circuits, DC and AC. Basic electrical quantities, current, charge, voltage, current, power. Behavior of passive and active electrical components. General methods of analysis of electrical circuits, rules of Kirchhoff. Basic

electrical circuits whose components are connected serial or parallel, voltage divider and current divider. Method of loops, methods of junctions, superposition theorem, Thevenin and Norton. Alternating currents. Show sinusoidal sizes with vectors and complex numbers. Ac power to a dipole with resistive, inductive and capacitive resistance. Resonant circuits and compensatory effect. Three phase systems, three phase power. Semiconductors, emission from cathodes, rectifiers, transistors, thyristors, lamps.

Laboratory part:
Stress, tension, ohmic resistance, inductor, capacitor at DC. Stress, tension, ohmic resistance, inductor, capacitor, impedance to alternating current. Coordination/tuning. Indirect and direct measurement of real, reactive/inncative and apparent power-phase consumption. Indirect and direct measurement of power factor of single-phase consumption. Power factor correction. Three-phase voltage, current, power and power factor. Relationship between the electrical transformer sizes. Oscilloscope: Measurements, tests. Rectifier, rectifier provisions. Study plans of industrial and manufacturing facilities regarding the cabling and power.

Title	**Machining Technology I**
Category	**CSI**
Type	**Mixed**
Hours per week	**5 (1TH+4L)**
TU / ΦΕ	**4 / 7**
Typical semester	**4**
Course level	**M**

Course purpose: The theoretical background development regarding measuring technologies of length, weldings, metal castings, treatment and cutting of metal – lamina and pipes.

Course objectives: After successfully completing the course, students should:

- ⇨ have acquired the necessary knowledge, experience and skills for the understanding of measuring technologies of length, weldings, metal castings, as well as treatment and cutting of metal and lamina.
- ⇨ have familiarize to the use of tools and machinery.
- ⇨ develop technical awareness.
- ⇨ take safety measures during their practice.

Course description:

Theoretical part:
Measurements: Background information on the measurements. The basic approach to measuring system (main parts). Instrumentation - definitions (precision, accuracy, precision, range, repeatability, reproducibility, resolution, sensitivity, reliability). Specifications of measuring instruments, operating principles. Measurement standards (basic and productive units SI). Measurement faults (absolute, relative). Causes of errors. Classification of errors (systematic, random, complex). Tolerances, gaskets, length prototypes, inspection of dimension and angles. High

precision measurements (the hierarchy of prototypes, certified reference materials, traceability). Basic concepts about the calibration.
Fitting: Raw materials, specifications, ordering. Phases of construction projects. Specifications, ordering tools, standardizations. Modern tools - equipment.
Foundry: Raw materials, specifications, custom cast models. Tools and basic casting operations. Printing methods and various castings. Mechanical printing. Edit castings, cast control.
Welding: Electro-weldings, oxyweldings, welding TIG, MIG, MAG. Flame cutting. Soft solderings.
Pipe manufacturing: Raw materials, specifications, ordering. Tools, machinery. Piping networks, control systems. Pipe coloring-Notations.
Lamina manufacturing: Raw materials, specifications, ordering. Machinery, tools and measuring instruments. Technical characteristics, operating principles, maintenance. Shaping and cutting laminas.
Workshop security: About accidents. Regulations for the proper laboratory function. Obligations of employers, employees. Safety and safe use of machinery tools and equipment. Safety signs in accordance with national legislation and EU directives.

Laboratory part:

- Practice in length measuring using high resolution measuring instuments.
- Inspection of surfaces and dimensions of mechanical products of mass production.
- Construction of joining two pieces with a tolerance of ± 0,1 mm.
- Mechanical printing and casting metal by a group of four students.
- Manufacture of typical pipe network with steel and copper pipes.
- Welding three pieces using arc welding and TIG.
- Lamina welding using oxywelding.
- Oxycutting of metal parts.
- Construction of special pipelining fittings using galvanized steel sheet in the lamina manufacturing area using software to create extracts.

Title	**Fluid Mechanics I**
Category	**CSI**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**4**
Course level	**M**
Course purpose:	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	

Course description:

Theoretical part:

- Properties of fluids & measuring units: density, viscosity, etc.
- Basic equations of Fluid Mechanics: Principle of Conservation of mass (continuity equation), Principle of Conservation of Linear Rotary Momentum (2nd law about motion of Newton), Principle of Energy Conservation (1st thermodynamic axiom), Memorandum Equations.
- Types of Mathematical Analysis in Fluid Dynamics: System & Volume Control.
- Hydrostatic: Spot pressure distribution with depth, fluid, measurement and pressure gauges, absolute, relative and atmospheric pressure, static and dynamic pressure forces on plain (vertical, horizontal and inclined) and curved surfaces, buoyancy.
- Basic Fluid Mechanics: Fluid Component Acceleration - Newton's second law, Bernulli's equation, static, dynamic and total pressure, flow speed measurement with tube Pitot-Static tube, examples of applying Bernoulli's equation, energy line and pressure-metric line, deviations from Bernoulli's equation.
- Fluid Kinematics: Velocity Field (flow description by Euler and Lagrange, 1D, 2D & 3D flow, permanent and non-permanent flow, flow lines, fibrous veins & flow orbits), Acceleration Field (the material derivative, non-permanent phenomena, convection phenomena), Control Volume, Transfer Theorem Reynolds (permanent and non-permanent effects, the theorem for moving control volumes, select control volume).
- Flow in closed conduits: The Reynolds number, laminar and turbulent flow, flow at the entrance of the pipeline, pressure and 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.

Laboratory part:

- Measurement Density & Viscosity Fluids.
- Measurement of hydrostatic forces on plain surfaces.
- Calibration manometer.
- Classification flowmeter of type Ventouri - Bernoulli's Equation.
- Local losses.
- Linear losses.

Title	**Technical Legislation**
Category	**CAELH**
Type	**Theoretical**
Hours per week	**2TH**
TU / ΦΕ	**3,5 / 6**
Typical semester	**4**
Course level	**M**

Course purpose:
Course objectives: After successfully completing the course, students should: ⇨ ⇨
Course description: — Introduction to Law and Legislation. — Basics and definitions. — Interpretation of Law and Legislation. — Research of legal sources using means of informatics. — The fundamental rights. — The judicial settlement of disputes - the Greek judicial system. — Key elements of civil law. — Key elements of criminal law. — Basics of labor law. — The assignment and elaboration of studies.

5th Semester

Title	**Heat Transmission**
Category	**CSI**
Type	**Theoretical**
Hours per week	**3 (2TH+1AE)**
TU / ΦΕ	**4 / 7**
Typical semester	**5**
Course level	**M**
Course purpose: Acquisition of basic knowledge fundamental for the understanding of heat transmission mechanisms and the response to related problems.	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description: Introduction to basic concepts and modes of heat transmission. Heat transmission by conduction: Permanent one-dimensional heat transfer on flat wall, cylindrical wall, spherical wall, compound wall. Heat transmission via convection: Flow of viscous fluid. Methodology for solving convection problems. Dimensionless numbers. Free convection in infinity - finite space. Forced convection over flat plates, inside - outside pipeline. Heat transfer by radiation. Absorption and emission of electromagnetic radiation. Methods of calculating thermal flows exchanged by radiation. Heat transfer during phase	

change: boiling - condensation. Heat exchangers. Thermo permeability factor: different types of flows in heat exchangers.

Title	**Machine Elements II**
Category	**CSI**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**5**
Course level	**M**

Course purpose: Familiarization to the study and the calculation of machine elements referring to transmission, that is gear movement, belt movement and chain movement.

Course objectives: After successfully completing the course, students should:

- ⇨ have acquired the necessary knowledge, experience and skills for the understanding, calculating and designing of gear movement, chain movement and belt movement. The explanation and the practical exercises with them in the laboratory for the acquisition of relevant experience.

Course description:

Theoretical part:

1. Gear movements
   - — Description of the geometry and kinematics of gear movements. Construction of gear movements, damage, construction materials, construction faults, lubrication. Undercuts and re-allocation distribution.
   - — Description of a direct frontal teeth and development of method of its calculation. Examples of application.
   - — Description of the lateral frontal teeth and development of method of its calculation. Examples of application.
   - — Description of a straight conical teeth and development of method of its calculation. Examples of application.
   - — Description of a spiral tooth - crown and development of method of its calculation. Examples of application.
   - — Description of planetary systems and develop the method of their calculation. Examples of application.

2. Belt movements
   - — Description of the geometry and kinematics of belt movements. Ways of prestressing, materials for pulley assemblying and belts.
   - — Description of belt movement with flat belt and development of the method of its calculation. Examples of application.
   - — Description of belt movement with trapezoid belt (standard and narrow) and development of the method of its calculation. Examples of application.
   - — Description of belt movement with toothed belt and the development of the method of its calculation. Examples of application.

3. Chain movements

- Description of the geometry and kinematics of chain movements. Materials for construction of sprockets and chains. Lubrication for chain movements. The polygon effect. Chain and wheel wearing.
- Description of chain movement with single or multiple chain and development of the method of its calculation. Examples of application.

Laboratory part:

- Practical experience with the above, for the benefit of experience.

- Processing of design study of an installation of movement transfer with gears, chains and belts with the corresponding calculations and drawings.

Title	**Electromechanical Installations**
Category	**CE**
Type	**Mixed**
Hours per week	**5 (2TH+1PE+2L)**
TU / ΦΕ	**5,5 / 9**
Typical semester	**5**
Course level	**M**

Course purpse:

Course objectives: After successfully completing the course, students should:

⇨

⇨

Course description:

Theoretical part:

- Description of the installation of mechanical elevator in buildings. Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.
- Description of the installation of hydraulic elevator in buildings. Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.
- Description of water and sanitation facilities in buildings. Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.
- Description of the installation of fuel gas in buildings. Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.

