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University of Western Macedonia
Department of Electrical and Computer Engineering
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Dear Students,

The Study Guide you currently hold (or reading on your screen) presents the Undergraduate Program of the Department of Electrical and Computer Engineering, of the University of Western Macedonia (DECE-UOWM).

The Study Guide has been designed to introduce you to the organization of the Department, to present useful information, and specifically to provide you with an outline of the curriculum through a presentation of each course offered. The Department of Electrical and Computer Engineering evolved from the Department of Informatics and Telecommunications Engineering, which started its operation in 2005.

This guide presents the academic organization and administrative structure of the University, the Department and the Faculty of Engineering to which it belongs.

At the same time, information is given regarding the Professors, the teaching and administrative staff, the location of the University, and the teaching and laboratory facilities of the Department. Information is also provided on student matters, topics of study organization, internships, information for the content, learning objectives and indicative bibliography of each course, as well as information on the study directions. This Program is similar to the Curriculum in the respective ECE Departments in Greece and abroad. It has reached its present form through a series of improvements and updates over the last 10 years, following the developments in the science and technology of the related subjects, which are rapidly evolving. Therefore, as a student you will be trained in modern and evolving fields such as signal and data analysis, computer systems, information processing, transmission and coding, electronic devices, mobile and satellite communications, automation systems, electrical power systems, renewable energy sources, smart energy grids, etc. Some of the introductory courses are offered jointly (co-teaching) with the Department of Mechanical Engineering, following the modern practices of co-teaching basic courses in other Engineering Departments. In addition to the classical educational process, the Department also offers internships with links to local industry and business, as well as international student exchanges through the IAESTE and ERASMUS+ programs.

The Department has excellent infrastructure and laboratories, and during this time period significant investment is being made in further developing its laboratory and research infrastructures through European or National/Regional Funds. The Department is characterized by its young age, strong extroversion and intense research activity.

Georgios C. Christoforidis
Professor, Head of Department

Markos Tsimpouras
Associate Professor, Vice Head
UNIVERSITY OF WESTERN MACEDONIA

FACULTY OF ENGINEERING (Kozani)
  Department of Mechanical Engineering (mech.uowm.gr)
  Department of Chemical Engineering (chemeng.uowm.gr)
  Department of Mineral Resources Engineering (mre.uowm.gr)
  Department of Product and Systems Design Engineering (ide.uowm.gr)

FACULTY OF SOCIAL SCIENCES AND HUMANITIES (Florina)
  Department of Elementary Education (www.eled.uowm.gr)
  Department of Nursery Education (www.nured.uowm.gr)
  Department of Psychology (psy.uowm.gr)
  Department of Communication and Digital Media (Kastoria) (cdm.uowm.gr)

FACULTY OF FINE ARTS (Florina)
  Department of Fine and Applied Arts (www.eetf.uowm.gr)

FACULTY OF ECONOMICS (Kozani)
  Department of Regional and Cross-border Development (rdcbs.uowm.gr)
  Department of Administrative Science and Technology (mst.uowm.gr)
  Department of Accounting and Finance (accfin.uowm.gr)
  Department of Business Administration and Management (Grevena) (ba.uowm.gr)
  Department of Statistics and Insurance Science (Grevena) (stat.uowm.gr)
  Department of Economics (Kastoria) (econ.uowm.gr)
  Department of International and European Economic Studies (iees.uowm.gr)

FACULTY OF SCIENCES (Kastoria)
  Department of Informatics (cs.uowm.gr)
  Department of Mathematics (math.uowm.gr)

FACULTY OF AGRICULTURAL SCIENCES (Florina)
  Department of Agriculture (agro.uowm.gr)

FACULTY OF HEALTH SCIENCES (Ptolemaida)
  Department of Obstetrics (mw.uowm.gr)
  Department of Occupational Therapy (ot.uowm.gr)
**Head**
Christoforidis Georgios, Professor

**Vice Head**
Tsipouras Markos, Associate Professor

**Teaching and Research Staff**
1. Angelidis Pantelis, Professor
2. Asimopoulos Nikolaos, Professor
3. Verykoukis Christos, Assistant Professor
4. Gavros Konstantinos, Associate Professor
5. Ganatsios Stergios, Professor
6. Dasygenis Minas, Assistant Professor
7. Zygiridis Theodoros, Associate Professor
8. Louta Malamati, Associate Professor
9. Lazaridis Vassilios, Lecturer
10. Mastoras Ioannis, Lecturer of Applications
11. Mavrooumis Konstantinos, Lecturer of Applications
12. Michalas Angelos, Professor
13. Bibi Stamati, Assistant Professor
14. Bisbas Antonios, Professor
15. Bouchouras Angelos, Assistant Professor
16. Parisis Konstantinos, Professor
17. Ploskas Nikolaos, Assistant Professor
18. Poulakis Nikolaos, Professor
19. Sarigiannidis Panagiotis, Associate Professor
20. Stergiou Konstantinos, Professor
21. Stimoniaris Dimitrios, Assistant Professor
22. Tavoultzidou Stavroula, Assistant Professor
23. Tsalikakis Dimitrios, Lecturer
24. Tsamitros Dimitrios, Associate Professor
25. Fragulis Georgios, Professor

**Staff representatives**
Representative of Laboratory Teaching Staff: Vlahopoulos Dimitrios
Special Representative of Technical Laboratory Staff: Not elected

**Student representatives**
Undergraduate Student Representative: Vassilios Bakavelos, Vassilios Stasinis
The Department of Electrical and Computer Engineering was founded in 2005 and is located in the city of Kozani. In the academic year 2005-2006 the department opened its doors to the first students and also began its operation as Department of Informatics and Telecommunications Engineering and in the academic year 2019-2020 it evolved into Department of Electrical and Computer Engineering. In the academic year 2021-2022 of newly admitted students stands at 117 (excluding transfers), while the number of enrolled students rises up to 800.

To fulfill the instructional requirements, the Department has 26 Professors and Lecturers, 6 members of Laboratory Teaching Staff, 3 members of Laboratory Technical Staff, Professors from other University Departments and the required number of part-time staff.
DEPARTMENT STAFF

PROFESSORS/LECTURERS

PROFESSORS

Angelidis Pantelis

- Diploma, Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki (1989).
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- Subject: Bioinformatics - Biomedical Signal Processing.
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Asimopoulos Nikolaos

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- MSC Department of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, July 1983.
- Diploma in Electrical Engineering, Aristotle University of Thessaloniki, November 1980.
- Subject: Digital Systems.
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Bisbas Antonios

- 1987, July: BA in Mathematics, Aristotle University of Thessaloniki
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Christoforidis Georgios

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Fragulis George
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• Aristotle University of Thessaloniki Doctor of Computer Science (Theory of Control), Mathematics, Department of Computer Science and Numerical Analysis, School of Physics and Mathematics, Aristotle University of Thessaloniki (1986-1990).
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• 1977 - 1981 Faculty of Physics, University of Bucharest, Nuclear Physics specialty.
• 1981 - 1982 Postgraduate course at the School of Nuclear Physics.
• 1985 - 1990 Doctoral dissertation in the Faculty of Physics of the University of Bucharest.
• Subject: Electronics-Microelectronics.
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Michalas Angelos
• Degree in Mathematics, University of Crete (1989)
• Postgraduate Diploma in Distributed and Parallel Systems, University of London (1992)
• Diploma in Electrical and Computer Engineering, National Technical University of Athens (2001)
• Subject: Computer Networks.
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Poulakis Nikolaos
• 1988: Bachelor of Physics, Dep. School of Physics, School of Sciences, NERC
• 1997: Doctoral Degree on "YBCO Series Raman Spectroscopy Study", Department of Physics, School of Applied Mathematics & Science, NTUA
• Subject: Measurement Technology.
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Stergiou Constantinos
• Diploma, Department of Computer Engineering & Informatics, University of Patras (1995).
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• Doctoral Degree, Department of Computer and Information Science, University of Strathclyde, UK (2001).
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ASSOCIATE PROFESSORS

Gavros Constantinos
• Bachelor of Electronic Engineering, UNIVERSITA DEGLI STUDI DI PAVIA (ITALIA), with a thesis: "Power Generation Stations - Operation and Automation", 1983
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Tsiamitros Dimitrios
• 1996 - 2001: Diploma in Electrical and Computer Engineering, School of Engineering, Aristotle University of Thessaloniki
• 2001 - 2005: Doctoral Degree on: "Influence of heterogeneous land on transient behavior of overhead power lines and underground power cables", ed. Of Electrical and Computer Engineering, School of Engineering, Aristotle University of Thessaloniki
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• Postgraduate qualification in Informatics in 2002.
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ASSISTANT PROFESSORS

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LECTURERS

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SPECIAL TECHNICAL LABORATORY STAFF

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Salakidis George
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ADMINISTRATIVE STAFF

Meliou Vassiliki (Secretary of the Department, vmeliou@uowm.gr)

Trigoni I. Theodora (dtrigoni@uowm.gr)

Trigoni P. Theodora (ttrigoni@uowm.gr)
The Department of Electrical and Computer Engineering is located in Kozani (70,420 inhabitants), capital of the prefecture of Kozani and headquarters of UOWM. It is one of the five Departments of the polytechnic school of UOWM. The Department's activities are carried out in the University's new privately owned building in the Active Urban Development Zone (ADZ) located South-West of Kozani (A) where the Department's Secretariat is also based, in premises at the eastern entrance of the City (which will cease to function at the end of the winter semester) (B) at a distance of 2 km from the city center and in Koila (C), at a distance of 3 km from the city center. The buildings are connected to the city by public transport.
GENERAL ISSUES CONCERNING UNDERGRADUATE STUDIES

The duration of studies at the Department lasts five years and is divided into ten semesters, which are differentiated into fall and spring semesters. Each student selects the courses that he will attend and will be examined in at the beginning of each semester, on dates which are announced by the Administration/Course Office. During the 10th semester a compulsory dissertation is drafted.

Successful study leads to the award of a single and integral diploma equivalent to master’s degree (integrated master), according to the Government Gazette τ.Β '2318 / 2-6-2021.

For the freshmen of the academic year 2021-2022, a total of 56 courses are required to obtain a degree, as well as writing a dissertation.

The academic year begins on 1st September of each year and ends on 31st of next August. The teaching prerequisite of each academic year is divided into two semesters. Each semester consists of at least 13 full weeks of teaching and three weeks of examinations. The first semester begins in late September and the second closes at the end of June. If the minimum number of teaching weeks is not completed in a course, then this course is not considered to be taught and it cannot be examined. In case of examining a non-taught course, the test is invalid and its grade is not considered in the final score of the degree. By decision of the Executive Committee, following a proposal by the General Assembly of the Department, an extension of the semester could be authorized up to a maximum of two weeks, in order that the required minimum number of teaching weeks is completed.

The courses, except for the examination periods, are interrupted from Christmas Eve until the day of Epiphany, on Ash Monday or Monday of Lent and from Megali Deytera-Good Monday (The last Monday before Easter) until Low Sunday. No classes are held or exams take place during weekends and the following holidays and national days:

<table>
<thead>
<tr>
<th>October, the 11th</th>
<th>The Liberation of Kozani</th>
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<tbody>
<tr>
<td>October, the 28th</td>
<td>The National Day of “OXI!” (NO)</td>
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<tr>
<td>November, the 17th</td>
<td>The National Day of “Polytechnio” (Engineering School)</td>
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<tr>
<td>December, the 6th</td>
<td>Ag.Nikolaos-St. Nicholas Day - patron saint of Kozani</td>
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</tbody>
</table>
In addition, classes are not held on the day of student elections.

Examinations are conducted exclusively after the fall and the spring semester for courses taught during these semesters, respectively. The student has the right to be examined in the courses of both semesters before the start of the fall semester. Each student is entitled to participate in examinations only of those courses which he has determined with the courses statement he lodged at the beginning of the semester.

The exam score of the students in each course is determined by the professor, who organizes it according to his best judgment written and/or oral examinations or relies on projects or laboratory exercises. In case of failure in a compulsory course, the student is obliged to repeat it in the following semesters or exams using the electronic platform of the institution exams.uowm.gr. In case of failure in a compulsory course, the student is obliged to repeat it in the following semesters.

The selection and receiving process of textbooks is performed through the "Eudoxus" Program (www.eudoxus.gr). Students have the right of choice and of the free supply of one textbook for each course taught. Overall, students are allowed to select and receive a number of free textbooks which is equal to the total number of compulsory and elective courses necessary for obtaining the degree. If students choose more elective courses than what is required for obtaining the degree, the right of choice and of the free supply of textbooks does not extend to the extra courses they have chosen and are tested, even when these courses are considered in obtaining their degree.

Students have the right to interrupt their studies, upon written request at the Administration Office of the Department, for as many semesters, consecutive or not, as they wish to, and certainly for no more than the minimum number of semesters required to receive a degree according to the indicative curriculum. These semesters are not calculated in the above maximum duration of Studies. Students who interrupt their studies as above, do
not maintain the student membership throughout the period of interruption of their studies. At the end of the interruption of their studies, the students can return to the Department.
INFRASTRUCTURE

The Department of Electrical and Computer Engineering is housed in three buildings located at the eastern entrance of the city of Kozani, on Lygeris and K. Karamanli Street and Koila Kozani.

The following educational laboratories operate in the Department:

- Renewable Energy Sources & Smart Electric Grids
- Industrial Electrical Installations
- Networks
- Indoor Electrical Installations
- Computer (6)
- Electrical Machines
- Electronics
- Electronic Health & Biomedicine
- Electronic Power and Electric Propulsion Systems
- Electronic constructions
- Electrotechnics
- Foreign languages and terminology
- Robotics
- Electricity Systems
- Telecommunications
- Digital Systems & Computer Architecture
- Digital Systems & Electronics
The Department possesses three Computer Laboratories, which consist of 25 workstations equipped with PC’s, a projector and a laser printer to assist the courses and the students. The Computer Laboratories operate with Virtual Machines (VM). There are some VM running with Microsoft Windows operating system and some with Linux operating systems (Ubuntu, Fedora, FreeBSD). An indicative list of applications available in the Computer Laboratories is:

- Microsoft SQL Server
- Android SDK
- Opnet
- FINE/ADAPT
- XAMP
- ARM IDE
- Xilinx
- SEE Electrical
- Java SDK
- Multisim
- Xsniifer
- GAMS
- Logisim
- Ns2
- WEKA
- MS Visual Studio
- Prolog
- ArgoUML
- ATP
- Microsof SQL Server
- Android SDK
- Opnet
- FINE/ADAPT
- XAMP
- ARM IDE
- Xilinx
- SEE Electrical
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- WEKA
- MS Visual Studio
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- Java SDK
- Multisim
- Xsniifer
- GAMS
- Logisim
- Ns2
- WEKA
- MS Visual Studio
- Prolog
- ArgoUML
- ATP
**TELECOMMUNICATIONS LABORATORY**

The Telecommunications Laboratory supports the educational activities in various courses of the study program and its equipment includes the following:

- Telecommunications Training System (25 work stations) for experimental training of students on the fundamental principles of analog and digital communications. Specifically, for each work station, the Telecommunications Training System consists of a preprinted circuits base which provides a computer connection, in which removable exercise boards are installed for the training of students of the Department on the Analog and Digital Communications.

- Educational Antennas System (10 work stations), providing practical experimentation on different types of antennas (e.g., horn type, helix type, flat, Yagi) at 1 GHz and 10 GHz frequencies.

- Microwave Communications Educational Systems (3 work spots).
• Spectrum analyzers, oscilloscopes and generators of random waveforms.
• Selective radiation meter Narda SRM-3006, for measurements within the frequency range 27 MHz – 3 GHz.
• Network analyzer Keysight E5063A for testing passive components, such as antennas, cables, filters, PCBs, within the frequency range 100 kHz – 4.5 GHz.

