FACILITIES

Laboratory Facilities and Equipment

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

GENERAL INFRASTRUCTURE

Physics – Thermodynamics

Informatics

Mathematics – Numerical Methods

MANUFACTURING SECTOR

Machine Tools – Machining Technology

Applied Mechanical Engineering and Dynamics

Machine Elements – Conveying and Elevating Machines

Technology of Materials

Mechanical Drawing and Design

ENERGY SECTOR

Fluid Mechanics – Hydrodynamic Machines

Energy Systems and Thermal Engines

Electrical Measurements and Industrial Automation

Internal Combustion Engines

Heating – Ventilation – Air Conditioning

In particular:

PHYSICS – THERMODYNAMICS LAB

Administrator: Professor Dimitrios CHASSAPIS

Educational Purpose

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

- Dynamics
- Electromagnetism
- Thermodynamics I and II

Objectives:

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

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

Educational equipment:

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

<u>DYNAMICS</u>

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

10. Measurement of gravitational acceleration on a simple pendulum

ELECTROMAGNETISM

11. Ohm's Law

12. DC Circuit

13. Resonance in forced electromagnetic oscillations – RLC circuit in series

14. Determination of the gravitational constant (torsion balance of Cavendisch)

15. Measuring Earth's magnetic field

16. Grading of a thermal element

17. Transistors - Crystal triodes

18. Electromagnetic induction – Inductance

19. Law of thermal radiation of Stefan – Boltzmann

20. Diffraction spectra of Hydrogen and Mercury

21. Joule's Law

Research equipment:

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

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

INFORMATICS LAB

Administrator: Associate Professor Athanasios PANTAZOPOULOS

Educational Purpose

Informatics Lab supports the laboratory part of the following courses:

- Computer Programming, I
- Computer Programming II

MATHEMATICS – NUMERICAL METHODS LAB

Administrator: Associate Professor Kostas KLEIDIS

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

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

Educational Purpose

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

- Numerical Analysis
- Probabilities and Statistics

MANUFACTURING SECTOR

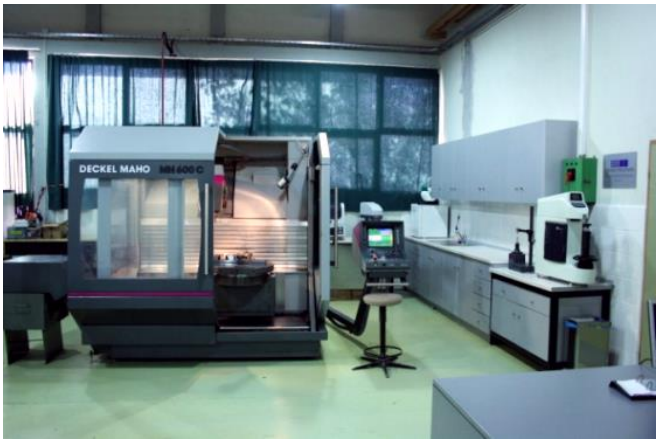
LABORATORY of MACHINING TECHNOLOGY and MACHINE TOOLS (MT^2-Lab)

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

Associate Professor Dimitrios SAGRIS (Member)

Assistant Professor Orestis FREIDERIKOS (Member)

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



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

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

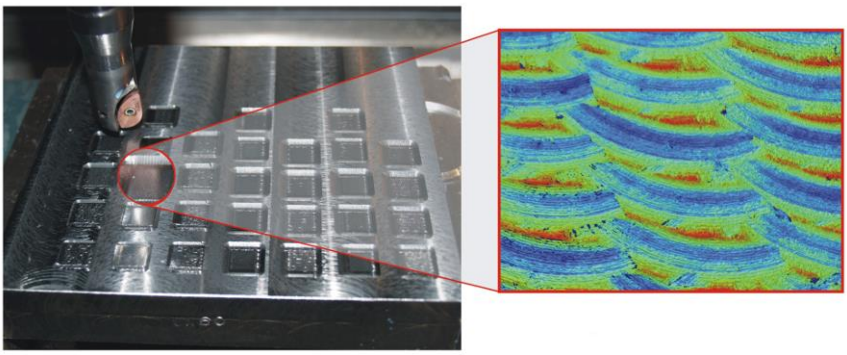
Educational Purpose

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

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

Research and Technological Services

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



5. Static and dynamic strength of mechanical components using the finite element method.
6. Measurement of various geometrical and surface sizes.
7. Characterization of surfaces.