— Description of insulation and heating installation in buildings. Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.
— Description of the electrical installation in buildings. Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.

Laboratory part:
Requirements of the regulations, customary practice and circumstantialities. Development issue calculations, technical descriptions and required design plans in a comprehensive study of the installation.

Title	**Machining Technology II**
Category	**CE**
Type	**Mixed**
Hours per week	**5 (1TH+4L)**
TU / ΦΕ	**4 / 7**
Typical semester	**5**
Course level	**M**

Course purpose: Knowing the manufacturing procedure of a mechanical part that is imprinted on a design or is real but has failed and thus needs to be recreated.

Course objectives: After successfully completing the course, students should:
- ⇨ understand the cutting process of metals and factors involved.
- ⇨ experience the lathe, features and handling.
- ⇨ learn about the milling machines, the functions and handling.
- ⇨ know drillers, the functions and handling.
- ⇨ know planes, the functions and controlling it.
- ⇨ know milling drills, features and handling.

Course description:

Theoretical part:
A. MECHANICAL TREATMENT
1. Cutting metal
2. Cutting Conditions
3. Materials for cutting tools
4. Forces and strength of cutting
5. Quality of processed cut surfaces

B. LATHES

1. Basic parts of parallel lathe
2. Snapping objects to the lathe
3. Tools and cutting conditions on the lathe
4. Lathing Parts
5. Hydraulic Copiers

C. MILLING MACHINES

1. General
2. UNIVERSAL milling machines
3. Cutting Tools
4. Cutting Conditions
5. Cutting gears (divider)

D. DRILLERS

1. General
2. Types of drills
3. Cutting tools for drills
4. Cutting Conditions

E PLANES

1. General
2. Basic parts and operation of cross planning
3. Cutting Conditions
4. Work carried out during planning

F. MILLING DRILLS

1. General
2. Cutting Tools
3. Cutting Conditions
4. Types of procedures

Laboratory part:
Students during the workshop are trained to handle the above mentioned machine-tools, performing a total of ten different exercises, and theoretical articles on related technology processes. The exercises are such as to be performed in a way that each student must necessarily make use of almost all the capabilities of the machine tools, not just getting a taste of manufacturing a piece, but with the concerns that are born during the attempt to provide answers, the student fully understands the difficulties and shapes an opinion about the processing flow. So in the end, the student is ready as an engineer to guide the operator of the machine tools.

Title	**Electrical Motors**
Category	**CE**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU/ ΦΕ	**5 / 8**
Typical semester	**5**
Course level	**M**
Course purpose:	

Course objectives: After successfully completing the course, students should: ⇨ ⇨
Course description: **Theoretical part:** Basic concepts and phenomena of electromagnetism. DC motors, generators and motors: operating principles, components, voltage, internal torque, behavior for different types of stimulation, under load. AC motors, synchronous and asynchronous. Sinusoidally distributed gap magnetic fields, magnetic fields on machines with multiple magnetic poles, internal components. Synchronous machines: construction and operating characteristics, syncronization and timing for starting the motor and generator. Asynchronous machines: advantages, operating principle and characteristics of induction machine, starting and speed control of asynchronous motors. **Laboratory part:** Generators and DC motors: joints, alteration, characteristic, choice, damage, setting the rotation speed od dc motors, WARD-LEONARD system. Modern generators and motors: joints, alteration, characteristics, choice, damage, power factor correction. Asynchronous motor of short-circuited runner: How to boot. Asynchronous finger carrier motor: Characteristic, measuring of loss and efficiency. Installing and connecting the motor. Single-phase asynchronous motors (with resistor - capacitor): Boot starting method. Change direction of rotation. Functioning as a single phase three phase motors. Change direction of rotation.

Title	**Internal Combustion Engines I**
Category	**CE**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU / ΦΕ	**5 / 8**
Typical semester	**5**
Course level	**M**

Course purpose: The presentation and development of basic concepts of the science of technology on which the function of the internal combustion piston engines is based. The study of the various function and construction parameters that affect the function, the efficiency and performance, combined to reliability, life duration, impact on the environment and on humans' health. The acquisition of specific knowledge for the way of maintaining them.
Course objectives: After successfully completing the course, students should: ⇨ ⇨

Course description: **Theoretical part:** Principles of operation, classification and description of elements of ICE. Structure, composition and materials ICE. Circles running, petrol, diesel and accessories. Construction and operational parameters: torque, average pressure, work, power, various degrees of efficiency, consumption. Conventional power systems, gasoline and diesel. Thermochemistry of mixtures of air - fuel. Theoretical study of cycles operated on air and with a mixture of air - fuel. Conventional and alternative fuels. Gas rotation procedure: mass measuring efficiency, flow through the valve, residual gas, scanning, streaming through the windows, overcrowding. Fuel supply regulation: mixture requirements, mixture formation, carburettor, Otto and Diesel engine injection system. Combustion Otto and diesel engines: normal and impulse combustion, fuel quality, octane number, cetane number. Operating characteristics of Otto and Diesel engines, natural breathing and supercharged. ICE selection criteria, damage, maintenance. Specific types of ICE. **Laboratory part:** Export, control, replacement of various components. Study the engineering configuration of these components. Study of cooling, lubrication, air mixture formation - fuel booster. External and internal timing.

6th Semester

Title	**Heating - Cooling – Air Conditioning I**
Category	**CE**
Type	**Mixed**
Hours per week	**6 (2TH+1PE+3L)**
TU / ΦΕ	**6 / 10**
Typical semester	**6**
Course level	**M**
Course purpose: Acquisition of the requisite knowledge in the field of heating for the ability to elaborate complete heating studies.	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description: **Theoretical part:** Data for building heat-insulation. Describe, study and calculate of basic heating systems. Reference to sophisticated modern systems of the above mentioned installations with examples of their application. Numerical solution of problems partial or all of actual installations.	

Laboratory part:
Applications of heat-insulation -heating and preparation of integrated studies. Testing and measurement of boilers.

Title	**Industrial Automation**
Category	**CE**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**6**
Course level	**M**

Course purpose: Acquisition of basic knowledge and structure-function principles on automatic control systems through analysis and composition, as well as industrial automation systems for electrical-electronic, pneumatic, hydraulic and combination of them. The knowledge of behavior and control of the parameters of the corresponding variables as well as their application in integrated production control and industrial automation systems.

Course objectives: After successfully completing the course, students should:

⇨

⇨

Course description:

Theoretical part:

Concept of Automation - Introduction SAE - Examples from the practice of technology. Mathematical models for calculating SAE - usage of Laplace transform & transfer functions - Boolean algebra and tables. Implementation of structural diagrams and signal flow analysis automation. Constituent units of electrical automation. Design and synthesis of electrical automation. Constituent units of pneumatic - hydraulic controls. Design and synthesis of intellectual property - hydraulic controls. Constituent units of electronic automation. Using microprocessors and microcomputers in automation. Design and synthesis of PLC automation. Automation synthesis. Provision settings. Contemporary theory SAE. Applications of automation in industry (CIM). Integrated production control systems, intelligence - information processing. Integrated solutions for industrial automation.

Laboratory part:

Design, synthesis and application of automations with:

- Hydraulic systems
- Pneumatic systems
- Electrical systems
- Their combinations along with the use of PLC and PC.

Microprocessors and microcomputers programming as part of industrial automation.

Exercises in automation use.

Title	**Machining Processes with Digital Guidance**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (2TH+3L)**
TU / ΦΕ	**5,5 / 9**
Typical semester	**6**
Course level	**M**

Course purpose: The transmission of necessary knowledge regarding machine-tools programming with digital guidance for conducting processes of forming mechanical units of simple geometrical shape. The familiarization of students with the use of EIA/ISO (G-code) code and standardized processing cycles for various control units of digital guided machine-tools in modern industry. The purpose of this course is to introduce students to numerical control of modern digitally-driven machine tools and render them able of using them.

Course objectives: After successfully completing the course, students should:

- ⇨ be able to conduct codes of processes according to EIA/ISO for digital guidance machine-tools
- ⇨ know the use of processing cycles in Heidenhain, Fanuc and Sinumeric control units
- ⇨ be able to study, analyze and process digital guidance code produced by automatic systems CAD/CAM
- ⇨ be able to use CNC machine-tools for conducting processes
- ⇨ be able to conduct measurements of cutting tools and eliminate the items for conduction by conventional and automated methodologies.

Course description:

Theoretical part:
Introduction to programming machine-tools with digital guidance (numerical control), Numerical control systems, Coordinate systems, Coordinate interpolation methods for digital guidance of machine-tools, Programming language EIA / ISO (G-code), Automatic processing cycle, Management of machine-tools and compensation, File structure of CLDATA, Terminator processors, Contact between PCs and digital-driven machine-tools.

Laboratory part:
Learning programming EIA / ISO (G-code) for conducting processes of forming mechanical units in digitally guided machine tools, and development of laboratory applications of lathing and milling.