• Training system of plastic optical fiber, with the ability to measure losses, consisting of a two-channel data transmission system.
• Double Sided Vacuum UV unit with the ability to produce single / double sided PCB through exposure to UV radiation and Tri-Tank unit with triple integrated function: DEVELOP / SPRAY WASH / BUBBLE ETCH.

LABORATORY OF MICROCOMPUTERS AND COMPUTER NETWORKS

The Microcomputer and Networks lab is equipped with state-of-the-art personal computers connected to a modern LAN, a Sun Blade server and specialized electronic training materials for multi-course service. It has:

• Personal Computers (64bit i5 processors, Windows 10 multiuser environment)
• Gigabit Ethernet LAN
• 2 Gigabit managed Linksys switches (full dublex mode)
• dual ultraSPARC 64bit Sun Blade server
• Xilinx FPGA boards
• Mikroelectronica development boards equipped with Microchips’ PICs

PCI and USB Data Acquisition Cards of National Instruments
The Digital Systems and Computer Architecture Laboratory meets the research and training needs in both core courses and in specialization courses of the Department. The Laboratory includes:

- 30 work stations with Intel i5 / 2GB Ram computer stations,
- 3 development inventors kit with Arduino microprocessor,
- 9 reconfigurable logic boards FPGA Xilinx Spartan 3A,
- 2 development kit devkit8000 with TI OMAP3530 (600MHz ARM Cortex-A8) processor, with a touch screen,
- 2 beagleboard development kit with ARM Cortex-A8 processor with DSP support, 4 mobile android units,
- 2 sets of lego mindstorm.

Also, under the management of the Laboratory are:

- an array of two computers with 4 parallel processing Nvidia Geforce 9800GTX graphics cards,
- a parallel system with 16 Xeon E5520@2.27GHz 76GB RAM processors,
- 4 servers with dual core Intel (R) Xeon (TM) CPU 3.40GHz / 8GB RAM processors. The computer operating systems are FreeBSD 9.0, Ubuntu 12 LTS, Microsoft Windows 7.

Laboratory equipment is also used for the dissertations of students in related subjects, as well as the research needs of the Department in matters related to software and hardware co-design, integrated systems-on-a-chip (SoC) and multi-core systems.
The Electronics Laboratory includes 20 workstations which are specially equipped with oscilloscopes, low and high frequency generators, AC and DC power supplies and multimeters. The software packages used in the laboratory for analyzing and designing electronic circuits are the Multisim and the ADS (Advanced Design Systems). The Electronics Laboratory is mainly used for the preparation of laboratory exercises for the Electronics I and Electronics II courses as well as for the research activities of the Department.
LABORATORY OF DIGITAL SYSTEMS AND ELECTRONICS

The Digital Systems and Electronics laboratory is used for laboratory exercises training as well as for the diploma theses of the students in related subjects. Laboratory exercises are performed at a physical component level. It concerns analog and digital systems in 20 work stations. Each work station in the laboratory is equipped with:

- HAMEG 20MHz Analog Oscilloscope
- Digital TEKTRONIC Oscilloscope 100MHz
- Generator AF HAMEG 5MHz
- Triple output DC power supplies
- Integrated XELTEK Developer
- Breadboard

ELECTRONICS CONSTRUCTION LABORATORY

The laboratory supports student work in related subjects and research activities by developing and constructing prototype electronic devices. The laboratory exercises are performed at the physical level of the component. The laboratory includes a system for designing and manufacturing original electronic boards, equipment for welding and detaching integrated circuits and equipment for measuring and controlling boards.
LABORATORY OF ELECTRONIC HEALTH AND BIOMEDICAL TECHNOLOGY

The Laboratory of Electronic Health and Biomedical Technology supports the courses “Biomedical Technology”, “Electronic Health” and “Bioinformatics”. In particular, it allows the training of students in the following:

Recording and analyzing of basic biosignals
- Recording and analysis of Electrocardiography with a wireless cardiograph.
- Measurement of arterial blood pressure with wireless sphygmomanometer.
- Measurement of lung function: Spirometry with wireless spirometer.
- Measurement of blood oxygenation with wireless oximeter.
- Take of cardiotocographic signal.

Digital Processing of Biological Signals
Methods and signal processing techniques derived from biological systems, signals and systems, design and implementation of digital filters, applications.
Use of fluorescence microscope for taking and processing biological sample images.

Introduction to Medical Imaging Systems
Management and editing images from computed tomography (CT Scan), Magnetic Resonance Imaging (MRI), endoscopy systems, ultrasound scanner. Reconstruction Methods of Medical Image: Image reconstruction algorithms (single backprojection, filtered backprojection, iterative reconstruction algorithms), defects in the reconstructed images, three-dimensional tomography.

Online health care
Provision and demand of online medical information, medical interventions through the Internet (such as tele-therapy) and peer support networks (p2p) in virtual medical communities. The online use of search methods and the use of the internet to support clinical trials. Health Portals. Telemedicine services and applications. Mobile and Wireless Communications in Health Care.
The laboratory has 12 workstations with properly designed energy analyzers for laboratory three-phase counterbalance exercises.

Other laboratory equipment includes:
- Voltmeters, Ammeters, Wattmeters, Multimeters
- DC / AC power supplies (Single phase, three phase)
- Constant resistors
- Variable resistors
- Ohmic, inductive, capacitive loads
- RLC variable loads
- Frequency generators
- Digital energy analyzers

**LABORATORY OF RENEWABLE ENERGY SOURCES AND SMART ELECTRIC GRIDS**

The laboratory equipment is used for the diploma theses of students (undergraduate and postgraduate) in related subjects as well as for research purposes - research projects.

The laboratory equipment includes:

**Microgrid No1:**
- Autonomous (island) inverter
- 2 (Two) PV inverters
- 12 PV panels with a nominal power of 2 kWp
- 1 (One) horizontal axis wind turbine 1 kW
- 24 FLA batteries
- Various loads, NI data recovery cards: DAQ 6008, Measuring devices
Microgrid No2:
- 2, 1.2kW hydrogen fuel cells with the corresponding inverters
- 2 electrolysis units and two hydrogen storage cans
- 1 inverter
- 1 wind turbine 1.5 kW, vertical axis
- 10 thin-film PV panels with a nominal power of 1 kW with the PV-inverter
- 24 FLA batteries with a capacity of 323 Ah each
- 1 electric car
- 1 electric scooter
- 1 electric bicycle
- 2 charging stations (level 1 and level 2) made in the UOWM

Microgrid No3 - charging station for electric cars from RES (In collaboration with the municipality of Kozani):
• 3 electric cars
• 3 floor chargers made in UOWM
• 1 wall quick-charger
• 48 FLA batteries for autonomous systems
• 2 island inverters
• 36 PV panels on the roof
• 2 PV inverters

Building energy inspection equipment:

• 1 ISO9869 Hukseflux TRSys 01 temperature meter
• 2 infrared (IR) cameras
• 1 Laser mini thermometer
• 1 Fluke Energy Analyzer
• 1 Photometer and 1 Hygrometer
• 1 Digital exhaust analyzer

LABORATORY OF INTERIOR ELECTRICAL INSTALLATIONS

The laboratory equipment is used for the diploma theses of the students (undergraduate and postgraduate) in related subjects. The laboratory has:

• 8 workstations - Simulations for indoor electrical installations
• Electrical panels
• Complete ground simulation device
• 4 work stations / KNX system layouts
• 4 Portable KNX system training devices
LABORATORY OF ELECTRIC MACHINES

The laboratory equipment is used for the diploma theses of the students in related subjects and includes:

- 3 complex excitation DC motors
- 2 series DC excitation motors
- 3 DC machines of parallel excitation
- 5 three-phase modern AC generators
- 12 three-phase asynchronous induction motors
- 2 single-phase asynchronous induction motors
- 5 three-phase power supplies with adjustable voltage and the possibility of dc voltage supply.
- 3 three-phase transformers
- 4 single-phase transformers
- Parallel display system of three-phase modern generators
- 2 modern systems for measuring torque, speed and mechanical power of engines
- 2 soft-starter asynchronous motors
- 4 new work stations with measuring instruments (current, voltage, speed meters)

LABORATORY OF POWER ELECTRONICS

The courses related to Power Electronics and Electrical Motor Systems are conducted in the Power Electronics laboratory. Its equipment is also used for the elaboration of diploma theses and for research purposes.
It has 2 fully equipped group workstations on benches, where students can perform a variety of laboratory exercises on all types of electronic power converters. The same workstations can be used to perform laboratory exercises on AC and DC motors using suitable inverters. In addition, a third group workstation can be used to perform simple rectifier experiments. The key feature is its modular structure, which allows students to "build" the laboratory experiment themselves, properly connecting the various physical units. In this way, the student can and more easily understand the parts of each circuit, and can understand better the contribution of each to the final operation of the system.

Specifically, the basic equipment of the laboratory includes:

- Semiconductor components (Diodes, diode bridges, thyristors, thyristor bridges, IGBT and their bridges, TRIAC, MOSFET)
- Various AC and DC power supplies, fully controlled (single-phase, three-phase)
- Inverter control units of various types and related controllers
- Complex loads consisting of resistors, coils and capacitors, but also loads with lamps
  - Isolation amplifier units to assist in obtaining voltage and current measurements and connecting to an oscilloscope
  - Waveform generator (sinusoidal, square, triangular, etc.)
  - Modular frequency converter, for experiments with AC drives
  - Special software for connecting to a computer and performing experiments
  - Various motors (Asynchronous, annular, DC parallel excitation, etc.)
  - Electrodynamical brake for simulation of various types of mechanical loads
  - Various measuring instruments (multimeters, wattmeters, tachometers, etc.)
  - Color oscilloscopes

LABORATORY OF NETWORKS AND ADVANCED SERVICES

The Laboratory of Networks and Advanced Services (LNAS) supports the educational work and the conduct of applied and basic research in the areas of communications networks, computer networks and advanced telecommunications services. Specifically, the Laboratory activities include the design, evaluation, performance analysis, optimization and network management, control and network management in wired and wireless networks, information security, analysis and evaluation of new technologies and protocols, dynamic restructuring networks, design and support of advanced services, adaptation of services and
applications over heterogeneous network infrastructures, network energy consumption management and telematics applications.

It possesses five work stations that provide access to modern network devices in switching and routing level. Additionally, it is possible to implement, support and configure wireless point-to-point links, unstructured wireless networks and optical interconnections. The Laboratory also provides a set of servers that offer modern services, including safe switching and routing services, digital telephony, virtual networking, implementation of digital telephone centers and cloud computing services.

In detail, the Laboratory of Networks and Advanced Services provides the following equipment:

- Two Cisco routers (2921 series).
- One Cisco router (2901 series).
- Three Cisco switches (series 2960S).
- Two Cisco switches (series 2960X).
- One Cisco switch (800 series).
- Two MikroTik switches (series CCR1009).
- Four MikroTik switches (series CRS125).
- Six access points 802.11n (various types).
- Two pairs of antennas to create a wireless link.
- Three servers (telephony, security center, visual interface).
- Simulation software of wireless local area (WLAN) networks, radio coverage and spectrum analysis of wireless local area networks simulation, including the 802.11n protocol.
- Application analysis software.
The Laboratory of Automatic Control Systems (ACS) (http://sae.thmmy.uowm.gr/) supports the educational work and the conduct of applied research in the area of ACS. Specifically, the laboratory, apart from the education of undergraduate students, includes the support-implementation of non-theoretical undergraduate and postgraduate diploma theses and the research on various topics from the wide interdisciplinary field of ACS.

It has seven workstations, which provide access to modern devices and machines that operate and are controlled independently or with a PC through appropriate software.

Specifically, the ACS Laboratory has the following equipment:

- 9 experimental devices MS150 of FEEDBACK, for analog motor control, consisting of an operational amplifier OA 150A, potentiometer unit AU 150B, preamplifier unit PA 150C, servo amplifier SA 150D, power supply PS 150E, output input potentiometer IP 150H LU 150L and voltmeter DC MV 143.
- 9 experimental devices 33-004USB of FEEDBACK, for analog and digital motor control, consisting of the mechanical unit 33-100, the analog unit 33-110, the digital unit 33-120, the power supply 01-100, the appropriate software 93 IMS and 33-921-1V65 eight PCs with Advantech PCI-1751 card.
- 1 experimental device 33-005PCI of FEEDBACK, inverted pendulum, consisting of the mechanical unit 33-200, the controller 33-201, the appropriate software 33-936 and a PC with Advantech PCI-1711 card.
- 1 FEEDBACK 33-007PCI experimental device, dual rotor, consisting of the TRMS mechanical unit, the 33-220 controller, the appropriate 33-949 software and a PC with Advantech PCI-1711 card.
- 9 FEEDBACK signal generators (5 FG601 and 4 FG600).
8 dual beam oscillators (1 GOLDSTAR DIGITAL STORAGE OS-3040 40MHz, 2 GOLDSTAR DIGITAL STORAGE OS-3020 20MHz, 1 LG DIGITAL STORAGE OS-3020D 20MHz, 1 LG ANALOG OS-5020 20MHz, 3 HAM / 3 HAM).
- 7 CE 5a analog computers.
- 5 generators generating TTi TG230 2MHz signals.
- 9 DIGITAL Protek 505 multimeters.

LABORATORY OF ELECTRICAL POWER SYSTEMS

The Laboratory of Electric Power Systems covers the educational needs of the Department in the field of electric systems.

In the laboratory, experiments are carried out aiming in the understanding of the basic concepts of electricity transmission and distribution. Through a set of laboratory exercises that include control and fault recognition in a medium voltage mains transformer, in combination with the use of the specialized software DigSILENT PowerFactory, the student is given the opportunity to acquire practical knowledge of the subject of Electric Power Systems and better understand the corresponding theoretical knowledge.

The laboratory equipment includes transmission line models, long and short, three-phase power supplies, 3-phase 20kV transformers, 3-phase phase change transformer, 3-phase Power Factory change autotransformer, 3-phase multi-phase transformer, modern machines, static control relays and systems - power analyzers. Specifically, the equipment consists of:

- four (4) models of 77 kV / 136 km long transmission lines
- six (6) variable three-phase inductive loads 2.5 kVAR
- four (4) variable three-phase capacitive loads 2.8 kVAR
- five (5) variable three-phase ohmic loads 3.3 Kw
- two (2) 15kV / 380V three-phase transformers
- three (3) three-phase transformers 220 / 380V 1kV charge angle adjustment
- two (2) 220/380 V charging angle adjustment autotransformers (d) 1kVA
- three (3) three-phase transformers 2kVA 380/127 V (multiple receivers)
- three (3) Terco transformers of 0/20 A voltage
- four (4) MO-1251/20 MHz oscilloscopes
- six (6) electric motors 220V / 2A / 250W / 1500rpm
- six (6) MPR-53 three-phase power analyzers
- two (2) three-phase de Lorenzo power supplies
- two (2) three-phase Elettronica Veneta power supplies
- one (1) three-phase Terco power supply 1300 MV
- panel of static relays Terco
- seven (7) variable resistance potentiometers
- one (1) synchronoscope device - parallelism of electrical networks
- five (5) PC work stations
- one (1) device for measuring dielectric oil resistance 60 kV (meger)

**ROBOTICS LABORATORY**

The lab possesses up-to-date equipment for the educational and research activities of the Department in the area of Robotics, such as:

- Articulated arm of industrial type.
- Educational configurations for the construction and programming of robotic units.
- Humanoid robots.
- Robots for social assistance applications.
- Robotic platforms of mobile type, for interior applications (e.g., in warehouses), capable of wireless networking, supervision, etc.
LABORATORY OF FOREIGN LANGUAGES AND TERMINOLOGY

The laboratory is used for teaching Foreign Language / Terminology courses. The laboratory has:

- 20 computer work stations
- Interactive Board
- Projector
**USEFUL INFORMATION**

**INTERNSHIP**

The Internship of students of the department started in the academic year 2010-2011 with funding from the *Operational Program for Education and Initial Vocational Training (O.P. "Education")* which is launched by the Ministry of Education and with the cooperation of various companies. Throughout the Internship, the supervisor on behalf of the company and the responsible professor are monitoring the progress of the students and evaluate their performance. During and after the end of the Internship, the student is required to submit reports on the work done in accordance with the rules contained in the Regulation of the University. The **duration of each Internship is three months**, with the possibility of extension. Responsible for the Internship of the Department is the Assistant Professor Minas Dasygenis.