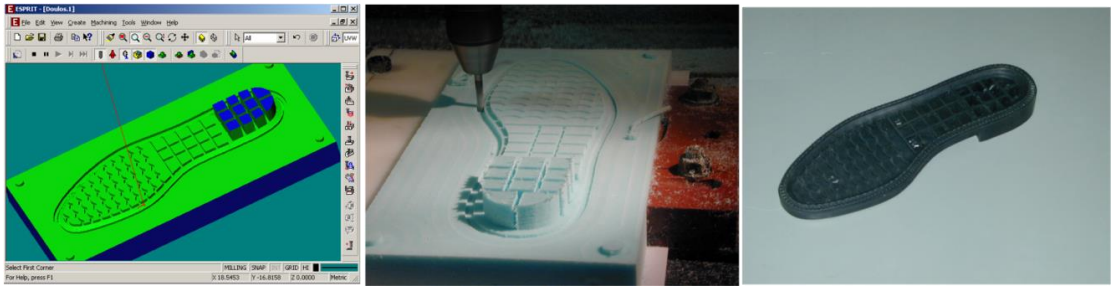
8. Creating prototypes with rapid prototyping method (Rapid Prototyping, Rapid Tooling).

9. Conduct dynamic balance in the operating conditions.

10. Control measurements of oscillational behavior of industrial structures and machinery.

11. Precision checking of machine tools and mechanical arrangements using Laser beams.

12. Information elaboration of digitally driven industrial arms (Industrial robots).



13. Design study of industrial automation.

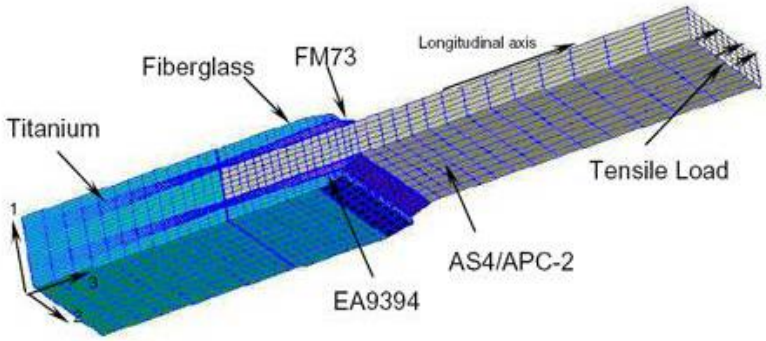
14. Non-destructive testing (ultrasound, cracks, thick coatings)

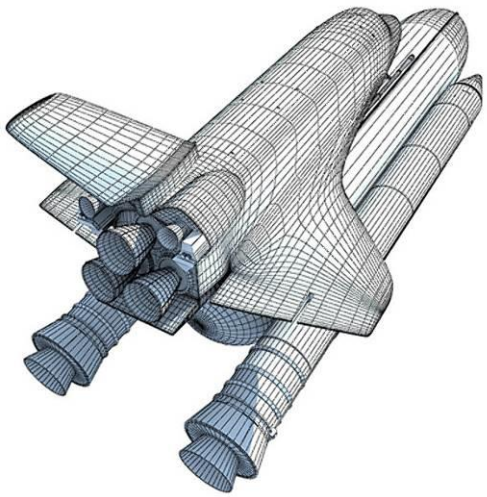
15. Mechanical strength testing of materials (tension, compression, bending, torsion)

16. Metallographic examination of materials and mechanical properties

Furthermore:

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

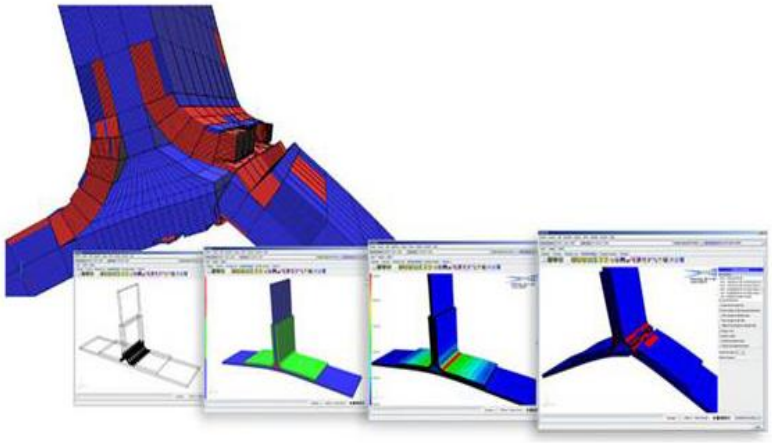




Consulting Services

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

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



Seminars

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

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

Laboratory Equipment

Appliances - Instruments - Machinery

1. CNC machining center DECKEL-MAHO 5-axis

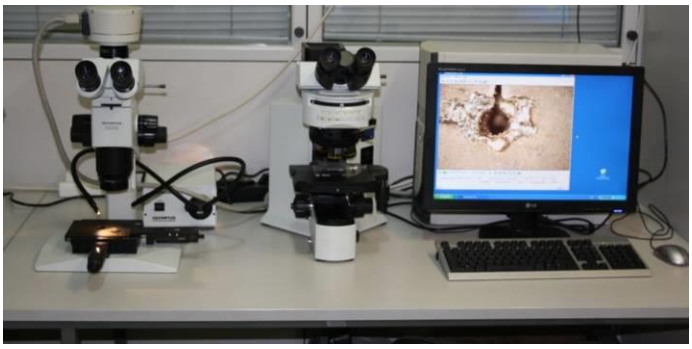
2. CNC milling machine3-axis with Heidenhein 530 i TNC guidance.

3. 3 CNC educational lathes (EMCO)

4. Rapid Prototyping Machine (Rapid Prototyping, Rapid Tooling Z-CORPORATION)

5. 3D optical profile meter (White Light Inter-ferrometer VEECO)

6. Optical Microscope (digital camera), OLYMPUS
7. Optical Stereoscope (digital camera), OLYMPUS
8. Micro durometer Vickers
9. Digital Rockwell hardness meter
10. Portable hardness meter Rockwell, Vickers
11. Digital Friction meter (TESA, DIAVITE)
12. Ultrasound for non-destructive testing NDT (Echograph Karl DEUTSCH).
13. Apparatus for measuring thickness of coating (Leptoskop Karl DEUTSCH)



14. Crack detector (crack detector Rmg 1045) Karl DEUTSCH
15. Various metering sensors (of, e.g., acceleration, velocity, etc.)
16. Force Sensor-acceleration for Model Analysis (KISTLER 8770A)
17. Strain gauge with measurement acquisition device (HBM)

18. Inductive LVDT transposition devices
19. Dynamometric 3-axis bank (KISTLER)
20. Apparatus for oscillation analysis and dynamic balancing
21. Measuring devices with Laser flatness, alignment, etc.
22. Signal acquisition and processing

<u>OTHER INSTRUMENTS</u>

23. Digital oscilloscope
24. Programmable checking device PLC Simatic S7-300

25. Inductive furnace with digital temperature indication

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

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

28. Torsion machine (INSTRON M55)

Software

1. Finite element analysis (FEM) (ANSYS, COMSOL, GENOA)

2. Design 3D-Design (SOLIDWORKS, TOPSOLID, ALIBRE)

3. Software for design and execution of mechanical configurations CAM (SolidCAM, Top CAM, Esprit, EdgeCam)

4. Analysis and processing of measuring data (LABVIEW)

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

Sub-LAB of MACHINING TECHNOLOGY I

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

1. Fitter
2. Measurements
3. Welding
4. Piper

5. Rolling mill

6. Sharpeners and Foundry

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

Sub-LAB: MACHINING TECHNOLOGY II

Machining Technology II Lab is fully equipped with lathes, milling tools axis, drills, etc., in order to meet the Department's educational needs. The current equipment is in excellent condition and, recently, some tool machines were further equipped with digital position measuring systems. During the 8th Semester, the students are trained both in handling the abovementioned tools, making a total of ten different exercises, and also in theoretical articles related to technology of metal forming involving material removal. Each semester, around 80 students are trained, in four (4) groups.

Sub-LAB of MECHANICAL DRAWING and DESIGN

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

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

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

LABORATORY of MACHINE ELEMENTS – CONVEYING & ELEVATING MACHINES

Administrator: Professor Anastasios MOISSIADIS

The Laboratory of Machine Elements – Conveying & Elevating Machines deals with the design, analysis, and synthesis of engineering systems in general, and lifting and transport in particular. The corresponding courses combine a broad range of cognitive subjects of Engineering such as Mechanical, Electrical and Electronic, Machine Elements, Hydraulic Systems, etc., hence Lab's mission focuses on guiding students in the correct application of knowledge acquired in respective core courses, combining, and composing them with new knowledge referred to lifting and handling equipment. This is achieved through integrated design and calculation of specific machinery of lifting and transport, which extends from the initial conception of the principle of the system, to elaboration of the required summary and construction design.