Title	**Computational Methods for Construction**
Category	**CM**
Type	**Mixed**

Hours per week	**5 (2TH+1PE+2L)**
TU / ΦΕ	**5,5 / 9**
Typical semester	**6**
Course level	**M**
Course purpose: The acquisition of essential knowledge regarding the computational analysis of engineer constructions that charge with thermo-mechanical loads using the finite elements method (FEA).	
Course objectives: After successfully completing the course, students should: ⇨ know how to calculate the stress and the strain of engineering constructions due to thermo-mechanical loads. ⇨ be able to simulate the intense condition of engineering constructions (in 2D and 3D dimensions) that are under thermo-mechanical loads.	
Course description: **Theoretical part:** 1. Introduction. The method of Ralyleigh - Ritz. The method of Galerkin. 2. Problems of a dimension. Axial tension. Torsion bar. 3. Develop registries stiffness (stiffness matrixes). 4. Netting. Development of stiffness matrix. 5. Beams and frames. Calculate stiffness matrix. Equivalent nodal loads of the item. 6. Two-dimensional problems. Triangle with constant distortion. 7. Quadrilateral and triangular elements of a higher order. Numerical integration. 8. Symmetrical by rotation bodies with symmetrical by rotation loads. 9. Solids in the field. Isoparametric elements. 10. The dynamic of mechanical constructions. 11. Field Problems. The method of Galerkin. Heat transmission. 12. Problems with restrictions on boundary conditions. **Laboratory part:** Applications of computational stress analysis - strain of engineering constructions with the method of finite element s (FEA) using proper PC software.	

Title	**Fluid Mechanics II**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (2TH+1PE+2L)**
TU / ΦΕ	**5,5 / 9**
Typical semester	**6**
Course level	**M**
Course purpose: Deepening in a wide range of chapters of Fluid Mechanics, as a continuation of the corresponding course of the 4th semester of studies.	

Course objectives: After successfully completing the course, students should:

- ⇨ have a deeper understanding of the flow in closed conductors, turbinate flow, flow in open conductors, hydrodynamic machines, while emphasis is given on compressor flow. Along with the teaching of theory, special emphasis is given in solving practical problems and the laboratory applications.

Course description:

Theoretical part:

Flow around bodies - basic principles of aerodynamics.

- — Theory of boundary layer.
- — Open flows.
- — Compressor flow.
- — Hydraulic shock.

Laboratory part:

- — Measurement of drag force on a body immersed in water flow.
- — Classification of centrifugal blower.
- — Collision of a jet of liquid into a solid surface.
- — Measurement of pressure drop in valves and piping.
- — Characterization of axial fan.
- — Characteristics operating centrifugal pump.

Title	**Renewable Energy Sources**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (2TH+1PE+2L)**
TU / ФЕ	**5,5 / 9**
Typical semester	**6**
Course level	**M**

Course purpose: Presentation of the exploitation technologies of the Mild - Renewable Sources of Energy.

Course objectives: After successfully completing the course, students should:

- ⇨ have acquired the basic exploitation knowledge of sun and wild power.
- ⇨ know the mild forms of energy.
- ⇨ be aware of the environmental consequences of the conventional sources of energy and the benefit of using renewable sources of energy.

Course description:

Theoretical part:

- — Possibilities and limits for use of renewable energy, meeting energy needs with renewable energy sources, problems and current efforts for their exploitation. Key elements of wind energy, wind characteristics, boundary layer, wind energy, wind measurements, Betz limit, wind generators (W/G)

type , degree of W/G efficiency, main W/G sections, wind farms, force analysis in W/G blades , calculation of annual energy production, economic component of the wind.

- Key elements of solar energy, solar radiation, solar constant, characteristics of solar radiation inside and outside the Earth's atmosphere, location and movement of the sun in relation to an observer on the surface of the earth, direct and diffuse solar radiation, methods and measuring instruments, calculation of solar radiation, solar panel, operating principles, balances of energy, typical performance, selective surfaces, concentrator solar panels, degree of efficiency, photovoltaic (PV) performance characteristic of PV, how wiring PV, degree of efficiency.
- Hydroelectric projects, type of hydroelectric power plants, calculation of energy produced.
- Biomass, combustion, pyrolysis, gasification, biofuels.
- Financial investment data of renewable energy sources.

Laboratory part:
Measurement of energy contained in air stream, points for operating small laboratory W/G and calculate the performance degree, consequence of impact angle on the blades based on the characteristics of W/G, measure the operational characteristics of PV in the laboratory and in the countryside, measuring the impact of connecting the P V, balance of power in solar panels, visit power plant made of renewable sources.

OPTIONAL COURSES of the MANUFACTURING SECTOR 6th SEMESTER

Title	**Experimental Strength of Materials**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**6**
Course level	**CE**

Course purpose: The understanding from the students of the mechanical properties of materials and their familiarization to the different kinds of materials extress with the aid of experimental methods, so as to be aware of the most important laboratory tests that provide a clear view of the resistance of engineering materials. Moreover, purpose of this course is to render the students capable of applying a laboratory evaluation test of engineering properties of materials in the frame of conducting an engineering construction or a research study.

Course objectives: After successfully completing the course, students should:

- ⇨ have embedded the knowledge of the theoretical part of the course of strength of materials.
- ⇨ estimate the mechanical behavior of a subject in various basic mechanical extress.

⇨ be able to experimentally verify any results that could be foreseen theoretically after a computational analysis.
Course description: **Theoretical part:** Loading test: Load device description - experiments. Types of tensile diagrams. Develop strength chart - identify characteristic points chart and related properties of the material for ductile and brittle fracture. Compression Test: Device Description-perform experiment. Develop a compression chart. Evaluation of results. Buckling Test: Description of device - perform experiment. Critical buckling load, evaluation of results. Torsion Test: Device Description - perform experiment. Develop a twisting diagram. Bending Test: Description of the device - perform experiment. Measure declinations due to bending, evaluation of results. Deformation measurement: Measurement of strain and maximum stress using electro-extensionmeter. Description of the experimental setup - perform experiment. Measuring Hardness Test: This method Brinell. Description of the device - perform experiment of hardness measurement by Brinell. The method of hardness by Rockwell. Description of the device - perform the experiment. Impact test by Charpy: Device description - perform the experiment. Fatigue Testing: Overview of methods - performance evaluation and experiment results. Non-destructive testing of materials: A description of methods and instruments and analysis of results. **Laboratory part:** Experiments performed by students in the above mentioned laboratory tests and evaluation of mechanical properties of the respective specimens.

Title	**Industrial Measurements - Automation Control**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**6**
Course level	**CE**
Course purpose: The acquisition of the essential knowledge regarding the technology of sensory instruments, their industrial measurements and the industrial automation control systems. In the frame of the course, students deepen in the understanding of capabilities, programming and the use of the above systems.	
Course objectives: After successfully completing the course, students should: ⇨ be familiar with industrial measuring systems and automation control systems.	

⇨ be able to design and materialize metrological applications using sensory instruments. ⇨ be able to design and materialize applications of automation control of the operation of mechanical arrangements according to appropriate measurements that connect to their operation.
Course description: **Theoretical part:** Introduction. Areas of interest and applications sensory instruments. Types and characteristics of sensors (detection approach, sensors of linear and angular displacement, acceleration, strain, force, pressure, flow, temperature, distance). Apparatus for data acquisition. Adaptors A / D. Interface analog sensors to the PC Signal reception. Processing of measurement data. Measurement faults. Principles of automated control systems. Mathematical description and modeling of dynamic systems. Transfer function and structural diagrams. Stability of dynamical systems. Adaptive control . Basic control layouts. Microcontrollers . Programmable logic controllers (PLC). Industrial networks and systems SCADA. Connecting PC with measuring devices to collect and process signals in real time and the continuously device monitoring based on constantly size measuring. Supervision and monitoring of real-time operation of industrial plants and facilities. **Laboratory part:** Elaboration by the students of laboratory applications using sensory instruments for receiving measurement signals and data processing for monitoring simple engineering applications.

OPTIONAL COURSES of the ENERGY SECTOR 6th SEMESTER

Title	**Industrial Refrigeration**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**6**
Course level	**CE**
Course purpose:	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description:	

Theoretical part:

- Refrigerant blends and circular functions.
- Cooling compressor units.
- Refrigeration units absorbed and steam nozzle.
- Cooling cycle gas plants and open cycle.
- Piping, machinery, fixtures & cooling areas.
- Applications of industrial refrigeration, cooling towers and cooling means.
- Household and industrial refrigerators.

Laboratory part:

- Laboratory measurements in home refrigerators.
- Laboratory measurements of heat pump.
- Construction of thermodynamic charts thermodynamic cycle (eg. p-h) worksheets

Title	**Techniques of Natural Processes**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**6**
Course level	**M**

Course purpose:

Course objective: After successfully completing the course, students should:

⇨

⇨

Course description:

Theoretical part:

- Definition and examples of physical / mechanical and thermal processes.
- Methods for calculating heat exchanging without phase change. Dimensioning.
- Thermodynamics of mixtures, mass and energy balances.
- Mechanical processes of separation. Types of filters.
- Calculation of strength of sealed containers and their accessories. Regulations.

Laboratory part:

- Laboratory measurements in domestic refrigerators.
- Laboratory measurements of heat pump.
- Construction of thermodynamic charts for logging thermodynamic cycle (eg. p-h) in worksheets.

7th Semester

COURSES of the MANUFACTURING SECTOR 7th SEMESTER

Title	**Machine Tools**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**7**
Course level	**M**

Course purpose: The presentation of modern machine-tools technology and the understanding of their fundamental principles of function, in order to be used efficiently. Specifically, the theoretical part of the course aims to transmit essential knowledge on constructive and operational parts of modern machine-tools and on their automatic control systems. The course also treats the methods used for the static and thermal analysis of machine-tools. Moreover, purpose of the course is to transmit to the students the cognitive background that regards to the diagnostic controls and the precision measurements that are essential for the good operation of the machine-tools. The laboratory part of the course has as purpose to familiarize the students with the use of CAM systems and their connection to digitally-driven machine-tools.