**ERASMUS PROGRAM**

ERASMUS + is the European Commission's new program for education, training, youth and sport, aimed at enhancing skills and employability, as well as modernizing education, training and youth systems in all areas of Lifelong Learning.

Under the ERASMUS + program, students of the Department may spend a period of 3-12 months studying abroad in institutions, with which the University of Western Macedonia has active bilateral agreements. The list of relevant agreements can be found at the following link:

[https://erasmus.uowm.gr/bilateral/department/icte/](https://erasmus.uowm.gr/bilateral/department/icte/)

Studying abroad is fully recognized by the Department of Origin, i.e., the DECE, provided that the student has been successfully tested in the selected courses. Responsible for the ERASMUS + program in the Department is Assistant Professor Stavroula Tavoultzidou.
COURSE CHART OF STUDY PROGRAMME
GENERAL DESCRIPTION

Undergraduate studies in the Department of Electrical and Electronic Engineering of the Polytechnic School of the University of Western Macedonia must include at least ten (10) academic semesters for admission of the Diploma, based on the founding Government Gazette of the Department (Government Gazette AD 192/2005, and renamed Government Gazette AD 70/2019). The courses, necessary for the award of the Diploma correspond to 300 credits, according to ECTS (European Credit Transfer System), which are divided into 30 units per academic semester. Through the model of uninterrupted five-year studies, the Department of Electrical and Electronic Engineering ensures both the foundation of studies in a strong theoretical and technological background, as well as the necessary focus in the individual subjects of the relevant field.

The Curriculum leads to the award of a diploma of "Electrical and Electronic Engineering ", which is a single and inseparable degree of postgraduate level (integrated master), according to the Government Gazette τ.Β '2318 / 2-6-2021.

During the first five academic semesters, the Curriculum includes compulsory courses, which ensure the foundation in basic sciences, as they are an integral part of Electrical and Electronic Engineering studies. Also, the Curriculum includes a series of core courses of the specialty, covering the entire range of cognitive subjects of Electrical and Electronic Engineer. The specific compulsory courses offered are placed in the first six semesters of study and cover its specialty's individual subjects. A significant number of courses include a compulsory part of laboratory training, which is considered necessary for the formation of a strong technological and scientific background in Engineering studies.

In order for a student to continue his studies in the 7th semester and beyond, it is necessary to have successfully passed at least 20 core courses of the Curriculum, during the first 6 semesters.

From the 7th semester onwards, the Curriculum provides a high level of specialization in three fields of study: a) the Energy division, b) the division of Telecommunications and Networks, and c) the division of Computers and Electronics. In each direction there are mandatory courses and courses of choice for each division, while students can also take courses from other divisions which are generally characterized as optional. Students may choose to do an optional three-month Internship corresponding to 15 ECTS, which is offered as an optional course.
In the last semester of the study program, it is compulsory to deliver a thesis of analytical, experimental, computational or combinatorial character, in the context of which students are invited to develop research activity and study in depth of a specific aspect of science issues of interest to them. The successful completion of the dissertation, under the supervision of a faculty member of the Department, is a necessary, substantial and formal condition for obtaining the diploma of Electrical and Electronic Engineer of the University of Western Macedonia. Any diploma work corresponds to 30 ECTS.

**GENERAL LEARNING OUTCOMES OF THE CURRICULUM**

Upon successful completion of the study program, the graduates of the Department have the knowledge, skills and abilities to study, design, analyze, construct, supervise, evaluate, maintain, conduct expertise and provide certification of compliance concerning installations and their applications in the following scientific fields:

a. electricity and power  
b. electrical installations and studies  
c. computers  
d. telecommunications and telecommunications systems and networks  
e. information technology and information systems  
f. automation, signal processing, image and audio processing systems, speech processing, graphics, etc.

At the same time, the graduate of Electrical and Electronic Engineering department is able to:

a. Identify a problem and choose the best solution after consulting the bibliography  
b. Operate and work either independently in the sector or in groups for achieving a common goal  
c. Plan and finally execute complex projects that require compliance with strict schedules  
d. Generate new ideas in research and apply the knowledge gained innovating in his science  
e. Adapt to new situations and be able to deal with them successfully  
f. Understand the need for lifelong learning and education and thus meet the requirements of technological developments in his science  
g. Follow a doctoral program in a field related to his science  
h. Apply his knowledge, skills and abilities taking into account the requirements of social development
## Study Program Outline

### 1st Semester

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Hours per week</th>
<th>ECTS credits</th>
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<td>MK1</td>
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<td>Mechanics</td>
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<td>Technical Drawing</td>
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### Number of Courses

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<td>MK12</td>
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<td>MK16</td>
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<td>Electrical Measurements</td>
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<td>MK17</td>
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<td>Introduction to Electric Power Systems</td>
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<th>ECTS Credits</th>
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<tr>
<td>YEH1</td>
<td>Transmission and Distribution Power Systems</td>
<td>4</td>
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<tr>
<td>YEH2</td>
<td>Electric Machines II</td>
<td>4</td>
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<tr>
<td>YEH3</td>
<td>Power Electronics I</td>
<td>4</td>
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<tr>
<td>YEH4</td>
<td>Modern Electrical Installations</td>
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### Elective Courses (at least 1)

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<td>Introduction to Nuclear Technology</td>
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<td>Energy Automation</td>
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<td>EEH4</td>
<td>Heat Transfer</td>
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<td>E27</td>
<td>Operational Research</td>
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(4 Compulsory - 2 Electives) (at least 1 Elective from DIVISION OF ENERGY and maximum 1 elective of free choice in total during semesters 7-8-9)
### 7th Semester – Telecommunications and Networks

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<td>Y2</td>
<td>Analysis and Simulation of Communication Networks</td>
<td>4</td>
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<tr>
<td>Y3</td>
<td>Antenna Systems and Wireless Propagation</td>
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<tr>
<td>E45</td>
<td>Digital Communications</td>
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### Elective Courses (at least 6 during semesters 7-8-9)

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<td>ETH1</td>
<td>Electromagnetic Compatibility</td>
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<tr>
<td>E2</td>
<td>e-Health</td>
<td>4</td>
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<tr>
<td>E9</td>
<td>Queuing Theory</td>
<td>4</td>
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<tr>
<td>E48</td>
<td>Mobile and Satellite Communications</td>
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<tr>
<td>ETH2</td>
<td>Information and Code Theory</td>
<td>4</td>
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<tr>
<td>ETH3</td>
<td>Network Programming</td>
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<td>ETH10</td>
<td>Basic Principles of the Internet of Things</td>
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**Number of Courses**

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3 Compulsory - 3 Electives
(at least 6 must be elective from Division of Telecommunications and Networks during semesters 7-8-9 and maximum 1 elective of Free Choice)

### 7th Semester – Computers & Electronics

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<tr>
<td>YYH1</td>
<td>Automatic Control Systems II</td>
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**ELECTIVE COURSES (at least 6 during semesters 7-8-9)**

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<td>Robotics</td>
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<td>Industrial Communications</td>
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<td>E47</td>
<td>Digital Electronics</td>
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<td>MK31</td>
<td>Object Oriented Programming II</td>
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<td>E34</td>
<td>Computer Graphics</td>
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<td>Information and Code Theory</td>
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<td>E2</td>
<td>e-Health</td>
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<td>EYH8</td>
<td>Data analysis</td>
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**Number of Courses** 6  
(3 Compulsory - 3 Electives)  
(at least 6 must be elective from Division of Telecommunications and Networks during semesters 7-8-9 and maximum 1 elective of Free Choice)  

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**7TH SEMESTER – FREE ELECTIVE**

Students can recognize up to 1 free choice elective course from those offered in the semesters 7-8-9. If they succeed in the above free elective courses, those will appear in the diploma annex but are not counted in the final degree.
<table>
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<th>Code</th>
<th>Course Title</th>
<th>Credits 1</th>
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<tbody>
<tr>
<td>E7</td>
<td>Technology, Research, Innovation Policies and Entrepreneurship</td>
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<td>E6</td>
<td>Quality Control</td>
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<td>EH2</td>
<td>English III (Academic Writing)</td>
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## 8th Semester — Energy

### Division of Energy Elective Courses (at least 4)

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<td>EEH5</td>
<td>High Voltage Engineering I</td>
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<td>EEH19</td>
<td>Electro-Hydraulic and Electro-Pneumatic Power Systems</td>
<td>4</td>
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<td>EEH7</td>
<td>Power Electronics II</td>
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<td>EEH20</td>
<td>Special Issues of Electric Power Systems</td>
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<tr>
<td>EEH14</td>
<td>Modern Electrical Installations and Buildings’ Energy Analysis</td>
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<tr>
<td>EEH10</td>
<td>Energy Economics and Energy Markets</td>
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<td>Special assignment</td>
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### Number of Courses

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(0 Compulsory - 6 Electives)
(At least 4 electives from DIVISION OF ENERGY and maximum 1 elective of free choice in total during semesters 7-8-9)
## 8th Semester — Telecommunications and Networks

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<thead>
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<th>Course Title</th>
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<td>Y5</td>
<td>Mobile Communication Networks</td>
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<td>Y6</td>
<td>Optical Communications and Networks</td>
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<td>Y11</td>
<td>Computer and Network Security</td>
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### Elective Courses
(at least 6 during semesters 7-8-9)

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<td>Wireless Sensor Networks</td>
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<td>E15</td>
<td>Biomedical Technology</td>
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<td>E49</td>
<td>Optics</td>
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<td>E37</td>
<td>Theory and Management of Telecommunication Traffic</td>
<td>4</td>
<td>5</td>
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<td>E39</td>
<td>Cloud Computing</td>
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<td>Special Assignment</td>
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<td>E46</td>
<td>Photonics – Optical Devices</td>
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<td>Big Data and Intelligent Applications on the Internet of Things</td>
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(3 Compulsory - 3 Electives)
(at least 6 electives from Division of Telecommunications and Networks during semesters 7-8-9 and maximum 1 elective by Free Choice)

## 8th Semester — Computers & Electronics

<table>
<thead>
<tr>
<th>Course Code</th>
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ELECTIVE COURSES (at least 6 during semesters 7-8-9)

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<td>EYH7</td>
<td>Mechatronics</td>
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<td>EYH3</td>
<td>SCADA Systems</td>
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<tr>
<td>E33</td>
<td>Embedded Systems</td>
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<td>E43</td>
<td>Digital Game Development</td>
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<td>E40</td>
<td>Advanced Databases</td>
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<td>EYH6</td>
<td>Machine Learning</td>
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<td>Y7-H</td>
<td>Human-Computer Interaction</td>
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<td>Cloud Computing</td>
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<td>Geographic Information Systems</td>
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Number of Courses: 6
Teaching Hours (Total): 24
ECTS Credits (Total): 30

8TH SEMESTER - FREE ELECTIVES
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<td>Industrial Management</td>
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<td>EH4</td>
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<td></td>
<td>Organization and Decision Making</td>
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# 9th Semester — Energy

## Elective Courses (at least 3)

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<td>YEH5</td>
<td>Industrial Electrical Installations</td>
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<td>EEE11</td>
<td>Electric Drive Systems</td>
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<td>EEE21</td>
<td>Protection and Stability of Power Systems</td>
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<td>EEE13</td>
<td>Optimization Methods in Electric Power Systems</td>
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<td>EEE15</td>
<td>Introduction to Smart Grids</td>
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<td>EEE16</td>
<td>Energy Storage Technologies</td>
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<td>EEE22</td>
<td>High Voltages II</td>
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<td>EEE23</td>
<td>Special Chapters of Power Electronics</td>
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<td>EEE24</td>
<td>Photovoltaic Systems and Applications</td>
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(1 Compulsory - 3 Electives)

(3 Electives from Division of Energy and maximum 1 Elective by Free Choice during semesters 7-8-9)
## 9th Semester – Telecommunications and Networks

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<td>YH2</td>
<td>Design and Operation of Computer Networks</td>
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<td>E35</td>
<td>Management and Optimization Communication Networks</td>
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### Elective Courses (at least 6 during semesters 7-8-9)

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<td>E3</td>
<td>Next Generation Networks and Services</td>
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<td>E24</td>
<td>Mobile Computing</td>
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<td>E42</td>
<td>Remote Sensing</td>
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<tr>
<td>E11</td>
<td>Data Mining</td>
<td>4</td>
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<td>Special Assignment</td>
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<td>(3 Compulsory - 3 Electives)</td>
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<td>(at least 6 from Division of Telecommunications and Networks during semesters 7-8-9 and maximum 1 elective by free choice)</td>
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## 9th Semester – Computers & Electronics

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<td>ΥΗ2</td>
<td>Design and Operation of Computer Networks</td>
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<td>MK35</td>
<td>Web Programming</td>
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<td>E23</td>
<td>Advanced Issues of Digital Design</td>
<td>4</td>
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**Elective Courses (at least 6 during semesters 7-8-9)**

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<td>Microtechnology and Nanotechnology</td>
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<td>Fuzzy Systems</td>
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<td>Compilers</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E11</td>
<td>Data Mining</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Y9</td>
<td>Bioinformatics</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E17</td>
<td>Digital Image Processing</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E24</td>
<td>Mobile Computing</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E10</td>
<td>Complexity Theory</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Number of Courses: 6  
(3 Compulsory - 3 Electives)  
(at least 6 form Division of Telecommunications and Networks during semesters 7-8-9 and maximum 1 elective by free choice)  

<table>
<thead>
<tr>
<th>Number of Courses</th>
<th>Teaching Hours (Total)</th>
<th>ECTS Credits (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>24</td>
<td>30</td>
</tr>
</tbody>
</table>

## 9th Semester – Free Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours per Week</th>
<th>ECTS Credits</th>
</tr>
</thead>
</table>
### Optional Courses

Students can declare, attend, be examined and secure the optional courses offered by the Department, without however being counted for obtaining the diploma or the calculation of the final grade. In case of successful attendance, the course is listed in the diploma annex, as well as the workload (ECTS credits) corresponding to each.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
<th>ECTS Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH6</td>
<td>Non-Destructive Testing</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E41</td>
<td>Informatics and Education</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Research work methodologies</th>
<th>2</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>E12</td>
<td>Internship</td>
<td>-</td>
<td>15</td>
</tr>
</tbody>
</table>

### 10th Semester

The 10th semester is devoted to the elaboration of a diploma thesis, which is equivalent to 30 ECTS credits.

### Diploma Thesis Writing Regulation

The Diploma Thesis (DT) is written by all students in the final year of their studies. The successful accomplishment of the DT, under the supervision of TRS (Teaching and Research Staff) members of the department, consists an essential, substantial and formal requirement for obtaining the diploma of Electrical and Computer Engineering of the University of Western Macedonia. Each DT is drafted individually or by two students.

In case it is prepared by two students, two separate theses should be submitted, and each one of them should be graded separately. The thesis regulation is available in the following link: [Diploma -Thesis Writing Regulation](#).

### Undertaking a DT
Students have the right to undertake a DT after completing the first 8 semesters of their studies and if the number of ECTS credits of the courses they owe does not exceed 50 ECTS. This number does not include the courses of the 9th semester.

**Purpose of DT**

The DT enables students to demonstrate their skills in concluding independent topics of Electrical and Computer Engineering. In addition, it represents an opportunity to practice and enrich their knowledge in Computer Science and Telecommunications, as well as their advanced applications. Through DT, students acquire and cultivate additional skills that will be brought into play in their future professional path. DT can combine some of the following characteristics:

- Research profile that may lead to new results, which are considered worthy of publication in scientific conferences and journals.
- Exploring new technologies and participation in development projects.
- Interdepartmental projects developed in collaboration with TRS) members of other departments.