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

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

Educational Purpose

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

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

TECHNOLOGY of MATERIALS LAB

Administrator: Konstantinos ANTHIMIDIS (Associate Professor)

Educational Purpose

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

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

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

Cutting and preparation of mineral samples

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

Equipment

The Laboratory is equipped with:

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

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

ENERGY SECTOR

FLUID MECHANICS & HYDRODYNAMIC MACHINES LABORATORY

Administrator: Dimitrios SOFIALIDIS (Associate Professor)

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

EQUIPMENT

The laboratory is equipped with the following instruments:

- A closed network appliance of a KAPLAN water turbine with variable angle fins.

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

Auxiliary Equipment

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

Educational Purpose

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

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

These courses involve:

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

- **Turbomachinery**

Involving:

1. Laboratory determination of operating characteristics curves of centrifugal pump.
2. Mapping of the centrifugal blower.
3. Mapping of axial fan blower.

4. Definition of centrifugal pump performance curves in dynamic conditions of similarity.

5. Classification of KAPLAN & PELTON water turbine.

6. Conjunction centrifugal pump and hydraulic system, finding operating point.

7. Calculate fin angle of centrifugal pump.

LABORATORY of ENERGY SYSTEMS and THERMAL ENGINES

Administrator: Athanasios KATSANEVAKIS (Associate Professor)

Educational Purpose

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

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

Renewable Energy Sources (RES)

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

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

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

The subjects covered are:

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

Experiments implemented in laboratory devices:

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

Steam boilers, steam turbines and energy systems

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

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

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

The subjects covered are:

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

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

Power balance of steam boiler, waste gas analysis, heat loss from insulated pipe, energy balance of steam whirl, energy balance in a heat exchanger condenser, calculation of efficiency of RANKINE cycle. The experimental results are compared with the results of the theoretical calculations in order the students to gain perception about the relationship between natural phenomena and methodologies of calculation. In the laboratory there is also a combustion chamber, to familiarize students with the operation of burners and to configuring the combustion parameters.

ELECTRICAL MEASUREMENTS and INDUSTRIAL AUTOMATION LAB

Administrator: Christos SIMOGLOU (Assistant Professor)

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

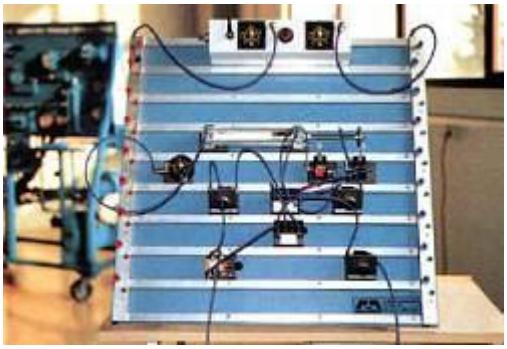
- Automation Control
- Electric Engines
- Electrical Technology & Electronics
- Electric Systems in Industry
- Electric Systems in Renewable Energy Systems

- Medium and High-Power Electrical Substations
- Electric Energy Storage and Demand Management

AUTOMATION CONTROL

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

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



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

ELECTRICAL TECHNOLOGY & ELECTRONICS

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

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

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

ELECTRIC ENGINES

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

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

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

LABORATORY of INTERNAL COMBUSTION ENGINES

Administrator: Savvas GEIVANIDIS (Associate Professor)

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

- Internal Combustion Engines
- Vehicle Motion Systems

The Laboratory is equipped with the following instruments:

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

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

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

Equipment:

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

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

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

HEATING – VENTILATION – AIR CONDITIONING (HVAC) LABORATORY

Administrator: Dimitrios MISIRLIS (Associate Professor)

The HVAC Laboratory serves the needs of the courses:

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

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

Equipment:

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

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

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

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

Teaching Classrooms

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

Labs of heavy-duty machinery

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

Labs of light-duty machinery

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

Classrooms

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

Postgraduate Studies Facilities

In the Multipurpose Building (O), right behind the Administration Building, the Department of Mechanical Engineering uses a classroom on the ground floor, of total

area 50 m^2, equipped with a network of 20 PC units. All classrooms are equipped with visual aids of teaching (such as, PCs, video projectors, overhead projectors, interactive tables, etc.) and are used during 08:00 - 21:00 five days a week (Monday to Friday). The postgraduate studies classroom is used also on Saturday.

e-Learning

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

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

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

The e-Learning platform is available at the electronic address:

http://elearning.cm.ihu.gr

Institutional Research Laboratories

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

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

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

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