Course objectives: After successfully completing the course, students should:

- ⇨ know the structure and function of modern machine-tools .
- ⇨ know in detail the systems used for the operation and control of machine-tools.
- ⇨ be able to study and analyze the static, dynamic and thermal behavior of machine-tools.
- ⇨ carry out diagnostic controls in respect to the proper function of the machine-tools by using the appropriate metro-technic equipment.
- ⇨ be able study tool-machines oscillation problems.
- ⇨ be able to carry out measurements for the precision control of the machine-tools, evaluate the results and compile the adequate technical evaluative reports.
- ⇨ able to use CAM system for processes in digitally driven machine-tools.

Course description:

Theoretical part:
Overview of machine tools, Static dynamics and thermal analysis of machine tools, machine tool components, motors, shafts, Controllers, position encoders, Electrical and electronic arrangements of machine tools, Automatic control systems - Numerical control of machine tools, Systems of restraining and loading parts to be

processed, Diagnostics control of machine tools, Mounting machine tools to prevent transmission of oscillatory stimuli to and from the environment, Precision of machine tools CNC, Precision measurements at ISO 230, Standard control tests with digital tools receiving digital driving.

Laboratory part:
Practice using a computer and appropriate software CAM design engineering in forming engineering objects with the help of digitally-driven machine tools. Automatic generation of machine source code from the CAD geometric model. Terminator processors. Interaction between PC and CNC- machine tool.

Title	**Lifting and Transportation Machines**
Category	**SM**
Type	**Mixed**
Hours per week	**6 (3TH+3L)**
TU / ΦΕ	**7 / 12**
Typical semester	**7**
Course level	**M**

Course purpose: Familiarity with the study of mechanical installations and in particular with the development of work production machinery which, in this case, is the moving of loads in the space.

Course objectives: After successfully completing the course, students should:

- ⇨ have understood the installations for moving loads in factories, warehouses, places of production. The explanation of all installations and the practical training on some of them for gaining similar experiences.

Course description:

Theoretical part:

- Installations for moving loads with discontinuing operation (crane bridge)
- Description of the installation lift system. Wire ropes, pulleys, drums, motors, brakes.
- Description of the installation path of the trolley and crane bridge. Rolling cogs, motors, brakes, couplings.
- Description of metal work facility, which is configured as either full-length body or as a meshy body.
- Detailed calculation of all the above items under the applicable regulations (DIN respectively and Eurocode 3).
- Description of the security measures of a facility and measures to ensure the continued operation of the facility until the next scheduled maintenance.
- Description of special lifting equipment such as hoists, jacks, etc.
- Facilities for moving loads with continuous mode (conveyor belts)
- Description of the installation of a conveyor belt. Support raoulas, drums of moving and reversal, cleaners, hardware drivers, motors. Species and type of conveyor belts. Film tensioning system. Metallic construction of supporting the conveyor belt.

— Development of calculation method of the facility in according to applicable regulations.

Laboratory part:

— Practical training on lifting facilities for similar experiences.
— Processing of study of the facility for moving loads with the corresponding calculations and schemas.

OPTIONAL COURSES of the MANUFACTURING SECTOR 7th SEMESTER

Title	**CAD/CAE**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (2TH+3L)**
TU / ΦΕ	**5,5 / 9**
Typical semester	**7**
Course level	**CE**

Course purpose: The acquisition of essential knowledge concerning the methodology of parametric design, analysis and optimization of mechanical parts and arrangements using computing systems CAD / CAE.

Course objectives: After successfully completing the course, students should:

⇨ be familiar with three dimensional parametric design systems / analysis-optimization using the method of finite elements (CAD/CAE).
⇨ be capable of making decisions regarding designing of mechanical parts or constructions based on results of simulation of their operation with finite elements systems.

Course description:

Theoretical part:

3 Dimensional space. Definition of edges, lines, surfaces, solids. Parametric modeling of solid geometry. Methods of geometrical and technological exchange data between systems, CAD / CAE. Neutral files IGES & STEP. Exam and create geometric topology data systems CAE. Types of finite elements. Create a 3D grid finite element mesh quality control. Set boundary conditions and loads. Types of analysis with the finite element method (static, dynamic, thermal, combined linear and nonlinear). Applications of finite element analysis for stress and strain. Analysis of results and optimization of geometry model.

Laboratory part:

Application of theoretical modules by means of examples and applications Design and optimization of mechanical parts and construction systems using CAD / CAE.

Title	**Design of Mechanical Engineering Constructions**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (2TH+3L)**
TU / ΦΕ	**5,5 / 9**
Typical semester	**7**
Course level	**CE**

Course purpose: The acquisition of the necessary knowledge on the principles and the methodology of the engineering design of a product or an arrangement in conjunction with the choice of production methods and quality control.

Course objectives: After successfully completing the course, students should:

- ⇨ be familiar with the engineering design methodology.
- ⇨ be able to conduct a complete mechanical constructions or mechanical products study.

Course description:

Theoretical part:
Conceiving the idea. Concepts of engineering systems. Stages of work in design engineering constructions. Design of a product or a complex mechanical arrangement. Search, analysis, selection, evaluation and optimization of possible solutions. Preparation design study. Basic rules of formation. Division of work into separate pieces. Construction according to the rules of standardization, production and assembly. Error recognitions and product optimizing. Means required for designing manufacturing a new product. The main materials that are used in mechanical engineering constructions. Quality inspection of finished product. "Circle of Life" product.

Laboratory part:
Elaboration, by students during the semester, of a design study of a complex engineering construction, a mechanical device or mechanical engineering product according to the principles and phases of engineering designing.

Title	**Systems – Robotics**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**7**
Course level	**CE**

Course purpose: To provide the necessary knowledge on modern systems technologies of industrial production. Emphasis is given on the description and

analysis of industrial robots, which are an essential tool in any modern industrial sector.
Course objectives: After successfully completing the course, students should: ⇨ be familiar with the modern systems of production systems ⇨ be able to choose and program the productive process by selecting the appropriate productive process and applying modern techniques like prototype creation etc. ⇨ be capable of improving the level of automation of a productive process, introducing the use of industrial robotic systems.
Course description: **Theoretical part:** Production systems with digital driven machine tools. CIM Production systems. Standard methods of interconnection of individual system components CIM. Relocation of machine tools. Distribution of cutting tools. Custom devices for restraining. Transportation provisions. Principles of assembling systems. Measuring machines with digital guidance (CMM). Non-conventional technologies of production systems. Reverse engineering , Rapid prototyping, Rapid tooling. **Robotics:** Historical overview. Areas of interest and applications of robotics. Structure of the robot. Components. Robot categories. The mechanical part. Degrees of freedom. Geometric forms of robotic arms. Wrist, Grapple. Motoring devices of robotic systems: Pneumatic - Hydraulic actuators. Electric actuators: Stepper motors, Types, driving, particularities. DC motors, Driving, Revolution Reducers. Sensors for robotic systems. Low Level Control: Servo checking of a joint, Basic structure of a closed loop system, Provisioning speed, acceleration, Motion profile, Implementation. Coordinated control of joints. Audit trail. **Laboratory part:** Elaboration of useful applications by laboratory students using automation - robotic systems, as well as reverse engineering.

Title	**Foundries– Weldings**
Category	**SM**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**7**
Course level	**CE**
Course purpose: Theoretical and practical training on the methods, techniques and practices of performing weldings and castings of metals and alloys.	
Course objectives: After successfully completing the course, students should: ⇨ be able to choose the appropriate welding and foundry method depending on	

the technical specifications and the requirements of the construction or the product as well as the materials to be used.
- ⇨ be capable of choosing the appropriate technological conditions of foundry and welding like temperature, tension, speed, stirring time, duration of the thermal process etc.
- ⇨ know the quality control methods of the products using the above product techniques.

Course description:

Theoretical part:
FOUNDRIES: Casting materials. Phenomena during the solidification and crystallization of the material (nucleation, growth, and eutectic solidification, differentiate). Foundry. Casting methods. Foundry presses and casting tools. Power supply systems. Metallographic and non-destructive testing of castings.
WELDINGS: Types of connections. Heat source. Density of heat-flow. Heat-affected zone. Advantages and disadvantages of the welds. Adhesion of materials. Welding melting. Electrical arc welding and inert gas protection. Regulations of electrodes. Oxygen welding. Bonding with Plasma. Bonding with a Laser. Welding with electron beam. Welding pressure. Welding heterogeneous. Welding symbolism. Preparing the ends of pieces to be welded. Forms of seams. Thickness of seams. Deformation during welding, internal stress. Seam weld defects. Quality Control of Welding. Criteria for selecting the method of welding. Security measures during welding.

Laboratory part:
Working out a casting and welding laboratory by students and quality control of the samples produced.

Title	**Mechanical Configurations**
Category	**SM**
Type	**Mixed**
Hours per week	**3 (2TH+1PE)**
TU / ΦΕ	**4 / 7**
Typical semester	**7**
Course level	**CE**

Course purpose: Transmission of the basic theoretical and technological knowledge on the subject of metallic materials mechanical configurations and gaining of experience in designing and conducting mechanical parts configuration processes by using the techniques of mechanical configurations.

Course objectives: After successfully completing the course, students should:
- ⇨ understand the phenomena that take place in mechanical parts configuration processes with plastic deformation.
- ⇨ know the modern techniques of mechanical configurations.

- ⇨ be capable of choosing and designing configuration processes as well as determining their technological parameters.
- ⇨ be capable of analyzing the results of mechanical configuration processes.