**Selection criteria**

Supervising teachers can use the following criteria before assigning a DT:

- Score in the courses related to the content of the DT.
- Average score.

In addition, supervisors have the right to refuse the assignment of a DT.

**Dissertation examination and marking**

The Dissertation is examined by the supervising professor and two additional co-examiners relevant to the subject of the DT. The average mark of the three examiners results in the final score of the Dissertation.

**Dissertation presentation**

The candidate graduates make a public presentation of their DTs during a day conference organized by the Department.

**Process of DT Assignment**

The assignment procedure is done during the course registration period. Each TRS member may announce at least two Dissertation subjects. Each TRS member is also the supervisor of the subject proposed and one of the examiners. The topics are posted on the website of the Department or on the personal pages of its members.

Students who undertake a DT have to submit to the Administration Office a document, signed by the supervisor/s that enables the title of the DT and the name of the supervising professor.
In case the student decides to change the subject and supervisor, he must first inform the previous supervisor and then make a new application for withdrawal in the period to be announced by the Secretariat. At least one academic semester must have elapsed between two consecutive DT statements of the same student.

The successfully completed DTs, are submitted to the Administration Office on announced dates.

**ADDITIONAL INFORMATION**

**Final Exams**

The exams are conducted exclusively after the end of the winter and spring semesters for the courses taught in those semesters, respectively. The student is entitled to be examined in the courses of both semesters before the beginning of the winter semester. The grade in each course is determined by the teacher, who can organize at his discretion written or oral exams or based on assignments or laboratory exercises.

**Examination and evaluation / grading regulations**

The grade scale with which students' performance scores are calculated is a ten-point system (0-10), with a minimum promotional grade of 5.

- Excellent: 8.50-10.00.
- Very Good: 6.50-8.49.
- Good: 5.00-6.49.
- Fail: 0.00-4.99

**Admission to one of the three Divisions**

In order for a student to be admitted in a division of his / her choice, he / she must have previously successfully passed at least 20 courses in the first 6 semesters. A change of direction is allowed up to 3 times in total, at the request of the student concerned, during the course statements at the beginning of each semester.

**Official duration of the program**

The studies in the Department of Electrical and Computer Engineering are five years of full-time study and the workload corresponds to 300 ECTS credits. A full academic year corresponds to 60 ECTS credits and each full academic semester corresponds to 30 ECTS credits. Each course is assigned the number of ECTS credits, which expresses the required workload (workload is the time calculated that a student typically needs to devote to completing all the learning activities required to achieve the expected learning outcomes).
COURSES DESCRIPTION
1st Semester
MATHEMATICAL ANALYSIS I
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
<th>MK1</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE UNIT TYPE</td>
<td>General Background</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>undergraduate</td>
</tr>
<tr>
<td>YEAR OF STUDIES</td>
<td>1st</td>
</tr>
<tr>
<td>YEAR OF STUDIES</td>
<td>1st</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>1st</td>
</tr>
<tr>
<td>ECTS CREDITS</td>
<td>5</td>
</tr>
<tr>
<td>COURSE WEBSITE (URL)</td>
<td>eclass.uowm.gr/courses/ICTE108/</td>
</tr>
<tr>
<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
</tr>
<tr>
<td>INSTRUCTOR</td>
<td>Bisbas A.</td>
</tr>
</tbody>
</table>
| LEARNING OUTCOMES / GENERAL COMPETENCES | Upon successful completion of this course, students will be able:  
  • to examine the convergence of real sequences, series, as well as power series,  
  • to calculate infinite sums,  
  • to study real functions of one variable,  
  • to differentiate parametrically-defined and implicit functions,  
  • to determine lines tangent to plane curves that are described in different ways,  
  • to calculate indefinite, definite, and improper integrals,  
  • to use polar coordinates,  
  • to calculate the area between curves, and the length of plane curves,  
  to approximate functions with polynomials. |
| PREREQUISITES          | -            |
| TEACHING METHODS       | Lectures, exercises |
| ASSESSMENT METHODS     | Written intermediate exam (25%), written final exam (75%). |
GREEK

<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. F. Ayres, Διαφορικός και Ολοκληρωτικός Λογισμός, Κλειδάριθμος, 2008.</td>
</tr>
<tr>
<td>4. Brand, Louis Μαθηματική ανάλυση, Εκδόσεις Ι. Συμεών, 1984</td>
</tr>
<tr>
<td>5. Ghorpade, Sudhir R.Limaye, Balmohan V., A Course in Calculus and Real Analysis [electronic resource], Heal-Link/Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.</td>
</tr>
</tbody>
</table>
LINEAR ALGEBRA
**COURSE UNIT CODE**  MK2  
**COURSE UNIT TYPE**  General Background  
**LEVEL OF STUDY**  undergraduate  
**YEAR OF STUDIES**  1st  
**YEAR OF STUDIES**  1st  
**SEMESTER**  1st  
**ECTS CREDITS**  4  
**COURSE WEBSITE (URL)**  eclass.uowm.gr/courses/ICTE307/  
**TEACHING WEEKLY HOURS**  3)  
**INSTRUCTOR**  Bisbas A.  

**COURSE CONTENTS**  

**LEARNING OUTCOMES / GENERAL COMPETENCES**  
Upon successful completion of this course, students will be able:  
  • to know and manage the general form of curves and surfaces,  
  • to understand and use concepts of vector spaces,  
  • to use matrices as tools in theoretical and numerical computations,  
  • to compute eigenvalues and eigenvectors,  
  • to compute determinants,  
  • to solve systems of linear equations,  
  to manage and use matrix diagonalization.  

**PREREQUISITES**  -  

**TEACHING METHODS**  Lectures, exercises  

**ASSESSMENT METHODS**  Written final exam (100%)
<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION/EXAMS</th>
<th>Greek</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RECOMMENDED BIBLIOGRAPHY</strong></td>
<td></td>
</tr>
<tr>
<td>2. Α. Κυριαζής, Εφαρμοσμένη Γραμμική Άλγεβρα, Νικητόπουλος Ε &amp; Σια ΟΕ, 2006.</td>
<td></td>
</tr>
<tr>
<td>5. Κουτελιέρης, Σιάνη, Γραμμική Άλγεβρα για Μηχανικούς, Τζίολας 2005.</td>
<td></td>
</tr>
</tbody>
</table>
STRUCTURED PROGRAMMING
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
<th>MK4-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE UNIT TYPE</td>
<td>General Background</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>undergraduate</td>
</tr>
<tr>
<td>YEAR OF STUDIES</td>
<td>1st</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>1st</td>
</tr>
<tr>
<td>ECTS CREDITS</td>
<td>5</td>
</tr>
<tr>
<td>COURSE WEBSITE (URL)</td>
<td><a href="https://eclass.uowm.gr/courses/ICTE110/">https://eclass.uowm.gr/courses/ICTE110/</a></td>
</tr>
<tr>
<td>TEACHING WEEKLY HOURS</td>
<td>5</td>
</tr>
<tr>
<td>INSTRUCTOR</td>
<td>Stergiou K.</td>
</tr>
</tbody>
</table>
| COURSE CONTENTS  | 1. Introductory Concepts. Programming Languages. Algorithms  
2. Running Algorithms and Compilers  
3. Programming Methodology. Design and Evaluation  
4. Introduction to the C programming language  
5. Data Types, Constants and Variables  
6. Commands, Basic decision structures (if, switch), loop structures (while do while, for)  
7. Tables, String, Multi-Dimensional Tables  
8. Pointers, Pointers and Tables  
9. Functions, Parameters, Parameter Passing, Value and Reference-based  
10. Scope and Duration of Variables  
11. Structures, Tables of Structures  
12. Dynamic memory assignment, Dynamic Tables  
13. File management |
The course is the main introductory course on computer programming, one of the most basic skills that electrical and computer engineers should possess. The course material aims at introducing students to the basic concepts of programming as well as algorithmic thinking using the widely used language C. The expected learning outcomes are the following:

1. Understanding the principles of algorithm design
2. Gaining experience in designing algorithms for simple and complex problems
3. Knowledge of programming principles with the C language (data types, variables, constants)
4. Knowledge of the basic components of structured programming languages such as C (loops, tables, strings, functions, aggregate types, files)
5. Knowledge of advanced specific characteristics of C (pointers, pointers and tables, passage of parameters using pointers)
6. Gaining experience in writing and debugging programs
7. Understanding and implementing basic algorithms (search, sorting)
8. Gaining experience and understanding software technology principles
9. Experience in collaborative problem solving

Upon successful completion of the course, students will:
10. know how to design simple algorithms
11. understand the basics of structured programming
12. know how to write, compile, and debug programs in C
13. are capable of writing programs in C using loops, tables, functions, pointers, structures, and files
14. have a basic knowledge of software technology

**PREREQUISITES**
- 

**TEACHING METHODS**
Face to face
### Assessment Methods

The evaluation is done through:

- written examination at the end of the semester that includes short answer questions and resolution of exercises
- scoring the code of laboratory exercises carried out during the semester
- laboratory examination at the end of the semester

The evaluation criteria are as follows:

- correctness
- clarity
- accuracy
- efficiency

### Language of Instruction/Exams

Greek

### Recommended Bibliography

1. Αλέξανδρος Καράκος, Εισαγωγή στη γλώσσα C, με παραδείγματα και ασκήσεις, ΚΑΡΑΚΟΣ ΣΠΥΡΙΔΩΝ, Έκδοση: 2/2012.
2. Ν. Χατζηγιαννάκης, Η γλώσσα C σε βάθος, Κλειδάριθμος, 2009
4. Σεφερίδης, C για Αρχάριους, Κλειδάριθμος, 2009

- Recommended Article/Paper Resources:
  ACM Transactions on Programming Languages and Systems, Journal of Computer Languages
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
<th>MKH3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COURSE UNIT TYPE</strong></td>
<td>General Background</td>
</tr>
<tr>
<td><strong>LEVEL OF STUDY</strong></td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td><strong>YEAR OF STUDIES</strong></td>
<td>1st</td>
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<tr>
<td><strong>SEMESTER</strong></td>
<td>1st</td>
</tr>
<tr>
<td><strong>ECTS CREDITS</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>COURSE WEBSITE</strong></td>
<td><a href="https://eclasse.uowm.gr/courses/ECE379/">https://eclasse.uowm.gr/courses/ECE379/</a></td>
</tr>
<tr>
<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Fillipidis K.</td>
</tr>
</tbody>
</table>
| **COURSE CONTENTS**  | Interactions and Motion  
The Momentum Principle and Impulse  
The Fundamental Interactions  
Contact Interactions  
Determining Motion from Forces  
Determining Forces from Motion  
The Energy Principle and Work  
Translational, Rotational, and Vibrational Energy  
Gravity  
Oscillations  
Collisions  
Angular Momentum, Torque and Rigid Body Dynamics  
Waves |
<table>
<thead>
<tr>
<th>Learning Outcomes / General Competences</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deduce from observations of an object’s motion whether or not it has interacted with its surroundings.</td>
<td></td>
</tr>
<tr>
<td>Mathematically describe position, motion, momentum and change of momentum in three dimensions.</td>
<td></td>
</tr>
<tr>
<td>Read and modify a simple computational model of motion at constant velocity.</td>
<td></td>
</tr>
<tr>
<td>Use both iterative and analytical techniques (differential equations solving) to predict the future motion of a system that is subjected to a constant or varying net force.</td>
<td></td>
</tr>
<tr>
<td>Use an iterative approach to predict the future momentum and motion of an object that is subjected to a varying net force when it cannot be solved analytically.</td>
<td></td>
</tr>
<tr>
<td>Draw and interpret graphs of the components of position or velocity vs. time.</td>
<td></td>
</tr>
<tr>
<td>Calculate the force exerted by a spring on an object in contact with it.</td>
<td></td>
</tr>
<tr>
<td>Calculate the approximate gravitational force on an object near the Earth’s surface.</td>
<td></td>
</tr>
<tr>
<td>Calculate the 3D gravitational or electric force exerted on a system by objects in its surroundings.</td>
<td></td>
</tr>
<tr>
<td>Iteratively predict the motion of an object that interacts gravitationally or electrically with its surroundings, by hand or with a computer.</td>
<td></td>
</tr>
<tr>
<td>Analyze simple collisions by applying the Momentum Principle to a system of more than one particle.</td>
<td></td>
</tr>
<tr>
<td>Using the ball–spring model, explain in words how an inanimate object can exert a force on an object that touches it.</td>
<td></td>
</tr>
<tr>
<td>Mathematically describe the motion of an object that interacts with a spring, both analytically and computationally (iteratively).</td>
<td></td>
</tr>
<tr>
<td>Identify systematically all the forces acting on a system.</td>
<td></td>
</tr>
<tr>
<td>Determine the values of unknown 3D forces acting on a system whose motion is known.</td>
<td></td>
</tr>
<tr>
<td>Analyze curving motion mathematically, and relate parallel and perpendicular components of ( \frac{dp}{dt} ) to the net force acting on the system.</td>
<td></td>
</tr>
<tr>
<td>Calculate the total energy (rest energy + kinetic energy) of a single particle system.</td>
<td></td>
</tr>
<tr>
<td>Calculate the total energy of a multiparticle system (rest energy, kinetic energy, and gravitational and electric potential energy).</td>
<td></td>
</tr>
<tr>
<td>Mathematically relate changes in energy of a system to the work done by the surroundings.</td>
<td></td>
</tr>
<tr>
<td>Analyze in detail processes involving changes in potential energy, kinetic energy, and rest energy.</td>
<td></td>
</tr>
<tr>
<td>Construct and interpret graphs of multiparticle system energy as a function of time.</td>
<td></td>
</tr>
<tr>
<td>PREREQUISITES</td>
<td>-</td>
</tr>
<tr>
<td>--------------------</td>
<td>---</td>
</tr>
<tr>
<td>TEACHING METHODS</td>
<td>Lectures</td>
</tr>
<tr>
<td>ASSESSMENT METHODS</td>
<td>Evaluation takes place in Greek and if need in English by final written examination on four problems. Optionally the students can build up their grade by taking part in a midterm examination (multiple choice test) and by submitting two VPython projects. Samples of examination items are posted on the-class and e-assessment platforms.</td>
</tr>
<tr>
<td>LANGUAGE OF INSTRUCTION/EXAMS</td>
<td>Greek (also possible in English)</td>
</tr>
<tr>
<td>RECOMMENDED BIBLIOGRAPHY</td>
<td>- Recommended Book RECOMMENDED BIBLIOGRAPHY:</td>
</tr>
<tr>
<td></td>
<td>1. Physics for scientists and engineers, RAYMOND A. SERWAY, JOHN W. JEWETT</td>
</tr>
<tr>
<td></td>
<td>2. University Physics, Young H., Freedman R.</td>
</tr>
<tr>
<td></td>
<td>3. Basic Principles of Physics, R. SHANKAR</td>
</tr>
<tr>
<td></td>
<td>4. Matter and Interactions, RUTH W. CHABAY, BRUCE A. SHERWOOD</td>
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<tr>
<td></td>
<td>- Recommended Article/Paper RECOMMENDED BIBLIOGRAPHY:</td>
</tr>
<tr>
<td></td>
<td>1. The Physics Teacher (published by AIP on behalf of the AAPT)</td>
</tr>
<tr>
<td></td>
<td>2. American Journal of Physics (published by AIP on behalf of the AAPT)</td>
</tr>
<tr>
<td></td>
<td>3. European Journal of Physics (published by IOP on behalf of the EPS)</td>
</tr>
<tr>
<td></td>
<td>- Recommended Websites and YouTube channels:</td>
</tr>
<tr>
<td></td>
<td>• Glowscript.org</td>
</tr>
<tr>
<td></td>
<td>• Let’s Code Physics</td>
</tr>
<tr>
<td></td>
<td>• Physics Explained</td>
</tr>
</tbody>
</table>
DIGITAL DESIGN
COURSE UNIT CODE     MK9
COURSE UNIT TYPE     General Background
LEVEL OF STUDY       Undergraduate
YEAR OF STUDIES      1st
SEMESTER             1st
ECTS CREDITS         5
COURSE WEBSITE (URL) https://eclass.uowm.gr/courses/ECE358/
TEACHING WEEKLY HOURS 4
INSTRUCTOR           Asimopoulos N.
COURSE CONTENTS      The purpose of this course is to provide to the students a detailed knowledge of the basic hardware elements of computer systems. Specifically, starting from the basic concepts of binary logic and logic circuits, students shall learn to use the building blocks of digital systems, as well as design and analyze both combinational and sequential digital circuits. In depth, digital design course deals with the following:

- Binary numbers and arithmetic
- Logic gates and standards symbolism
- Basic concepts of logic circuits
- Boole Algebra, logic functions and simplification methods, digital circuits synthesis and analysis
- Combinational circuits
- Binary Adder, half adder, full adder, parallel adder and subtractor circuits
- Comparator, Decoder - Encoder circuits
- Demultiplexer, Multiplexer circuits
- Programmable logical arrays
- Analysis and design of synchronous/asynchronous sequential circuits
- Introduction to VHDL
- Exercises
<table>
<thead>
<tr>
<th>LEARNING OUTCOMES / GENERAL COMPETENCES</th>
<th>Upon successful completion of the digital design course, students shall attain familiarity with a broad range of digital circuits. That is, combinational and sequential digital circuits and computer systems’ integrated circuits and shall thoroughly understand the principles and disciplines for robust digital logic and digital systems’ design.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREREQUISITES</td>
<td>-</td>
</tr>
<tr>
<td>TEACHING METHODS</td>
<td>Lectures, Practical exercises, Laboratory exercises</td>
</tr>
<tr>
<td>ASSESSMENT METHODS</td>
<td>Written exam (100%)</td>
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<tr>
<td>LANGUAGE OF INSTRUCTION/EXAMS</td>
<td>Greek</td>
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**TECHNICAL DRAWING**
<table>
<thead>
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<th>COURSE UNIT CODE</th>
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<tbody>
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<td>COURSE UNIT TYPE</td>
<td>General Background</td>
</tr>
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<td>LEVEL OF STUDY</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>YEAR OF STUDIES</td>
<td>1st</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>1st</td>
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<tr>
<td>ECTS CREDITS</td>
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<td>COURSE WEBSITE (URL)</td>
<td><a href="https://eclass.uowm.gr/courses/ECE352/">https://eclass.uowm.gr/courses/ECE352/</a></td>
</tr>
<tr>
<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
</tr>
<tr>
<td>INSTRUCTOR</td>
<td>Stimoniaris D.</td>
</tr>
<tr>
<td>COURSE CONTENTS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Introduction to technical and electrical design. Regulations, legislation</td>
</tr>
<tr>
<td></td>
<td>• Conventional design and study of electrical circuits</td>
</tr>
<tr>
<td></td>
<td>• Introduction and configuration of EPLAN software package</td>
</tr>
<tr>
<td></td>
<td>• Creation and designing of a project</td>
</tr>
<tr>
<td></td>
<td>• Set screw terminals, cables and materials (libraries)</td>
</tr>
<tr>
<td></td>
<td>• Definition and management of materials, cables, with databases of companies</td>
</tr>
<tr>
<td></td>
<td>• Documentation and export a full project feasibility analysis</td>
</tr>
<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>This course provides the basic knowledge for planning and design documentation for electrical and electronic circuits and their application to electrical energy networks using Computers and specialized software designer packages. On successful completion of this module the student will be able to:</td>
</tr>
<tr>
<td></td>
<td>• have the theoretical and practical background for designing electric circuits</td>
</tr>
<tr>
<td></td>
<td>• apply suitable rules and standards for an electrical design</td>
</tr>
<tr>
<td></td>
<td>• use appropriately software packages for designing circuits on a PC</td>
</tr>
<tr>
<td>PREREQUISITES</td>
<td>-</td>
</tr>
<tr>
<td>TEACHING METHODS</td>
<td>Lectures, Individual Study, e-class platform support, Software package exercise</td>
</tr>
</tbody>
</table>
### ASSESSMENT METHODS
- **Type:** Laboratory (50%)
  - **Date of exams:** Weekly
- **Type:** Exams (50%)
  - **Exams on PC**
  - **Date:** End of the semester

### LANGUAGE OF INSTRUCTION/EXAMS
| Greek |

### RECOMMENDED BIBLIOGRAPHY
1. ELWE: Training systems for basic and future oriented education in natural science and engineering
2. German Schematic Diagrams of Industrial Equipment SIEMENS
4. www.eplan.gr
ENGLISH I-ENGLISH FOR ELECTRICAL AND COMPUTER ENGINEERING
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<tr>
<td><strong>COURSE WEBSITE</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ECE355/">https://eclass.uowm.gr/courses/ECE355/</a></td>
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<tr>
<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>2</td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Tavoultzidou S.</td>
</tr>
</tbody>
</table>
| **COURSE CONTENTS**  | Electrical and Computer Engineering  
Energy Conversion  
Energy Conversion Devices  
Electric Power Systems  
Renewable Sources  
Semiconductors  
Integrated Circuits  
Telecommunications  
Robotics and Artificial Intelligence  
Computer History  
Computer Generations  
Software  
Operating Systems  
Programming languages |
# Learning Outcomes / General Competences

The course aims to qualify students with:

- developing reading strategies to reading comprehension of authentic academic discipline-based texts.
- identifying and applying grammatical structures and Electrical and Computer Engineering lexis.
- drawing inferences regarding their mother tongue (Greek) and English language on grammar, lexis, and discourse elements.
- producing simple academic discourse (reports, descriptions, instructions, etc.)
- interpreting and analysing information in diagrams, tables, etc.

The course focuses on teaching ESP/EAP with a view to enabling students to:

- meet their career needs, i.e., working as Electrical and Computer Engineers in a national, international, or interdisciplinary environment
- take part in various European Programmes (Erasmus+, etc.)
- attend postgraduate studies
- develop linguistic and intercultural awareness

## Prerequisites

- 

### Teaching Methods

- Face-to face
- Synchronous distance learning (zoom), if required

### Assessment Methods

- End-semester exams test (60%)
- Mid-semester test (40%)

Assessment exercises:

- Multiple choice questions
- TRUE-FALSE questions
- Word Building (Nouns/Adjectives)
- Grammatical structures
- Synonyms-Antonyms
- Vocabulary Expansion (prefix-es/suffixes/difficult plural forms/differences between AmE-BrE)
- Short academic and technical texts production of reference and paraphrasing

## Language of Instruction/Exams

English
**RECOMMENDED BIBLIOGRAPHY**


2nd Semester
MATHEMATICAL ANALYSIS II
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
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<td><a href="https://eclass.uowm.gr/courses/HMMY119/">https://eclass.uowm.gr/courses/HMMY119/</a></td>
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<tr>
<td>INSTRUCTOR</td>
<td>Bisbas A.</td>
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<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>Upon successful completion of this course, students will be able:</td>
</tr>
<tr>
<td></td>
<td>• to differentiate variables of several functions,</td>
</tr>
<tr>
<td></td>
<td>• to use cylindrical and spherical coordinates,</td>
</tr>
<tr>
<td></td>
<td>• to find extreme values (free/constraint) and saddle points,</td>
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<td></td>
<td>• to linearize functions and find tangent planes,</td>
</tr>
<tr>
<td></td>
<td>• to perform double and triple integration,</td>
</tr>
<tr>
<td></td>
<td>• to manipulate vectors,</td>
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<tr>
<td></td>
<td>• to differentiate vector functions,</td>
</tr>
<tr>
<td></td>
<td>• to detect irrotational and solenoidal fields,</td>
</tr>
<tr>
<td></td>
<td>• to determine potentials for conservative fields,</td>
</tr>
<tr>
<td></td>
<td>• to parametrically describe curves and surfaces,</td>
</tr>
<tr>
<td></td>
<td>• to calculate line integrals and fluxes through surfaces of vector fields,</td>
</tr>
<tr>
<td></td>
<td>• to use Green’s, Gauss, και Stokes theorems.</td>
</tr>
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<td>PREREQUISITES</td>
<td>Elements of the following course are required: Mathematical Analysis I</td>
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<tr>
<td>TEACHING METHODS</td>
<td>Lectures, exercises</td>
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<td>ASSESSMENT METHODS</td>
<td>Written intermediate exam (25%), written final exam (75%)</td>
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<td>LANGUAGE OF INSTRUCTION/EXAMS</td>
<td>Greek</td>
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<td><a href="https://eclass.uowm.gr/courses/ECE373/">https://eclass.uowm.gr/courses/ECE373/</a></td>
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<td>TEACHING WEEKLY HOURS</td>
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<tr>
<td>INSTRUCTOR</td>
<td>Poulakis N.</td>
</tr>
<tr>
<td>COURSE CONTENTS</td>
<td></td>
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</tbody>
</table>

1. Electrical quantities and circuit elements: International System of Units (SI), voltage and current, power and energy, voltage and current sources, electrical resistance (Ohm’s law), Kirchhoff’s laws, analysis of a circuit that contains dependent sources.

2. Simple ohmic elements: Resistors in series and parallel, voltage divider circuits, voltage and current measurement, resistance measurement–Wheatstone bridge, equivalence of triangle with star circuits (Δ-to-Υ).

3. Techniques for circuit analysis: Method of voltage nodes with independent and/or dependent sources and special cases, method of current loops with independent and/or dependent sources and special cases, comparison of the two methods.


5. First order circuits RL and RC: Natural and step response, the general solution for step and natural responses, Sequential Switches.

LEARNING OUTCOMES / GENERAL COMPETENCES

At successful end of the course the student will be able to:

• understand, use and convert SI and empirical units in electric circuits,
• calculate the power for every element of a simple circuit,
• recognize series or parallel connections of resistors and calculate the total resistance,
• use voltage divider and current divider to solve simple circuits,
• analyze a Wheatstone bridge and use it to measure an unknown resistance,
• use Δ – Y transformation to solve simple circuits,
• use the method of voltage nodes and the method of current loops to solve a circuit,
• judge which method is preferable for each circuit,
• understand the source transformation and be able to use it for solving a circuit,
• understand the meaning of and be able to solve the equivalent Thevenin and Norton circuits of a complex circuit,
• understand and estimate the value of the load which satisfies the condition for maximum power transfer,
• know and be able to use the equations for the voltage, current, power and energy in an inductive coil or a capacitor as well as in parallel or serial combinations of such,
• understand of the concept of the mutual inductance and be able to use the dot convention to form the current loop equations for a circuit that contains magnetically coupled coils,
• calculate the transitional response of RL and RC circuits as well as their response in step excitation,
• be able to analyze a circuit with successive switching function,
• calculate the transitional response and the response to step excitation of parallel and series RLC circuits.

General competencies:

• Analysis and synthesis of data and information concerning electric circuits by the use of appropriate technologies
• Individual/Independent work.

PREREQUISITES

- 

TEACHING METHODS

Theory Lectures (2 hours/week)
Tutorial exercises (1 hours/week)
Laboratory exercises (2 hours/week)
### Assessment Methods

- Three written progress exams (25%)
- Final written problem-solving exam (35%)
- Weekly laboratory assessments with final written report (40%)

### Language of Instruction/Exams

Greek

### Recommended Bibliography


### Object Oriented Programming I
<table>
<thead>
<tr>
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<td><strong>COURSE WEBSITE (URL)</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE209/">https://eclass.uowm.gr/courses/ICTE209/</a></td>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Bibi S.</td>
</tr>
</tbody>
</table>
The course introduces students to the concepts related to Object Oriented programming, aiming to learn the most popular object-oriented programming language, Java. Students will come in contact with concepts such as subtraction, polymorphism, and see how they are implemented through heredity, content, and interfaces. The course deals with stream and file management, code debugging techniques and dynamic data set management. Students will be trained in the use of threads in order to create multi-threaded applications. Students will also gain hands-on experience in using the above concepts through their involvement with the Java programming language, both through a series of laboratory courses and through programming assignments.

Course modules:

- **Section 1:** Introduction to Object Oriented Programming, Basic Concepts, Types and Generations of Programming Languages, Java (History, Versions, Technologies, Advantages)
- **Section 2:** Java Code Development, the first program, operators, control commands, iteration structures, input-output commands, basic libraries / packages, IDE environments
- **Section 3:** Classes & Objects, Implementing Classes and Objects in Java, Designing Classes, Member Data, Member Functions, Constructors, Data Access Types, Definition and Use of Objects
- **Section 4:** Classes & Objects, modifiers, get, set, toToString functions, const, static, overload mechanism, string management
- **Section 5:** Data Sets, One-Dimensional and Two-Dimensional Tables, Arraylists, Access mechanisms, Iterators
- **Section 6:** Composition, objects as data members of classes, how to handle objects, examples of composition
- **Section 7:** Inheritance, implementation of class hierarchy, superclasses, subclasses, override of functions, comparison between inheritance and composition
- **Section 8:** Polymorphism, Abstract Classes, Dynamic and Static Binding, Data Type Conversion, Examples of Polymorphism
- **Section 9:** Interfaces, scope, objectives, "multiple" inheritance
- **Section 10:** Exceptions, Exception Management, Hierarchy, Chain Exceptions, Defining new Exception, Error management.
- **Section 11:** Graphical User Interface, Introduction to Swing Library, Graphical Components, Colors, Fonts, Shapes, Event Managers, Listeners
LEARNING OUTCOMES / GENERAL COMPETENCES
Upon successful completion of the course students will be able to:
Understand in depth the principles of Object-Oriented Programming.
Design and implement object-oriented applications.
Understand in-depth the concepts of encapsulation, polymorphism and inheritance.
Implement classes with their members and methods and create objects.
Understand and use abstract classes.
Understand the use and operation of arrays, strings, and collections in Java.
Design and develop simple and complex applications with Java language.
Design and develop graphical user interfaces with Java language.
Understand in-depth the exception mechanism supported by Java and define new exceptions.
Understand the concept of parallel programming by using threads.
Recognize code errors and have the ability to correct them.
Evaluate solutions and choose the most appropriate one to apply to real problems.

PREREQUISITES -

TEACHING METHODS Face-to-face
The evaluation of students is carried out with:

- Written evaluation
- Laboratory examination
- Application Development (Teamwork)

The written evaluation is intended to examine the students' knowledge of the taught material and to capture the degree of its assimilation. Includes multiple choice questions, free questions but also short answers, code evaluation, code development.

The purpose of the laboratory exams is to determine the degree of students’ familiarity when designing and developing Java applications in limited time. It includes short application development in Java language.

The teamwork includes application development in Java into teams of two persons. The applications implemented in Java are submitted electronically in the e-class platform.

The final evaluation of the students is as follows: 60% Grade of written examination + 20% Grade of teamwork + 20% Grade of laboratory examination.

**Books (in Greek)**
1. Savitch Walter, Absolute Java (contains CD), Pearson.
2. Deitel Paul J., Deitel Harvey M., Java how to program, Prentice Hall
4. E. Lervik and VB Havdal, Java the UML way, Wiley.
5. R. Cadenhead and L. Lemay, Java 7, Sams Publishing.