Course description:

Theoretical part:
Mechanical properties of metals. Theory of plasticity. Leakage criteria. Standard mechanical tests to determine characteristic properties for ductile metals. Effect of temperature and anisotropy of the material during plastic deformation. Tools for mechanical configurations. Ordering of configuration processes: forging, rolling, extrusion, drawing, surveying, valuation, swaging and bending. Basic knowledge of operation and technological elements of the hydraulic mechanical presses. Defects on finished pieces, Residual stresses. Friction, wearing and lubrication of tools in machining in processing of mechanical configurations. Numerical simulation methods of simulating the forming processes of solid material and lamina with plastic deformation. Design and manufacture of cuttive and formative molds.

Practical Exercises:
Calculation of basic parameters of the above mentioned processed of forming mechanical parts with plastic material deformation.

Title	**Heat and Surface Treatment of Metals**
Category	**SM**
Type	**Theoretical**
Hours per week	**3 (2TH+1PE)**
TU / ΦΕ	**4 / 7**
Typical semester	**7**
Course level	**CE**

Course purpose: Learning the most important methods of thermal and surface processes of metals and alloys that are used in mechanical engineering applications.

Course objectives: After successfully completing the course, students should:
- ⇨ be capable of choosing the proper thermal and surface process which a metallic material should undergo in order to obtain the desirable properties e.g., mechanical resistance, resistance to corrosion or erosion, resistance to surface wear, etc.
- ⇨ be able to choose the conditions of the thermal or surface process by defining the optimum process parameters according to the technological requirements.

Course description:
Heat treatment: Annealing (full, partial, normalization, homogenization, recrystallization, cashiered). Dyeing and restoration , means of dyeing and cracking tendencies. Martensitic dyeing. Martensitic transformation. Flame dyeing. Induction paint. TTT and CCT diagrams. Restore simple and alloy metallic materials. The role of alloy elements. Sclerosis by material aging. Structural changes during aging.

Thermodynamics of precipitation. Surface treatments: Carbonization, nitriding, nitrocarbonization, nickelizing, cyanosis, voriosis, chromating, alouminizing, galvanizing, anodizing, phosphating, plating and surface coatings (PVD, CVD, LCVD, Plasma spray, Thermal spray, HVOF).

COURSES of the ENERGY SECTOR7th SEMESTER

Title	**Hydrodynamic Machines**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**7**
Course level	**M**
Course purpose:	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description: **Theoretical part:** — Introduction & Categories of Turbomachinery. — Dimensional Analysis of Turbomachinery. — Basic Laws of Turbomachinery. — Efficiency of Turbomachinery. — Turbomachinery Operating Characteristic Curves. — Characteristic Pipelining Curve. — Pump Connection (Parallel and in Series). — Theory of Two-Dimensional Blades. — Triangles of Turbomachinery Shaft Speed. — Triangles of Speed Radial (Centrifuges) Turbomachinery. **Laboratory part:** — Classification of centrifugal pump - Pump A. — Classification of centrifugal pump - Pump B. — Determination of curve pump characteristic at different rotational speeds of operation & finding curve contours efficiency. — Operation of two centrifugal pumps connected in series — Operation of two centrifugal pumps connected in parallel. — Determination of operating point of centrifugal pump & pipelining. — Determination of blade angle for the centrifugal pump. — Cavitation detection and Identification of NSPHR in a centrifugal pump.	

Title	**Steam Turbines and Steam Boilers**
Category	**SE**
Type	**Mixed**
Hours per week	**6 (3TH+3L)**
TU / ΦΕ	**7 / 12**
Typical semester	**7**
Course level	**M**
Course purpose: Acquisition of basic knowledge in the field of industrial steam productors and thermal turbomachinery.	
Course purpose: After successfully completing the course, students should: ⇨ be capable of energy calculation of a steam productor engine unit, calculation of the side factors (alternators etc.) compilation of relevant energy flow diagrams in a steam productor- turbomachinery system for the production of electric energy.	
Course description: **Theoretical part:** Key elements of technical thermodynamics, association size, state of water and steam, combustion, basic equations of combustion, calculations for supplying combustion air, composition of exhaust-gases, producing CO2, fuels, boiler types, description and operation of steam productors, balances of energy exchangers and boilers, heat transfer on key parts of the steam productor, smokestack, calculation of gas dew point, steam piping, steam network elements, pressure loss calculations, heating, steam traps, condensate networks, network components, water treatment for use in steam boilers, boiler operation safety rules, basic principles of steam turbine operation, flow calculation in blades, speed triangles, thermodynamic calculations, turbines of action and reaction, degree of efficiency calculation of turbine,power cycles, RANKINE cycle, energy balances in circles of power production, calculation of performance degree, methods for improving efficiency, alternative methods of power production, future directions. **Laboratory part:** Balance of power of boiler, exhaust gas analysis, heat loss from insulated pipe, energy balance on steam turbine, energy balance on heat exchanger condenser, computation of performance degree of RANKINE cycle. At the same time the experimental results are compared with results theoretical calculations.	

OPTIONAL COURSES of the ENERGY SECTOR 7th SEMESTER

Title	**Internal Combustion Engines II**
Category	**SE**

Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU / ΦΕ	**5 / 8**
Typical semester	**7**
Course level	**CE**
Course purpose: Presentation and development of basic concepts of the science of technology on which the operation of internal combustion piston engines is founded. Study of the various function and construction parameters which affect the operation, the effect, the performance and their dynamic behavior in the environment and man's health. Study of the laboratory observation equipment and evaluation of their function.	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description: **Theoretical part:** Formation and control of pollutants: nitrogen oxides, carbon monoxide, unburned hydrocarbons, particulates, exhaust gas processing. Catalytic converters and emission control systems. ICE energy behavior, thermal calculation of engine, supercharging. Heat engine: heat transfer by convection and radiation, heat load and temperature of various components. Friction and lubrication: general principles, friction of various components, friction losses, lubricants, types of lubrication, hydrodynamic lubrication theory. Information dynamics of reciprocating engines, kinematics. Working forces of substance and mass, torque diagram, balancing. Examples of calculations. Power supply systems with mechanical fuel injection. **Laboratory part:** Laboratory measurements and engine testing: measure various functional sizes, types of tests, performance charts. Electric dynamometer: measurements, calculations, diagram construction. Download of dynamic point chart: processing, calculations. Exhaust gas analyzer: operating principles, measurement and limits for emissions. Electronic control unit of car engine: description, measurement, vehicle damage identification. Device for head testing: detection of head faults, in actual operational temperature.	

Title	**Electrical Motors II**
Category	**SE**
Type	**Mixed**
Hours per week	**4 (2TH+2L)**
TU / ΦΕ	**5 / 8**
Typical semester	**7**
Course level	**CE**

Course purose:
Course objectives: After successfully completing the course, students should: ⇨ ⇨
Course description: **Theoretical part:** Generally about the use of electricity in motion and the requirements of the powertrain. Structure of electric drive systems. The pair system prime mover and electrical generator and its applications, testing, operation and automation. The system of engine and engine of work production (mechanisms of motion transport, torque, speed, friction, transients, stability). Speed control arrangements (Kramer, Scherbious, Kaskade). Systems with or without electronic power converters. DC engine systems with controlled AC or DC electronic voltage regulators. Systems of three-phase inductivie motors with electronic control voltage converters or cycloconverters or frequency converters or inverters to control slip with power recovery. Modern three-phase engine systems with cycloconverters, self-check systems of modern engines. Systems with other types of electronically controlled engines. Use of programmable controllers in motion. Mathematical analysis of systems behavior, start, stop, protection. Techniques for controlling systems via computer. Efficiency and energy savings. Comparison and selection criteria. Use of systems in electric trains, electric buses, electric and hybrid vehicles, lifts, hoists, air transport systems, transport systems, industrial materials, air conditioning units, etc. **Laboratory part:** The subjects of the exercises are listed in the study of permanent or transient behavior of various types of electric drive systems using electronic power converters by means of automatic control or computer. In particular, apart from the fundamental techniques for controlling electric motion, DC motor systems are considered and controlled by a power converter with a DC motor with closed loops of speed and current control, with a DC machine controlled in all four quadrants, with three-phase induction motor control through voltage, with three phase induction motor control via frequency converter PWM with a three-phase induction motor finger carrier cursor controlled by inverters with slip effect control, with modern three-phase motor via inverter with sensor location.

Title	**Computational Methods in Fluid Dynamics and Heat Transfer**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**7**
Course level	**CE**

Course purpose:

Course objectives: After successfully completing the course, students should:

⇨

⇨

Course description:

Theoretical part:

- Transport equation: report on the mechanisms of convection, diffusion and source. Presentation of equations of Navier-Stokes (continuity and momentum), energy and explanation of various terms.
- Summary of Numerical Analysis. Solution of algebric systems. Linearization of algebraic equations. Numeric fault.
- The derivative approach with Taylor rows. Upstream, downstream and centrist differentiation.
- Discretization, computational grid and boundary conditions.

Laboratory part:

- One-dimensional, permanent heat transfer on a bar (resolution with calculations using Excel):
  - Fixed coordinator of conductivity, without external cooling / heating with convection or heat production.
  - Fixed coordinator of conductivity with external cooling / heating with convection or heat production.
  - Variable (depending on temperature) coordinator of conductivity, with an external freezing / heating with convection or heat production.
- One-dimensional, non-permanent cooling / heating (point) body (resolution with calculations using Excel).
- Resolve to Excel with trial-and-error equation of combusting hydrocarbon of type CaIβOγ with air. The calculations will take into account a given super-stoichiometric ratio λ, the temperature of the oxidating air and the change in heat capacity of gases and temperature to calculate the content of the exaust fases and the adiabatic combustion temperature.
- Solving of pipeline networks of liquid or gas flow using the Hardy-Cross method.
- Solving two-dimensional, steady, laminar flow.
- Solving using method of Runge-Kutta of an appropriate problem (e.g. particle trajectory through a given fluid flow).