**Journals**
- Science of Computer Programming, Elsevier
- Journal of Systems and Software, Elsevier
- Proceedings of the ACM on Programming Languages, ACM

**Language of Instruction/Exams**
Greek

**Recommended Bibliography**

**Electrical Materials**
<table>
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<tr>
<td>INSTRUCTOR</td>
<td>Poulakis N.</td>
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</tbody>
</table>
| COURSE CONTENTS  | 1. Atomic structure, atomic bonds and type of solids  
2. Molecular kinetic theory, thermal expansion, heat and thermal noise  
3. Crystal state, crystal types and defects  
4. Classical theory for the electrical and thermal conductivity: Drude model, dependence of the special resistivity on temperature, electrical conductivity in non-ideal metals and alloys  
5. Thermal conductivity in metals, thermal resistance  
6. Electrical conductivity in non-metallic materials  
7. AC conductivity. |
| LEARNING OUTCOMES / GENERAL COMPETENCES | With successful completion of the course, students will be able to:  
• understand the macroscopic properties (mechanical, thermal, electrical, and magnetic) of the basic materials of the modern technological applications, based on their microstructure, ionic or crystal,  
• comprehend phase diagrams both qualitatively and quantitatively,  
• comprehend curves of electric and magnetic quantities, and  
• mathematically extract the values of the basic physical quantities of materials.  
General competencies:  
• Search for, analysis and synthesis of data and information using appropriate technologies  
• Understanding of the basic physical properties of materials on the basis of their microscopic structure |
### PREREQUISITES
- 

### TEACHING METHODS
Face to face

### ASSESSMENT METHODS
- A midterm written progress exam (25%)
- Final written problem-solving exam (75%)

### LANGUAGE OF INSTRUCTION/EXAMS
Greek

### RECOMMENDED BIBLIOGRAPHY
DISCRETE MATHEMATICS
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Ploskas N.</td>
</tr>
</tbody>
</table>
| **COURSE CONTENTS**  | • Logic and Proofs.  
|                      | • Finite and Infinite Sets.  
|                      | • Computability.  
|                      | • Formal Languages and Grammars.  
|                      | • Permutations.  
|                      | • Combinations and Discrete Probability.  
|                      | • Relations and Functions.  
|                      | • Graphs and Trees.  
|                      | • Finite State Machines.  
|                      | • Discrete Numeric Functions and Generating Functions.  
|                      | • Algorithms and Complexity.  
|                      | • Recursive Relations.  |
LEARNING OUTCOMES / GENERAL COMPETENCES

Upon successful completion of this course, students will:

• understand methods for solving discrete mathematical problems
• apply solution methods to unknown problems
• developing problem-solving skills and creative thinking
• understand the basics of set theory
• understand the basics of computability
• understand the basics of formal languages and grammars
• be able to calculate permutations and computations
• be able to solve basic problems in graphs and trees
• be able to study discrete numeric functions
• understand the basics of algorithmic complexity
• be able to calculate recursive functions

General Competences:
• Search for, analysis and synthesis of data and information by the use of appropriate technologies
• Decision-making
• Individual/Independent work
• Algorithmic thinking
• Solve complex algorithmic problems

PREREQUISITES

- 

TEACHING METHODS

Face to face

ASSESSMENT METHODS

The assessment method consists of two intermediate written examinations (20%) and a final written examination (80%). The intermediate and final examinations include multiple choice questions, short answer questions, and problem-solving questions. The above evaluation criteria are posted on the course website.

LANGUAGE OF INSTRUCTION/EXAMS

Greek
## RECOMMENDED BIBLIOGRAPHY

- Recommended Book RECOMMENDED BIBLIOGRAPHY:

1. Rosen Kenneth H., Διακριτά μαθηματικά και εφαρμογές τους, Εκδόσεις Α. Τζιόλα, Έκδοση: 8η/2018
2. Lipschutz Seymour, Lipson Marc Lars, Διακριτά μαθηματικά, Εκδόσεις Α. Τζιόλα, Έκδοση: 2η έκδ./2003

- Related Scientific Journals:

4. Discrete Mathematics
5. SIAM Journal on Discrete Mathematics
6. Discrete Mathematics and Applications
PROBABILITY THEORY AND STATISTICS
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Bisbas A.</td>
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<tr>
<td><strong>COURSE CONTENTS</strong></td>
<td>Descriptive statistics: data summary and presentation, frequency distribution, histogram, characteristic values (mean, median, mode, range, variance, standard deviation). Probability theory: basic concepts, events, conditional probability, addition and multiplication law of probabilities, Bayes theorem. Probability distributions, discrete and continuous random variables, expected value, variance and standard deviation. Important distributions: Bernoulli, binomial, geometric, Poisson, uniform, exponential, gamma, normal distribution and the central limit theorem, Student, X² and F distributions. Statistical estimation: sampling distributions, point estimation, properties of estimators, confidence intervals. Statistical hypotheses: hypothesis testing, type I and type II errors, required sample size, goodness of fit tests.</td>
</tr>
<tr>
<td><strong>LEARNING OUTCOMES / GENERAL COMPETENCES</strong></td>
<td>After the completion of the course the students should be able to apply the basic concepts and techniques of probability theory and statistical inference.</td>
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<tr>
<td><strong>PREREQUISITES</strong></td>
<td>Mathematical Analysis</td>
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<td><strong>TEACHING METHODS</strong></td>
<td>Lectures, Hours of Instruction 52 (Theory: 26, Exercises: 26)</td>
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<td><strong>ASSESSMENT METHODS</strong></td>
<td>Final written exam (compulsory), Intermediate written exam and/or assignments (optional)</td>
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<td>RECOMMENDED BIBLIOGRAPHY</td>
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3rd Semester
APPLIED MATHEMATICS I
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<td>INSTRUCTOR</td>
<td>Zygiridis T.</td>
</tr>
</tbody>
</table>
LEARNING OUTCOMES / GENERAL COMPETENCES

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

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

General Competences:

• Search for, analysis and synthesis of data and information by the use of appropriate technologies.
• Decision-making.
• Individual/Independent work.

PREREQUISITES

Elements of the following courses are required:

• Mathematical Analysis I
• Mathematical Analysis II
• Linear Algebra

TEACHING METHODS

- Face-to-face
- Online synchronous (if necessary)

ASSESSMENT METHODS

Summative mid-term written assessment (25%) and summative final written assessment (75%) in Greek. The adequacy of theoretical knowledge, the ability to apply specific methodologies and the ability to solve problems under specific time constraints are tested. The evaluation criteria refer to the validity of the answers, as well as to the degree of their clarity and completeness. Oral exams are provided for students with learning difficulties. The criteria can be accessed by students via the platform eclass.uowm.gr.

LANGUAGE OF INSTRUCTION/EXAMS

Greek
RECOMMENDED BIBLIOGRAPHY


2. Θ. Ρασσιάς, Μαθηματικά ΙΙ β έκδοση, ΤΣΟΤΡΑΣ ΑΝ ΑΘΑΝΑ-ΣΙΟΣ, Έκδοση: 2η/2017.


4. Κάρολος Σεραφειμίδης, Διαφορικές Εξισώσεις, Εκδόσεις "σοφία", 2010.

5. ΝΙΚΟΛΑΟΣ Μ. ΣΤΑΥΡΑΚΑΚΗΣ, Διαφορικές Εξισώσεις: Συνήθεις και Μερικές. Θεωρία και Εφαρμογές από τη Φύση και τη Ζωή, ΤΣΟΤΡΑΣ ΑΝ ΑΘΑΝΑΣΙΟΣ, Έκδοση: 2η/2017.

6. Μυλωνάς Νίκος, Σχοινάς Χρήστος, Διαφορικές Εξισώσεις, Μετασχηματισμοί και Μιγαδικές Συναρτήσεις, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & Υ.ΙΟΙ, Έκδοση: 1η/2015.

7. Κραββαρίτης Δ., Εισαγωγή στις Διαφορικές εξισώσεις, ΤΣΟΤΡΑΣ ΑΝ ΑΘΑΝΑΣΙΟΣ, Έκδοση: 1η/2014.


ELECTRICAL MEASUREMENTS
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<tr>
<td>TEACHING WEEKLY HOURS</td>
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<tr>
<td>INSTRUCTOR</td>
<td>Poulakis N.</td>
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</tbody>
</table>
| COURSE CONTENTS  | 1. Systems of units: International System (SI) and Anglo-Saxon System of units, measurement standards, electrical measurement standards.  
                     4. Measurement setups and measurement systems: Capacitors and inductors with losses, ammeters and voltmeters in measurement setups, voltage dividers, measurement transformers.  
                     6. Power and energy measurement in DC and AC circuits, power measurement in single- and three phase circuits.  
                     7. Static and dynamic sensor characteristics  
                     8. Sensor signal conditioning  
                     9. Electro-mechanical sensors of position, displacement, force, mechanical voltage  
                     10. Temperature sensors |
**LEARNING OUTCOMES / GENERAL COMPETENCES**

At successful completion of the course, student will:

- be able to process measurement data, estimate errors and present the results with correct statistics
- know the basic operating principles and structure of electrical measurement instruments, with emphasis on the modern digital instruments and the differences with the traditional analogue ones (advantages-disadvantages)
- know the basic electrical measurement setups, the techniques and the elements used for measurements in the full range of electrical power
- be able to analyze the basic bridge circuits and calculate their output voltage
- be familiar with the operation of digital instruments for electrical measurements, be able to select the optimum sampling characteristics according to the sensitivity and spectral resolution sought in each application,
- understand the characteristics of the basic types of voltage/current waveforms and be able to measure them
- be able to assess the value of the static and dynamic characteristics of the common transducers used to measure physical quantities

be able to use the basic circuits and techniques of supply and signal processing of electromechanical temperature, and light sensors.

**General Competences:**

- Search for, analysis and synthesis of data and information using appropriate technologies,

---

**PREREQUISITES**

- Electrical Circuits I
- Electrical Circuits II
- Discrete Mathematics

**TEACHING METHODS**

- Face to face theory lectures (2h/week)
- Individual laboratory practice (2h/week)

**ASSESSMENT METHODS**

- Final written exam in measuring circuits design and analysis and uncertainty estimation problems (70%)
- 6 laboratory assessments leading to final written reports (30%)

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
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<td>3. “Transducers and Their Elements: Design and Application”,</td>
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ALGORITHMS AND DATA STRUCTURES
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<td>INSTRUCTOR</td>
<td>Ploskas N.</td>
</tr>
<tr>
<td>COURSE CONTENTS</td>
<td>• Abstract Data Types</td>
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<tr>
<td></td>
<td>• Compound Data Structures.</td>
</tr>
<tr>
<td></td>
<td>• Arrays, Pointers, Linked Lists.</td>
</tr>
<tr>
<td></td>
<td>• Stacks, Queues.</td>
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<tr>
<td></td>
<td>• Algorithms and Complexity.</td>
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<td>• Recursive Algorithms.</td>
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<td></td>
<td>• Searching and Sorting Algorithms.</td>
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<td></td>
<td>• Graphs and Trees.</td>
</tr>
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<td>• Search Trees.</td>
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<tr>
<td></td>
<td>• Priority Queues.</td>
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<td></td>
<td>• Heap.</td>
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<tr>
<td></td>
<td>• Hashing.</td>
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<tr>
<td></td>
<td>• Programming in C.</td>
</tr>
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</table>
LEARNING OUTCOMES / GENERAL COMPETENCES

Upon successful completion of this course, students will:

• analyze and compare the efficiency of algorithms in terms of their theoretical complexity
• use, develop and extend the data structures arrays, lists, queues, stacks and trees and understand their applications
• apply the algorithms that will studied in this course to unknown problems
• select and/or develop appropriate data structures and algorithms for implementing abstract data types
• design and implement efficient solutions in complex computational problems
• understand and implement sorting algorithms
• use various hashing techniques for data storage
• handle basic functions in priority queues

General Competences:

• Search for, analysis and synthesis of data and information by the use of appropriate technologies
• Decision-making
• Individual/Independent work
• Algorithmic thinking
• Solve complex algorithmic problems

PREREQUISITES

- 

TEACHING METHODS

• Face to face

ASSESSMENT METHODS

• The language of evaluation is Greek. The assessment method consists of an intermediate written examination (10%), three assignments (30%) and a final written examination (60%). The intermediate and final examinations include multiple choice questions, short answer questions, and problem-solving questions. The three assignments require the implementation of algorithms in the C programming language.

• The above evaluation criteria are posted on the course website.

LANGUAGE OF INSTRUCTION/EXAMS

Greek
**RECOMMENDED BIBLIOGRAPHY**

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<th>#</th>
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<tr>
<td>3.</td>
<td>Παναγιώτης Μποζάνης, <em>Δομές δεδομένων</em>, Εκδόσεις Τζιόλα, Έκδοση: 2η/2016</td>
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<td>4.</td>
<td>Γεώργιος Γεωργακόπουλος, Πανεπιστημιακές Εκδόσεις Κρήτης, Έκδοση: 2η/2002</td>
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Related Scientific Journals:

5. Algorithmica
6. Journal of Algorithms
7. ACM Transactions on Algorithms
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<tr>
<td>INSTRUCTOR</td>
<td>Tsiamitros D.</td>
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</table>
| COURSE CONTENTS  | • Electric parameters definition in sinusoidal alternating current during steady-state operation – Voltage and current representation as a function of time.  
|                  | • Electric parameters representation as phasors.  
|                  | • R, L, C in AC current. Voltage-current phasors representation.  
|                  | • Impedance, series and shunt circuits analysis.  
|                  | • Typical AC current circuits analysis.  
|                  | • AC power and power triangles.  
|                  | • Power factor correction – Compensation in single-phase circuits.  
|                  | • Resonance, Comparison with power factor correction.  
|                  | • Three-phase circuits, Y and D connections, AC power in three-phase systems.  
|                  | • Power factor correction in three-phase circuits.  
|                  | • Magnetic-coupled circuits, Ideal transformers and mutual inductance.  
|                  | • Laplace and Fourier transform.  
|                  | • Frequency response and filters. |
LEARNING OUTCOMES / GENERAL COMPETENCES
On successful completion of this module the learner will be able to:
1. Understand, analyze and design simple ac circuits.
2. Know the basic power and energy formulas.
3. Make power factor correction in new or old one-phase installations.
4. Understand and analyze three-phase circuits.
5. Make power factor correction in new or old three-phase installations.
6. Understand and analyze resonance circuits.
7. Understand and analyze magnetic-coupled circuits.

PREREQUISITES
Electric Circuits I, Mathematical Analysis I and II

TEACHING METHODS
Lectures, Problems solving in class, Laboratory exercises, Homework-study

ASSESSMENT METHODS
Final examination (70%) including: - Multiple choice questions - Questions needing development - Problems solving, intermediate exams, Laboratory exercises (30%)

LANGUAGE OF INSTRUCTION/EXAMS
Greek

RECOMMENDED BIBLIOGRAPHY
1. Σημειώσεις στην Ηλεκτροτεχνία ΙΙ, ΤΕΙ Δυτικής Μακεδονίας, 2009, επιμέλεια: Δημήτριος Τσιαμήτρος, διαθέσιμο και ηλεκτρονικά στο eclass.teikoz.gr.

INTRODUCTION TO TELECOMMUNICATIONS
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<tr>
<td>INSTRUCTOR</td>
<td>Louta M.</td>
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<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>The course objective is the comprehension and learning of the basic principles of communications, data networking and communication protocols. Specifically, the telecommunication systems model and the layered protocol architecture are presented in detail (OSI reference model, TCP/IP protocol stack). Emphasis is given on the first two layers (Physical, Data Link).</td>
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<tr>
<td>PREREQUISITES</td>
<td>-</td>
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<td>TEACHING METHODS</td>
<td>The course is taught via lectures, while students actively participate. The lectures are supported with presentations in power point, which are available to the students via the asynchronous tele-education platform. Exercises are solved.</td>
</tr>
<tr>
<td>ASSESSMENT METHODS</td>
<td>Course assessment is conducted by written exams taking place at the middle and the end of the semester, including questions (both open and multiple choice) as well as exercises that cover the course content (30% and 70%, respectively).</td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Florini</td>
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</table>
Thermodynamics course consists of the following sections:

- **Introduction - Basic concepts and definitions** (thermodynamics, systems, statutory equations, pressure, temperature, thermodynamic process, mechanical work, energy, heat, reversibility).
- The first Thermodynamic Law of energy conservation (internal energy, enthalpy, work, closed systems, permanent flow processes).
- The second Thermodynamic Law of energy quality degradation (entropy and thermodynamic equilibrium, heat reversibility engines, heat pumps, perfect gas entropy, ideal Carnot cycle for ideal gas, application to energy conversion processes).
- Mathematical foundation of Thermodynamics (total differential and static functions, transformation relations, Legendre transformations, basic property relations for PVT systems of variable composition and heat capacities for PVT systems of fixed composition, equilibrium in closed heterogeneous systems).
- Third Thermodynamic Law (absolute zero, ideal crystal entropy, consequences of the 3rd law).
- Air power generation cycles (internal combustion engines, Carnot, Otto, Diesel, Diesotto, Brayton-Joule, Stirling, Ericson) and steam.
- Thermodynamic cycles of steam power generation (Rankine, with regeneration / reheating), cogeneration and combined cycles.
- Thermodynamics of power plants with air and steam heat and combustion (conversion of chemical and nuclear energy into work and electricity production, work on steam, improvements, work on gas).
- Thermodynamic analysis of processes according to the 2nd Thermodynamic Law (reversible process work, energy not convertible into work, exergy, extermination destruction, entropy production)
- Thermodynamics of cooling and liquefaction (heating and cooling as basic thermodynamic problems, cooling production methods, Carnot cooling cycle, refrigeration cycle with vapor compression and absorption, gasification cycles of gas, heat
LEARNING OUTCOMES / GENERAL COMPETENCES

After the successful completion of the Heat Transfer course the student would be able to:

• Comprehend the basics of the Thermodynamics and know their definitions
• Comprehend and explain Thermodynamic Laws, basic thermodynamic processes, energy balance, entropy, exergy, entropy production
• Calculate thermodynamic parameters and solve thermodynamic problems employing statutory equations, thermodynamic laws applying mathematics.
• Assess various fluid processes (open and closed systems)
• Develop thermodynamic processes (thermodynamic cycles) concerning air power production (Carnot, Otto, Diesel, Diesotto, Brayton-Joule, Stirling, Ericson), steam power production (Rankine), co-production and combined thermodynamic cycles
• Comprehend cooling production cycles (ideal and real gas compression via adsorption of liquefaction process), heat pumps

After the successful completion of the Heat Transfer course the student would develop:

• Ability of searching, analyzing and synthesizing raw data and processing information applying appropriate technology tools
• Ability of criticism and self-criticism
• Ability to promote liberal, creative and inductive thinking

PREREQUISITES
Mathematics I, Mathematics II, Physics

TEACHING METHODS
• Face – to – face education
• Simultaneous distance education

ASSESSMENT METHODS
• Final written examination: 70 %
• Mid – term examination: 30 %

LANGUAGE OF INSTRUCTION/EXAMS
Greek

RECOMMENDED BIBLIOGRAPHY
4TH SEMESTER
APPLIED MATHEMATICS II
COURSE UNIT CODE       MK21
COURSE UNIT TYPE       General Background
LEVEL OF STUDY         UNDERGRADUATE
YEAR OF STUDIES        2nd
SEMESTER               4th
ECTS CREDITS           5
COURSE WEBSITE (URL)   https://eclass.uowm.gr/courses/ICTE217/
TEACHING WEEKLY HOURS  4
INSTRUCTOR             Zygiridis T.

COURSE CONTENTS

LEARNING OUTCOMES /
GENERAL COMPETENCES
Upon successful completion of this course, students will be able:

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

General Competences:
- Search for, analysis and synthesis of data and information by the use of appropriate technologies.
- Decision-making.
- Individual/Independent work.
### PREREQUISITES
Elements of the following courses are required:
- Linear Algebra
- Mathematical Analysis II
- Applied Mathematics I

### TEACHING METHODS
- Face-to-face
- Online synchronous (if necessary)

### ASSESSMENT METHODS
Summative mid-term written assessment (25%) and summative final written assessment (75%) in Greek. The adequacy of theoretical knowledge, the ability to apply specific methodologies and the ability to solve problems under specific time constraints are tested. The evaluation criteria refer to the validity of the answers, as well as to the degree of their clarity and completeness. Oral exams are provided for students with learning difficulties. The criteria can be accessed by students via the platform eclass.uowm.gr.

### LANGUAGE OF INSTRUCTION/EXAMS
Greek

### RECOMMENDED BIBLIOGRAPHY

1. ΤΡΑΧΑΝΑΣ ΣΤΕΦΑΝΟΣ, ΜΕΡΙΚΕΣ ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ, ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 2009.
2. Παντελίδης Γεώργιος Ν., Κραββαρίτης Δημήτρης, Εισαγωγή στις διαφορικές εξισώσεις μερικών παραγώγων, Ζήτη, 2003.
5. ΝΙΚΟΛΑΟΣ Μ. ΣΤΑΥΡΑΚΑΚΗΣ, Μερικές Διαφορικές Εξισώσεις, Μιγαδικές Συναρτήσεις: Θεωρία και Εφαρμογές, ΝΙΚΟΛΑΟΣ ΣΤΑΥΡΑΚΑΚΗΣ ΜΙΧΑΗΛ, Έκδοση: 1η/2016.
ELECTROMAGNETISM
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<td><strong>INSTRUCTOR</strong></td>
<td>Zigiridis T.</td>
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<td><strong>COURSE CONTENTS</strong></td>
<td>Electrostatic field: point and distributed electric charges φόρτια, Coulomb’s law, electric-field intensity, scalar electric potential, dielectric displacement, Gauss law, boundary conditions. Conductors, capacitors, capacitance. Dielectric polarization. The method of images. Fields due to constant electric currents: current intensity, current density, Ohm’s law, electric resistance, Joule’s law, grounding systems. Magnetostatic field: Ampere’s law, vector magnetic potential, Biot-Savart law, magnetic flex, self-inductance, forces on wires. Electromagnetic induction, Faraday’s law.</td>
</tr>
</tbody>
</table>
LEARNING OUTCOMES / GENERAL COMPETENCES

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

- to describe the sources of static electric and magnetic fields and understand the physical significance of the pertinent quantities,
- to compute the electric-field intensity, generated by point or distributed charges,
- to understand the interaction between electric fields and conductors,
- to calculate the capacitance of different configurations and the resistance of conducting objects,
- to understand the behavior of simple grounding elements,
- to calculate the magnetic-field intensity due to known current distributions,
- to calculate the induced voltages on conductors and the applied forces on current-carrying wires.

General Competences:

- Search for, analysis and synthesis of data and information by the use of appropriate technologies.
- Decision-making.
- Individual/Independent work.

PREREQUISITES

Elements of the following courses are required:

- Mathematical Analysis II

TEACHING METHODS

- Face-to-face
- Online synchronous (if necessary)

ASSESSMENT METHODS

Summative mid-term written assessment (25%) and summative final written assessment (75%) in Greek. The adequacy of theoretical knowledge, the ability to apply specific methodologies and the ability to solve problems under specific time constraints are tested. The evaluation criteria refer to the validity of the answers, as well as to the degree of their clarity and completeness. Oral exams are provided for students with learning difficulties. The criteria can be accessed by students via the platform eclass.uowm.gr.

LANGUAGE OF INSTRUCTION/EXAMS

Greek
1. ΤΣΙΜΠΟΥΚΗΣ Δ. ΘΕΟΔΩΡΟΣ, ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΚΟ ΠΕΔΙΟ (ενιαίος τόμος), ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, Έκδοση: 1η/2014
2. Ρουμελιώτης Ι.-Τσαλαμέγκας Ι., Ηλεκτρομαγνητικά Πεδία, τόμος Β’, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., Έκδοση: 1η έκδ./2010.
3. GRIFFITHS J. DAVID, ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΗΛΕΚΤΡΟΔΥΝΑΜΙΚΗ (ΣΕ ΕΝΑΝ ΤΟΜΟ), ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, Έκδοση: 1η/2012.
SIGNAL AND SYSTEM THEORY
COURSE UNIT CODE | MK23
---|---
COURSE UNIT TYPE | Specialized Background
LEVEL OF STUDY | Undergraduate
YEAR OF STUDIES | 2\textsuperscript{nd}
SEMESTER | 4\textsuperscript{th}
ECTS CREDITS | 4
COURSE WEBSITE (URL) | https://eclass.uowm.gr/courses/ICTE234/
TEACHING WEEKLY HOURS | 4
INSTRUCTOR | Tsipouras M.


LEARNING OUTCOMES / GENERAL COMPETENCES | Upon successful completion of this course, students will be able:
- to classify signals and systems based on their properties,
- to compute convolutions,
- to describe signals using transform / series Fourier,
- to apply Laplace transform,
- to manage generalized functions,
- to study the stability of linear systems
- to compute system response,
- to determine the effect of filters on signals,
- to apply the sampling theorem and describe the connection signal continuous and discrete time.

PREREQUISITES | -

TEACHING METHODS | Lectures, theoretical exercises, development exercises

ASSESSMENT METHODS | Two mandatory exercises (30%)
| Final written examination (70%)

LANGUAGE OF INSTRUCTION/EXAMS | Greek
### Numerical Analysis

#### Recommended Bibliography


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<thead>
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<th>COURSE UNIT CODE</th>
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<td>Tsipouras M.</td>
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<tr>
<td>COURSE CONTENTS</td>
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<tr>
<td></td>
<td>• Introduction to Numerical Analysis, Numerical Systems, Representation of Numbers, Conversions, Floating – point numbers, Errors, Absolute and relative error, Propagation of uncertainty, Accuracy.</td>
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<tr>
<td></td>
<td>• Linear Systems, Linear System Solving, Cramer’s Rule, Gauss Method, Gauss – Jordan Method, Thomas’ algorithm, LU decomposition, Cholesky decomposition</td>
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<td></td>
<td>• Solving nonlinear equations and systems, Roots of nonlinear equations, Long Division, Bisection method, Newton Raphson method, Intersection method, Nonlinear System Solving.</td>
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<td>• Numerical integration, Rectangle method, Simpson’s 1/3 rule, Simpson’s 3/8 rule, Composite functions.</td>
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<td></td>
<td>• Interpolation and Extrapolation, Numerical Approach, Polynomial interpolation, Lagrange polynomial, Newton polynomial, Least squares.</td>
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<tr>
<td></td>
<td>• Solving first order linear differential equations, Euler Method, Runge – Kutta Method.</td>
</tr>
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</table>
**LEARNING OUTCOMES / GENERAL COMPETENCES**

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

- to understand the basic arithmetic methods.
- to estimate the advantages and disadvantages of the methods.
- to distinguish the differences between the methods in order to choose the most appropriate one for the problem they are called to solve.
- to design and develop mathematical modeling and numerical analysis algorithms.
- to compose and / or use appropriate software to implement the required application.
- to explain the results of different methods based on absolute and relative errors.
- to evaluate and compare Numerical Analysis methods.
- to judge the appropriateness of each arithmetic method in specific problems.

**PREREQUISITES**

Mathematical Analysis I, II, Applied Mathematics I, Introduction to Structured Programming

**TEACHING METHODS**

Face to face
Distance learning

**ASSESSMENT METHODS**

Assessment methods: Two mandatory sets of assignments (30%) and a final written exam (70%).

Assessment criteria: They are explicitly mentioned in the first lesson and are announced on the course website.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

- Recommended Book Resources:

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<td><strong>INSTRUCTOR</strong></td>
<td>Gavros K.</td>
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</table>
COURSE CONTENTS

THEORETICAL PART
Ch 1: Semiconductors
1.1 Energy bands
1.2 N-type and P-type semiconductors
1.3 Semiconducting elements

Ch 2: Semiconductor diodes
2.1 The pn junction
2.2 Biasing a pn junction
2.3 Voltage-current characteristic curve of a diode
2.4 Diode models, barrier potential, dynamic resistance
2.5 dc diode resistance
2.6 Temperature effects
2.7 Diode datasheet information: power rating and pick inverse voltage

Ch 3: Special purpose diodes
3.1 LED
3.2 Zener diodes
3.3 The zener voltage and load regulator

Ch 4: Diode applications
4.1 The half-wave rectifier
4.2 The full-wave rectifier
4.3 The capacitor filter
4.4 Voltage and load regulation
4.5 Limiters

Ch 5: Bipolar Junction Transistors (BJT)
5.1 BJT structure
5.2 Forward-inverse bias
5.3 The common emitter (CE) connection
5.4 Base bias
5.5 Voltage divider bias
5.6 Other types of bias
5.7 Troubleshooting

Ch 6: The CE amplifier
6.1 DC and AC models
6.2 AC resistance of the emitter
6.3 The CE amplifier analysis (voltage gain)
6.4 Emitter resistance elimination
6.5 Multi-stage amplifiers

LABORATORY PART
Assignment 1: The diode curve
**LEARNING OUTCOMES / GENERAL COMPETENCES**

«Electronics I» is the first part of a two-semester course. It is dedicated to the principles of analog electronic circuits.

Starting with the atomic structure of semiconductors, the syllabus continues with the main characteristics of the pn junction, diode biasing and characteristics, the main rectifier circuits, and power supply filters and regulators. It also contains elements of the Bipolar Junction Transistor (BJT) structure, BJT bias circuits and their function as small signal amplifiers and switches.

Electric circuit design and analysis is based on theoretical calculations assisted by a powerful computer simulating tool, MultiSim®.

On successful completion of this module the learner will be able to:

- Explain how to bias a diode and describe its IV characteristic curve.
- Design and analyze the operation of three basic rectifier circuits: half-wave rectifier, center-tapped and bridge full wave rectifier.
- Describe the function of power supply filters and regulators.
- Describe the three types of BJT bias circuits: base, voltage divider and emitter.
- Design and analyze the operation of a BJT as a small signal amplifier.
- Use a BJT in a switching circuit.