Title	**Heating - Cooling- Air Conditioning II**
Category	**SE**
Type	**Mixed**
Hours per week	**5 (3TH+2L)**
TU / ΦΕ	**6,5 / 11**
Typical semester	**7**

Course level	**CE**
Course purpose: The acquisition of requisite knowledge in the field of Ventilation and Air Conditioning for the elaboration of basic study of Air Conditioning.	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description: **Theoretical part:** Theory of cooling (cooling cycles and provisions), compressors of refrigeration units. Psychrometry (situations and changes in air). Calculation of cooling loads. Air ducts, election fans. Description, design and calculations of basic air-conditioning systems (central units, semi-central units, split systems, cooling with Fan Coils). Reference to sophisticated modern systems of air-conditioning. Numerical problem solving of a part or all of a total of real small businesses. **Laboratory part:** Measurements and exercises in refrigerating air-cooled units and water-cooled condensers. Exercises in experimental Central Air-conditioning unit. Presentation of Split experimental working mode and experimental cooling tower. Other applications of air conditioning.	

Title	**Environmental Technology**
Category	**SE**
Type	**Theoretical**
Hours per week	**4 (2TH+2PE)**
TU / ΦΕ	**5 / 8**
Typical semester	**7**
Course level	**CE**
Course purpose:	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description: The impact of human activity on the environment, environmental economics, the concept of sustainability. Classification of human activities and environmental impacts. The anti-pollution technology. The principle of zero-carbon design with respect to the approach of retention. Examples from industry, housing and daily human activity.	

Resource savings. Gaseous waste and main causes of their production. Measurement of gas wastes, retention systems of gas wastes, chemical processing of gas wastes, applications. Liquid waste and main causes of their production. Measurement of liquid waste, wastewater retention and cleaning systems , wastewater chemical processing systems, applications. Solid waste and their main causes of production. Measurement of solid waste, retention and treatment of solid waste, chemical processing of solid waste , applications. Environmental management systems. Introduction to ISO 14000. Anti-pollution technology equipment. Filters, cyclones, soackers, gas decontamination systems design. Wastewater processing, biologic purifications, aerobic and anaerobic processing systems. Processing of solid wastes, landfills, thermal processing of wastes. Recycling. Principles of recycling, waste management systems.

Title	**Organization, Management and Implementation of Technical Project**
Category	**SE**
Type	**Theoretical**
Hours per week	**4 (2TH+2PE)**
TU / ΦΕ	**5 / 8**
Typical semester	**7**
Course level	**CE**
Course purpose:	
Course objectives: After successfully completing the course, students should: ⇨ ⇨	
Course description:	

7. DEPARTMENT LABORATORIES

To meet the Educational and Research needs of the Department the following Laboratories operate:

INFRASTRUCTURE SECTOR

- Physics –Thermodynamics
- Informatics
- Mathematics–Numerical Methods

MANUFACTURING SECTOR

- Machine Tools and Mechanical Technology
- Applied Engineering and Dynamics of Mechanical Engineering
- Machine Elements- Lifting and Transportation Machinery
- Technology of Materials
- Engineering Workshop

ENERGY SECTOR

- Fluid Mechanics and Hydrodynamic Machines
- Energy Systems and Thermal Engines
- Electrical Measurements and Industrial Automation
- Internal Combustion Engines
- Heating-Cooling-Air Conditioning

INFRASTRUCTURE SECTOR

1. PHYSICS – THERMODYNAMICS WORKSHOP

Laboratory Administrator: Professor HASSAPIS Dimitrios

Educational Work

The Workshop of Physics - Thermodynamics supports the educational work of the Department of Mechanical Engineering by covering the teaching of theoretical and laboratory part of the following courses:

- Physics I
- Physics II
- Thermodynamics

Objective:
The Physics Workshop has as main objective to bring together tomorrow's technologist engineer with the Experimental Physics and more specifically with the substance of the experimental procedure: to measure a physical quantity, export useful conclusions by graphic and/or numerical processing of measurements and quantitative assessment of the accuracy of the final result.

Furthermore, the Physics Workshop has equipment that serves the development of dissertation projects, conducting research and providing services to thirds.

Educational equipment:
To serve the educational process the Workshop has integrated experimental devices, each of which serves two students. The provisions cover the following topics:

1. Measuring the static and kinetic friction
2. Composition of electronic harmonic oscillations
3. The fundamental equation of Engineering (Machine Atwood)
4. Coefficient of linear thermal expansion
5. Composition of coplanar forces
6. Straight smoothly accelerated motion
7. Freefall
8. Determination of gyration with the method of speed oscillations
9. Hooke's Law - Harmonic oscillation of coil springs
10. Measurement of gravitational acceleration on the simple pendulum
11. Ohm's Law
12. DC Circuit
13. Resonance in forced electromagnetic oscillations RLC circuit in series
14. Determination of the gravitational constant (by torsion balance in Gavendisch)
15. Earth's magnetic field
16. Grading of thermal element
17. Transistors - Crystal triods
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 the convenience of research activities and services the Workshop of Physics currently 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 systemelectronic
- ✓ Portable radiometer FH40G of Eberline Intruments
- ✓ Weather Station Vantage Pro2 and Weatherlink software of Davis Instruments
- ✓ Portable sound measuring MI6301 PR Pro Set and SoundLink software of METREL
- ✓ Computer Software Mathcad 13 of Mathsoft Engineering & Education

2. INFORMATICS LABORATORY

Laboratory Administrator: Associate Professor PANTAZOPOULOS Athanasios

Educational Work

The Informatics Workshop supports the educational work of the Department of Mechanical Engineering, STEF / TEI of Serres, by covering teaching of the laboratory part of the following courses:

- Introduction to Computers and Programming
- Computer Programming

3. MATHEMATICS–NUMERICAL METHODS LABORATORY

Laboratory Administrator: Assistant Professor KLEIDIS Konstantinos

Numerical Analysis falls in the spectrum of Applied Mathematics and treats the finding of approximate solutions to complex problems whose solution, in the frame of a mathematical model, 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*. In this frame, 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 comprised of a finite number of steps, for the solution of a problem, with a finite number of operations in every step), as well as the study of their precision and stability, that is, their *error* analysis. The applied part regards programing of the algorithms in question, in a programming language, in the optimum way – that is, with the least possible computational time (CPU hours) and the demanded space of memory (RAM).

The rapid development of computational systems lead to the management of a great deal of intractable scientific applications, through numerical methods. For this reason, in 2010 the Workshop of Numerical Methods of the Department of Engineering of the TEI of Serres started its activities. Today, the present Workshop is still being developed aiming to meet (as far as possible) the needs of the educational process.

Educational Work

The Numerical Methods Workshop supports the educational work of the Department of Engineering covering the teaching of the laboratory part of the course:

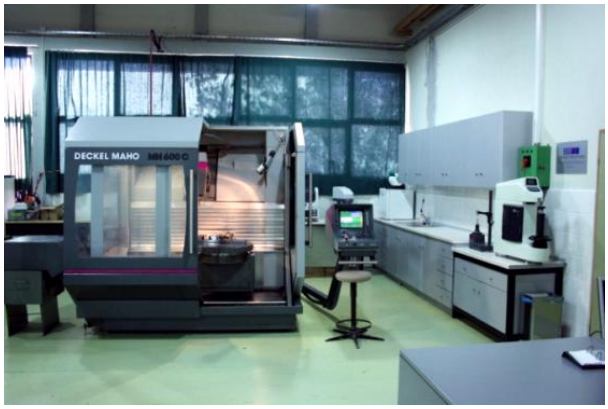
- Numerical Analysis

MANUFACTURING SECTOR

1. WORKSHOP of MECHANICAL TECHNOLOGY AND MACHINE TOOLS

Laboratory Administrator: Professor DAVID Konstantinos

The Machine Tools Workshop of the Mechanical Engineering Department of TEI of Serres started operating in 1994, when it was founded and began to be equipped with suitable mechanical and metrological equipment in order to meet its mission both in the educational process and in elaborating technological research.



The objective of the Workshop is to provide excellent education in the subject of Machine Tools, Machining, and in general of molding technology mechanical products. Moreover, the Workshop is constantly developing and updating the knowledge through the implementation of research projects. Also, the philosophy of the workshop includes the provision of technology services to the industry in which the Workshop maintains close working relationships by providing customized services.

The activities of the Workshop concern the following scientific fields:

- 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 Work

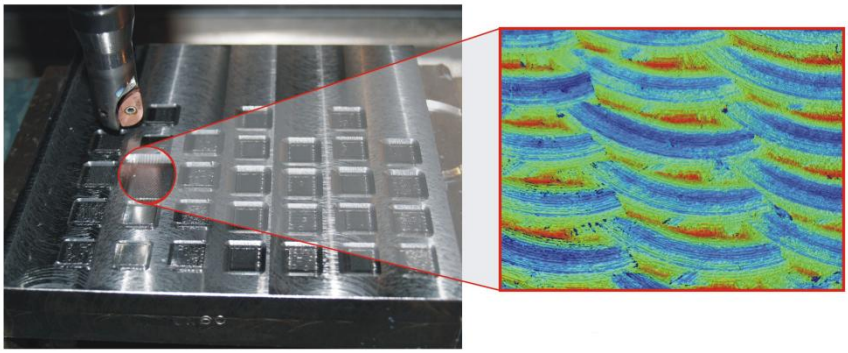
The Workshop of Machine Tools supports the educational work of the Department of Mechanical Engineering by covering the teaching of theoretical and laboratory classes of the following:

- Machine Tools
- Mechanical Configurations and Tribology

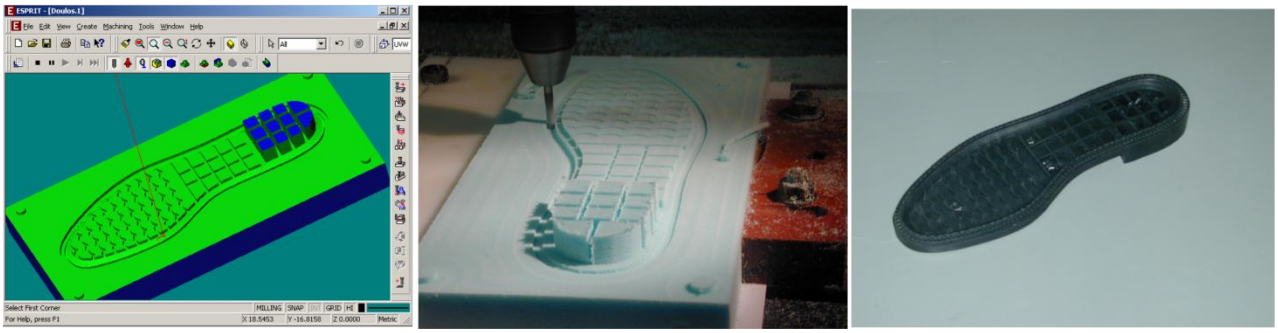
- Design with Computer
- Construction Designing
- Production Systems - Robotics

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. Study of static and dynamic strength of mechanical components and devices through calculations using the finite element method (FEM).
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

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.

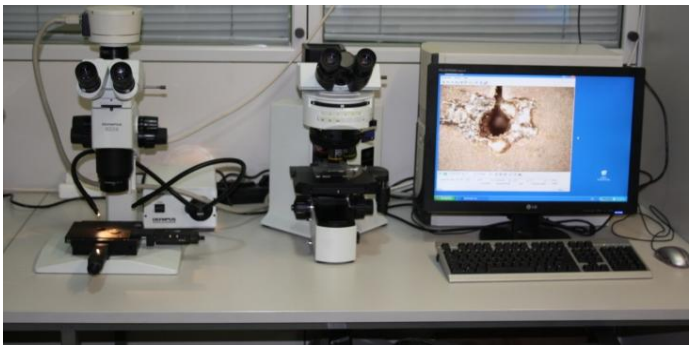
Seminars

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 centerDECKEL-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 Interferometer VEECO)
6. Optical Microscope (with digital camera), OLYMPUS
7. Optical Stereoscope (with digital camera), OLYMPUS
8. Micro durometer Vickers
9. Digital Rockwell hardness meter
10. Portable hardness meter Brinell, 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 Rmg1045) Karl DEUTSCH



15. Various metering sensors (acceleration, velocity)
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 (NATIONAL INSTRUMENTS)
23. Digital oscilloscope
24. Programmable checking device PLC Simatic S7-300
25. Inductive furnace with digital temperature indication

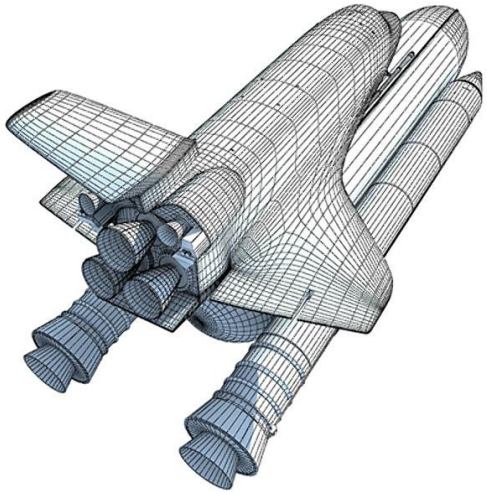
26. Full range of appliances metallographic laboratory (preparation metallographic specimens STRUERS).

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, TopCaM, Esprit, EdgeCam)
4. Analysis and processing of measuring data (LABVIEW)

2. WORKSHOP OF APPLIED ENGINEERING AND DYNAMICS OF MECHANICAL ENGINEERING

Laboratory Administrator: Professor GKOTSIS Pashalis



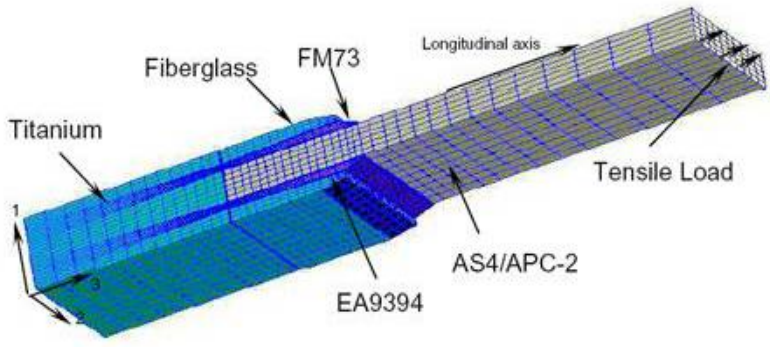
Educational Project

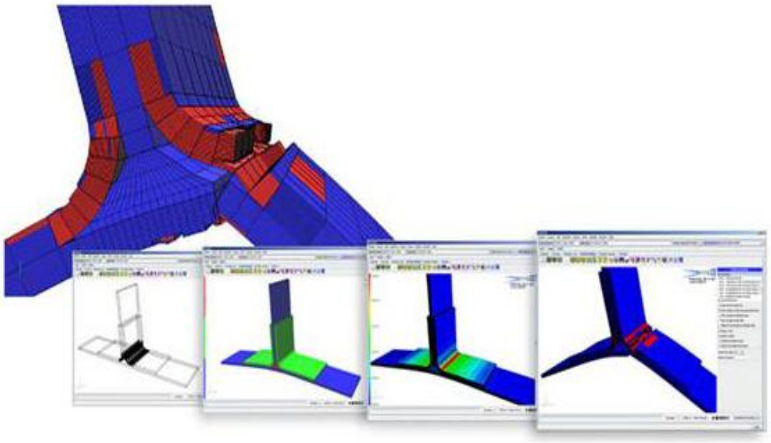
The Workshop of Applied Engineering and Dynamics of Mechanical Engineering supports the educational work of the Department of Mechanical Engineering by covering the teaching of theoretical and laboratory courses of the following classes:

- EngineeringI
- Engineering II
- Oscillations and Machine Dynamics
- Computational Methods for Construction
- CAD/CAE
- Experimental Material Strength

Research

Field of study is the area of Composite Materials and constructions made of Composite material, development, modeling, simulation and transmission of fracture as well as the fracture load with the use of finite elements. Also, the structural optimization of constructions.





Equipment

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

Twisting machine (INSTRON M55)

Software analysis of composite materials by the finite element analysis method (GENOA)

3. WORKSHOP OF MACHINE ELEMENTS - ELEVATING & CONVEYING MACHINERY

Laboratory Administrator: Professor MOISIADIS Anastasios

The Workshop of Machine Elements - Lifting & Transportation Machinery deals with the design, analysis and synthesis of engineering systems in general and the lifting and transport in particular. The corresponding course combines a broad range of cognitive subjects of Engineering such as Mechanical, Electrical and Electronic, Machine Elements, Hydraulic Systems, etc., hence the mission of the workshop 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 designs.

particular emphasis is placed 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, braking system, marching system, metallic construction, construction measures to increase operational safety and availability of lifting and transportation systems.

Also 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 Work

The Workshop of Machine Elements - Lifting & Transportation Machinery supports the educational work of the Department of Mechanical Engineering by covering the teaching of theoretical and laboratory classes of the following:

- Lifting and Transportation Machines
- Machine Elements I
- Machine Elements II
- Mechanical Installations
- Steel Constructions

a. TECHNOLOGY OF MATERIALS WORKSHOP

Laboratory Administrator: MOSHIDIS Nikolaos (Lecturer)

Educational Work

The Technology of Materials Workshop supports the educational work of the Department of Mechanical Engineering and covers the teaching of theoretical and laboratory of the following classes:

- Introduction to Material Science
- Technology of Mechanical Engineering Materials

- Heat and Surface Treatment of Metals

The Materials Technology Laboratory forming in the Construction Sector since 2006, is growing more and more with the supply and installation of new modern machinery and equipment, for the training and practical training for students on subjects related with:

- Casting of metals, particularly aluminum alloys
- Cutting and preparation of mineral samples
- Observing the structure of the samples under a microscope
- Measuring the hardness of samples
- Resistance measurement of samples

Equipment

The Laboratory is equipped with:

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

It should be noted that, apart from education and practical training for students, the equipment is used especially for dissertation projects and research programs of the institution.

4. ENGINEERING WORKSHOP

Laboratory Administrator: MARKOU Athanasios (Application Instructor)

Educational Work

The Engineering Workshop supports the educational work of the Department of Mechanical Engineering by covering the teaching of theoretical and laboratory courses of the following classes:

- Machining Technology I
- Machining Technology II
- Mechanical Design I
- Mechanical Design II

ENGINEERING WORKSHOP I

The Engineering Workshop I is equipped with the most modern and latest machinery, tools and instruments. In this lab and for each semester, about 80 students carry out laboratory exercises in 4 groups. The laboratory exercises are carried out in separate sections that include all the cognitive areas of the material of study outline. These sections are:

1. Fitter
2. Measurements
3. Welding
4. Pipery
5. Rolling mill
6. Sharpenry and Foundry

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

MACHINING TECHNOLOGY II

The Engineering Workshop is fully equipped with (lathes, milling tools axis, drills etc.) in order to fulfill the educational needs of the course Machining Technology II. The equipment is in excellent condition and recently some tool machines were equipped with digital position measuring systems. Students during the semester, in the workshop part of the course, are trained both in handling the abovementioned tools, making a total of ten different exercises, but in theoretical articles related to technology of mechanical configurations with material removal as well. Every semester around 80 students in four groups are trained.

MECHANICAL DESIGN WORKSHOP

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

In the Mechanical Design Workshop, each semester six student teams of 24 persons, fulfill their laboratory exercises during the classes Mechanical Design I & II. During their training students design components in elevations, intersections, details, and practice in fitting scales and 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 Regulations DIN, ISO etc.

Alongside with all of 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.

ENERGY SECTOR

1. FLUID MECHANICS & HYDRAULIC MACHINES WORKSHOP

Laboratory Administrators: SOFIALIDIS Dimitrios Associate Professor
STOILAS Georgios (Application Instructor)

The laboratory is located on the ground floor of Heavy Engineering Laboratory of the Department.

EQUIPMENT

The workshop is equipped with the following:

- Closed network appliance with KAPLAN water turbine with variable angle fins.
- PELTON water turbine system.
- Axial fan with import & export ducts.
- 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.

The laboratory has auxiliary equipment such as:

- Viscometer.
- Pitot. Tubes
- Flowmeters.
- Manometers.
- Dynamometers.
- Instruments for measuring electrical quantities

SUPPORT OF COGNITIVE OBJECT

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

- **A. Fluid Mechanics I & II, of the 4th and 5th semester, respectively**

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.

- **B. Hydrodynamic machines of the 6th semester**

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.

2. WORKSHOP of ENERGY SYSTEMS AND THERMAL ENGINES

Laboratory Administrator: Associate Professor KATSANEVAKIS Athanasios

The Renewable Energy Sources Laboratory serves the needs of the following courses:

- Renewable Sources of Energy–RSE
- Steam turbines and steam boilers
- Heat transmission

Renewable Sources of Energy–RSE

Course Objectives: 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 the RSE, 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.

The following experiments are 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 attact 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.

In the laboratory the following experiments are implemented in 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. In the meantime, experimental results are compared with results of theoretical calculations in order for the students to gain perception about the relationship between natural phenomena and methodologies of calculation.
Additionally, in the laboratory a the combustion chamber exists, for student familiarity with the operation of the burners and configuring the combustion parameters.

Heat transfer

Course Objectives: To acquire knowledge in the field of heat transfer.
Course Purpose: To set the students able to understand the phenomena of heat transfer.
Course description: The course is implemented through lectures and active participation in practical exercises.
The subjects covered are:
Fundamentals of heat transfer, heat transfer by conduction, induction, radiation, basic equations, typical applications, dimensionless numbers in heat transfer, complex heat transfer. Heat transfer in insulating materials, through walls, on blade/ vane surfaces, in pipes, in heat exchangers, applications.

3. ELECTRICAL MEASUREMENTS AND INDUSTRIAL AUTOMATION WORKSHOP

Laboratory Administrator: THEMELIS Dimitrios (Application Instructor)

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

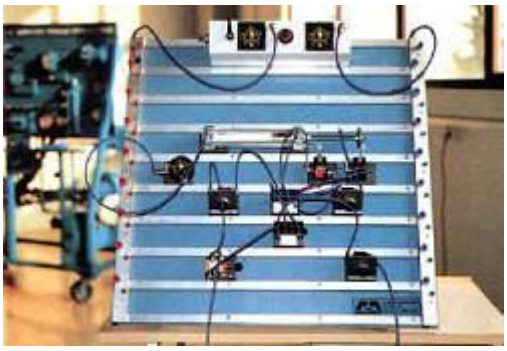
- Industrial Automations
- Electrical Engines
- Electrotechnics

INDUSTRIAL AUTOMATION

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 that can be adjusted to 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.

ELECTROTECHNICS

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.

ELECTRICAL ENGINES

This workshop 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 Machines, 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.

4. WORKSHOP of INTERNAL COMBUSTION ENGINES

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

- Internal Combustion EnginesI
- Internal Combustion Engines II

The Laboratory is equipped with the following equipment:

Models of engines intersected for inspection during training for 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 and operational, to state that they meet the specifications and therefore it is possible to operate them without problems.

Cluster of electromagnetic dynamometer to conduct laboratory measuring exercises of various parameters in operating engines and study the effect of altering these parameters on the performance of the engines. 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 dynamid-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 inputing 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-COOLING-AIR CONDITIONING WORKSHOP

The Heating – Cooling – Air Conditioning Laboratory serves the needs of the courses:

- Heating – Cooling – Air Conditioning I
- Heating – Cooling – Air Conditioning II

The Heating-Cooling-Air Conditioning Laboratory deals primarily with Heating and Air-Conditioning and to a lesser extent with Cooling since there is no special Cooling course set by the Greek Ministry of Education. This gap is covered by a special optional course.

Students of the 5th semester that attend the course 'Heating' mainly learn to study central heating. The H.C.A/C laboratory is equipped with various devices and instruments. It provides 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 for the needs of the laboratory course H.C.A/C. II. Students learn the basics of a refrigerating unit, a refrigeration cycle and how to calculate the cooling capacity of facility.

There is also a fully independent Air Conditioning Unit which is connected to a computer. Students can make adjustments and observe the various changes to statutory changes, whilst they are able to measure air flow in m3/h or m3/s, with four different methods.

8. STUDENT TOPICS

12.1 LIBRARY

The Library of the Institute is now housed in the new three-floor building, total area 2.500m^2 , the construction of which was funded by B-CSF. The library has been equipped with 20.000 books-Greek and foreign- magazines and newspapers as well as with a collection of literature and CD-ROMs. The books are classified according to the DDC system, 21st edition. Borrowing is for the period of 15 days and is possible only with the borrowing card, which the Library provides.
There is also a copier available for the students to use but only for a certain number of photocopies of the Library material. The Library consists of the following sectors:

1)The Borrowing Sector
2)The IT Sector
3)The Electronic Clipping Documentation Sector
4)The Sector of Audiovisual Media

The Library of T.E.I of Serres is open every working day throughout the year. The timetable is as follows:
September - June: 8:30a.m. to 20:00p.m.
July - August: 8:30a.m. to 14:00p.m.

Library Address:
Technological Educational Institution (T.E.I.) of Serres - Library
Magnesia Terminal, 62 124 Serres
Tel: 2321049265,2321049269
Fax: 2321045405
e-mail: admin@lib.teiser.gr
Web-site: http://lib.teiser.gr

12.2 STUDENT CLUB

T.E.I. of Serres also has a student restaurant. All students of the Institution have the right to have meals in the student restaurant for free. Information about the above is given by the Student Club Office (ground floor- library Building). Starting from the following academic year, the restaurant will be housed in the new-constructed student club building of T.E.I.

12.3 STUDENT DORMITORIES

The students live in houses of their own choice. To students who meet specific financial requirements, a house is provided (or a housing allowance in case of lack of room in the dormitories) by the Institution. The students have to meet with the requirements as described in law 3220/2004, to have the right for this provision. New dormitories are being constructed in the area of the T.E.I.
The State provides an annual housing allowance of EUR 1.000, (Law 3220-2004). The certificate is provided by the Secretariat.

12.4 EMPLOYABILITY OF STUDENTS – MODULE OF 2 WORKING HOURS

Students who work for the T.E.I during their studies can get financial aid in the form of payment. The working hours cannot exceed ten (10) hours per week.

12.5 HEALTHCARE

All students have equal rights to health and insurance. Students are provided with a special health booklet, with which they can visit doctors and buy medicine without paying. The distance to the closest hospital is only 2km far.

12.6 GYM

The facilities of the Gym offer the possibility to all the students and staff of the T.E.I. of Serres to do sports. In the Gym you can find:

- A room with fitness weights
- Gymnastics room
- Ping-pong rooms
- Sauna

12.7 SPORTS AND CULTURAL ACTIVITIES

Completing their enrollment, the students are automatically members of the student club, through which they are represented. The club often calls student meetings, where open discussions about issues of their concern take place. Elections take place once a year at a specific date, which is the same for all T.E.I of the country. The club also organizes excursions or visits of educational or entertaining content. In the Institution there is a fitness gym open every day. Another possibility for the students is to take part in dance tutorials (modern or traditional) as well as in the sports tutorials such as basketball, football, volleyball, ping-pong, shooting, aerobics or self-defense. In progress are also the sectors for theatre, music and cinematography.

9. Liaison Office

The Liaison Office of the T.E.I of Serres is housed in the multipurpose building and its function falls within the terms of co-financing from the Operational Program For Education and Lifelong Learning. The scientific director of the Liaison Office is the Vice President for Academic Affairs and Personnel of the Institute.

The institution of the Liaison Office is part of the systematic effort of T.E.I. of Serres to connect with the social and productive environment and offers students and alumni the possibility of communication, information and planning their career and prospects for further training and specialization.

The main objective of the Liaison Office is the link between education and labor market through networks of communication, networking and cooperation with the productive sector, the employers and the wider society as well as to provide full support and information to students and alumni of the Foundation for effective planning of professional attitude. The GI prepares and guides the students and graduates on career issues and provides information on:

- jobs and internships
- trends and developments in the labor market
- the professional rights of graduates
- mentoring and preparing students for the design of their careers (further study, writing CVs, interview techniques, youth entrepreneurship programs, labor market integration)
- academic development opportunities, undergraduate and graduate programs at foreign institutions and in our country, as well as scholarships in Greece and abroad.

Communication with the Liaison Office:

Multipurpose Building (Building O)
1st Floor
Tel. 23210 49228, 49374
Email: liaisof@teiser.gr