**General Competences:**

- Analysis and synthesis of data using proper mathematical tools and simulation software

**PREREQUISITES**

- 

**TEACHING METHODS**

Face-to-face
**ASSESSMENT METHODS**

The grade of the course theory derives from the grade of the written examination as well as that of the possible progress exams. The grade of the course laboratory is that of the final exam (Project), in which the quality of the delivered assignments is taken into account qualitatively. The final grade of the course is calculated indicatively based on the following equation.

\[
\text{Final grade} = 0.75 \times \text{(Theory grade)} + 0.25 \times \text{(laboratory grade)}, \text{ if } (\text{THEORY grade}) \geq 5.
\]

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

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TELECOMMUNICATION NETWORKS
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<td>INSTRUCTOR</td>
<td>Louta M.</td>
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<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>The course objective is the comprehension and learning of the various networking technologies. In this context, a wide range of issues are addressed, aiming to cover telecommunication networks and techniques for network design, development, management and evaluation.</td>
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<tr>
<td>PREREQUISITES</td>
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<td>TEACHING METHODS</td>
<td>The course is taught via lectures, while students actively participate. The lectures are supported with presentations in power point, which are available to the students via the asynchronous tele-education platform. Exercises are solved. Additionally, laboratorial exercises are carried out with the help of simulation programs.</td>
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<td>ASSESSMENT METHODS</td>
<td>Course assessment is conducted by written exams taking place at the middle and the end of the semester, including questions (both open and multiple choice) as well as exercises that cover the course content (30% and 70%, respectively).</td>
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<td>LANGUAGE OF INSTRUCTION/EXAMS</td>
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ENGLISH II-ACADEMIC SKILLS
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<td>Tavoultzidou S.</td>
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<tr>
<td>COURSE CONTENTS</td>
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<tr>
<td></td>
<td>• Curriculum Vitae (English CV, Resume, Europass)</td>
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<td>• Cover Letter</td>
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<td>• Statement of purpose (Personal Statement)</td>
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<td>• Power Point Presentations in English</td>
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<td>• Referencing/ Bibliography styles (APA, MLA, Chicago, IEEE etc)</td>
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<td>• Citing/Referencing bibliographic sources</td>
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</table>
Upon successful completion of the course students will be able to:

- compose a Curriculum Vitae/Resume
- write the Cover Letter of a CV/ Resume
- write Application Letters, Job or Postgraduate Studies related
- write a Personal Statement for a scholarship
- make a Power Point presentation in English
- make a Pecha Kucha presentation in English
- create a Poster for a conference
- know the process of writing a research paper
- write the abstract of a research paper
- use the different citation styles (APA, MLA, Chicago, IEEE etc)
- apply the different ways of recording bibliography and reference sources

The main concern of the course is to enhance students’ language skills required to meet:

- their needs as Electrical and Computer Engineering students at undergraduate level
- their needs regarding postgraduate studies, European Programmes (Erasmus+, etc.)
- their career pursuits as electrical and computer engineers, as well as academic researchers

PREREQUISITES -

TEACHING METHODS
- Face-to face
- Synchronous distance learning (zoom), if required

ASSESSMENT METHODS
- End-semester exams test (60%)
- Mid-semester test (20%)
- Project (20%)

LANGUAGE OF INSTRUCTION/EXAMS
English
5th Semester

RECOMMENDED BIBLIOGRAPHY

1. Integrating Technical & Academic Writing into your English Course - Theory and Practice - Κωδ. Βιβλίου Εύδοξο: 86199178 Έκδοση: 1η/2019, Συγγραφείς: E. Panourgia

2. University Writing Course Student's Book with answers, Κωδ. Βιβλίου στον Εύδοξο: 10686, Έκδοση: 1η έκδ./2007, Morley John ,Doyle Peter,Pople Ian

3. Ακαδημαϊκή Γραφή, Κωδ. Βιβλίου στον Εύδοξο: 68391268, Έκδοση: 3η/2017, Ευδωρίδου Έλσα -Καρακασίδης Θόδωρος
ELECTROMAGNETIC WAVES
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<td><strong>INSTRUCTOR</strong></td>
<td>Zygiridis T.</td>
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</table>
**LEARNING OUTCOMES / GENERAL COMPETENCES**

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

- to recognize the differences between static and time-varying fields,
- to determine the electric-field using the magnetic-field intensity, and vice versa,
- to use complex representations of electromagnetic quantities,
- to understand the properties and behavior of electromagnetic fields,
- to know the impact of propagation media on wave properties,
- to solve simple problems involving reflection and transmission of waves,
- to solve problems pertinent to transmission lines, using circuit models,
- to determine the characteristics of waveguide structures that fulfil certain constraints,
- to study the properties of simple antennas.

**General Competences:**

- Search for, analysis and synthesis of data and information by the use of appropriate technologies.
- Decision-making.
- Individual/Independent work.

**PREREQUISITES**

Elements of the following courses are required:

- Electromagnetism
- Mathematical Analysis II

**TEACHING METHODS**

- Face-to-face
- Online synchronous (if necessary)
**ASSESSMENT METHODS**

Summative mid-term written assessment (25%) and summative final written assessment (75%) in Greek. The adequacy of theoretical knowledge, the ability to apply specific methodologies and the ability to solve problems under specific time constraints are tested. The evaluation criteria refer to the validity of the answers, as well as to the degree of their clarity and completeness. Oral exams are provided for students with learning difficulties. The criteria can be accessed by students via the platform eclass.uowm.gr.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

1. Τσιμπούκης Δ. Θεόδωρος, Ηλεκτρομαγνητικό Πεδίο, Πανεπιστημιακές Εκδόσεις Κρήτης, 2014.
2. Shen Liang Chi, Kong Jin Au, Εφαρμοσμένος Ηλεκτρομαγνητισμός, ΣΤΕΛΛΑ ΠΑΡΙΚΟΥ & ΣΙΑ, 2007
4. Τσαλαμέγκας Ιωάννης Λ., Ρουμελιώτης Ιωάννης Α., Ηλεκτρομαγνητικά πεδία, τόμος Α΄, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ, Έκδοση: 1η έκδ./2010.
5. DAVID CHENG, ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΚΑ ΠΕΔΙΑ ΚΑΙ ΚΥΜΑΤΑ, ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ, Έκδοση: 1/2013.
INTRODUCTION TO ELECTRIC POWER SYSTEMS
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<td><strong>INSTRUCTOR</strong></td>
<td>Christoforidis G.</td>
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The course consists of the following main topics:

i. Introduction in electric Power Systems (Week 1)
   - Historical background of the evolution and structure of Electric Power Generation, Transmission and Distribution
   - The Greek Electric Power System: components, structure, special features
   - Electricity billing and Energy Markets
   - Basic operating characteristics of a Power System

ii. Basic Concepts (Weeks 2 and 3)
   - Phasors
   - Symmetric 3-phase circuits and equivalent models
   - Power flow calculation
   - Symmetric component analysis
   - Per-unit system.

iii. Power plants (Weeks 4 and 5)
   - Thermal power plants – thermal processes and power flow
   - Gas turbines-combined cycle
   - Hydroelectric power plant
   - Renewable Energy Sources
   - Other kind of technologies

iv. Synchronous generators (Weeks 6-8)
   - Types of modern synchronous generators, main features
   - Modeling, parameters, equivalent circuits
   - Steady state and transient operation
   - Active-reactive power control and voltage control
   - Generator synchronization on the grid
   - Power balance and losses

v. Power Transformers (Weeks 9-11)
   - 1-phase and 3-phase transformers, equivalent circuits, structural characteristics, losses
   - Open-circuit and short-circuit experiments
   - Types of transformers (power, current and voltage, 3-winding, auto transformer)
   - Winding connection of 3-phase transformers
   - Parallel connection and voltage control

vi. Lines and cables (both overhead and underground) of transmission and distribution grid (Weeks 12 and 13)
   - Introduction, electrical parameters
   - Equivalent model of short lines
After successfully completing this course, students will be able to:

- recognize the basic elements that compose a power system and understand its operation
- analyze and perform per-unit calculations on a power system
- describe and analyze the power generation procedure in power plants
- compare and evaluate various kinds of power production plants (different types and technologies)
- understand and analyze the operation of synchronous generators connected to the grid
- understand and analyze the operation of power transformers under different winding connections
- know the electrical characteristics of power lines and cables and apply the short-line model for power flow analysis

PREREQUISITES
- 

TEACHING METHODS
- Lectures (PowerPoint slides via projections) and tutorials
- Learning process support via e-class platform
- Laboratory exercises

ASSESSMENT METHODS
- Laboratory project assignments (30%)
- Final exams (70 %)

LANGUAGE OF INSTRUCTION/EXAMS
Greek-English

RECOMMENDED BIBLIOGRAPHY

DIGITAL SIGNAL PROCESSING
<table>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Tsipouras M.</td>
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</table>
**COURSE CONTENTS**

- Introductory Concepts, Continuous and Discrete Signals, Analog to Digital Converting, Sampling, Nyquist / Shannon Theorem, Quantum, Coding
- The concept of frequency response, Introduction to Transfer Function, Effect of poles on frequency response, Implementation Discrete Systems.
- Introduction to Filters, Finite Impulse Response Filters (FIR), The concept of linear phase, Median Filtering, FIR Design, Infinite Impulse Response Filters (IIR), IIR Design, Lowpass Analog Filters, IIR Filter Design.

**LEARNING OUTCOMES / GENERAL COMPETENCES**

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

- to understand simple and complex concepts of digital signal processing.
- to perform sampling, oversampling, under sampling.
- to calculate convolution and correlation in signals.
- to apply DFT and ZT to real or complex signals.
- to design FIR and IR digital filters.
- to design software for all of the above in MATLAB.

**PREREQUISITES**

-
**TEACHING METHODS**
Lectures, theoretical exercises, examples in MATLAB, exercises in MATLAB

**ASSESSMENT METHODS**
- One optional exercise with oral examination (40%)
- Final written examination (60%)

**LANGUAGE OF INSTRUCTION/EXAMS**
Greek

**RECOMMENDED BIBLIOGRAPHY**

- Recommended Book Resources:

**Electronics II**
COURSE UNIT CODE       MK30
COURSE UNIT TYPE       Specialization
LEVEL OF STUDY         Undergraduate
YEAR OF STUDIES        3rd
SEMESTER               5th
ECTS CREDITS           5
COURSE WEBSITE (URL)   https://eclass.uowm.gr/courses/ECE357/
TEACHING WEEKLY HOURS  4
INSTRUCTOR             Kollatou T.


LEARNING OUTCOMES / GENERAL COMPETENCES
This course is an introduction to electronic circuits with MOSFET transistors, Op-Amp circuits and filters. The student acquires knowledge of the scope of the above circuits and learns how to use these skills to solve and deal with related practical problems and issues. In addition, the students acquire the knowledge and practical skills to analyse and understand the above electronic circuits. With the appropriately designed laboratory exercises and circuits that the students are required to prepare, they acquire the experience to construct and characterise experimentally a series of practical circuit and at the same they learn how to use efficiently laboratory instrumentation.

PREREQUISITES        Electronics I
TEACHING METHODS      Lectures, Laboratory Practical Exercises and tutorials
ASSESSMENT METHODS

- Interim Progress Exam Test, Submission of weekly written lab exercises, Final Examination Laboratory (prerequisite base 5 in the final examination laboratory), Final Theory Examination (prerequisite base 5 in the final examination of the theory).
- Final Course Grade (100%): Final written examination theory (added the bonus of the Interim Progress Exam Test) = 75%
  Final Written Examination and Laboratory = 25%.

LANGUAGE OF INSTRUCTION/EXAMS
Greek

RECOMMENDED BIBLIOGRAPHY
<table>
<thead>
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<th>COURSE UNIT CODE</th>
<th>K31</th>
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<td>COURSE WEBSITE (URL)</td>
<td><a href="https://eclass.uowm.gr/courses/ICTE155/">https://eclass.uowm.gr/courses/ICTE155/</a>  <a href="https://arch.icte.uowm.gr/courses/arch/">https://arch.icte.uowm.gr/courses/arch/</a></td>
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<tr>
<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
</tr>
<tr>
<td>INSTRUCTOR</td>
<td>Dasygenis M.</td>
</tr>
</tbody>
</table>
LEARNING OUTCOMES / GENERAL COMPETENCES

Upon successful completion of this course, students will be able to demonstrate knowledge and understanding of:

- the CPU types,
- the architectural mechanisms for increasing CPU speed,
- the CPU datapath,
- the CPU pipeline,
- the input/output mechanisms,
- the peripheral interconnection to the CPU,
- the data buses,
- the cache memory operation,
- the CPU control using assembly instructions

From the laboratory assignments, students will gain the abilities to:

- use the layer of assembly programming,
- understand the benefits and drawbacks of using assembly language,
- develop and debug assembly programs,
- understand all x86 assembly constructs,
- understand input/output techniques in the x86 world,
- understand how to manipulate strings,
- use the software and hardware interrupts,
- create interrupt handlers,
- to visualize graphic elements using assembly.

The course attendance aims:

- Individual/Independent work
- Group/Team work
- Project planning and management
- Bibliography research
- Critical thinking

PREREQUISITES

Digital Design

TEACHING METHODS

Lectures, PowerPoint slides, Lecture Notes, in class quizzes, e-class, automated examination system i-exams, open courses video lectures, laboratory exercises, semester group project.
The final grade is the sum of the laboratory grade and theory grade. The Maximum for these grades is 5, totaling both in 10. The students have to pass the Laboratory (at least 2.5/5) and Theory (at least 2.5/5), and also be present at the 85% of the laboratory sessions.

Theory Examination (max 5 grades)
- Multiple Choice Questions Examination – 3
- Theory Exercises – 2

Lab Examination (max 5 grades)
- Labpoints (completing code challenges) - 2
- Semester Project - 2
- Lab Examination (code writing) - 1

**LANGUAGE OF INSTRUCTION/EXAMS**
Greek

**RECOMMENDED BIBLIOGRAPHY**
Greek Books from Eudoxos

1. Βιβλίο [86055864]: ΨΗΦΙΑΚΗ ΣΧΕΔΙΑΣΗ ΚΑΙ ΑΡΧΙΤΕΚΤΟΝΙΚΗ ΥΠΟΛΟΓΙΣΤΩΝ, ΕΚΔΟΣΗ ARM®, SARAH L. HARRIS, DAVID MONEY HARRIS
2. Βιβλίο [68370526]: Αρχιτεκτονική Υπολογιστών, Δημήτριος Β. Νικολός
3. Βιβλίο [15120]: Οργάνωση και αρχιτεκτονική ηλεκτρονικών υπολογιστών, Hammacher Carl, Vranesic Zvonko, Zaky Safwat
4. Βιβλίο [12561945]: ΟΡΓΑΝΩΣΗ ΚΑΙ ΣΧΕΔΙΑΣΗ ΥΠΟΛΟΓΙΣΤΩΝ: Η ΔΙΑΣΥΝΔΕΣΗ ΥΛΙΚΟΥ ΚΑΙ ΛΟΓΙΣΜΙΚΟΥ, DAVID A. PATTERSON, JOHN L. HENNESSY

**TECHNO-ECONOMIC STUDY**
**COURSE UNIT CODE**  MKH8  
**COURSE UNIT TYPE**  General background  
**LEVEL OF STUDY**  Undergraduate  
**YEAR OF STUDIES**  3rd  
**SEMESTER**  5th  
**ECTS CREDITS**  4  
**COURSE WEBSITE (URL)**  [https://eclass.uowm.gr/courses/ECE361/](https://eclass.uowm.gr/courses/ECE361/)  
**TEACHING WEEKLY HOURS**  3  
**INSTRUCTOR**  P. Gaidatzis  
**COURSE CONTENTS**  Businesses on a daily basis are faced with a wide range of issues that they need to manage and resolve by making decisions that shape their financial future. In the lesson themes are developed referring to the following areas:

1. business concept,  
2. time value of money,  
3. uniform series of payments (rants),  
4. calculation of loan details,  
5. methods used to assess the feasibility or otherwise of an investment,  
6. break-even point calculation of the turnover,  
7. risk management and calculation methods.  

Particular emphasis is given to the part of tutorial exercises in repetitive combinatorial exercises that integrate into practical applications and problems all the theoretical and practical methods that have been analyzed in previous lessons.
The purpose of the Techno-economic Analysis course is to understand the basic concepts of the purpose of financial management in a business, to analyze the financial environment in which it operates, as well as to acquire theoretical and practical knowledge on the proper methodology to be followed for the evaluation of investments in fixed assets in conditions of certainty, valuation of inventories and value of enterprises, as well as risk management in conditions of uncertainty.

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

- Know the objective of the business from a financial management point of view.
- Understand the time value of money.
- Have knowledge of the various methods of valuation of fixed assets investments under certain conditions.
- Analyze risk management in conditions of uncertainty.
- Calculate the break-even point of a business's turnover.
- Combine all the previous tools for solving complex problems.
- Use computing tools (e.g., Microsoft Excel) to evaluate investment programs.

General Competences:

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Adapting to new situations
- Decision-making
- Group/Team work
- Project planning and management
### Teaching Methods
- Onsite learning
- Option of Modern distance learning courses

### Assessment Methods
- Interim evaluation progress (30%)
- Teamwork of econometric analysis in an energy investment case study (30%)
- Final Written Examination (40%)

### Language of Instruction/Exams
Greek

### Recommended Bibliography
6TH SEMESTER
MICROPROCESSORS
### COURSE UNIT CODE
E22

### COURSE UNIT TYPE
Specialization

### LEVEL OF STUDY
Undergraduate

### YEAR OF STUDIES
3rd

### SEMESTER
6th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://eclass.uowm.gr/courses/ECE358

### TEACHING WEEKLY HOURS
4

### INSTRUCTOR
Asimopoulos N.

### COURSE CONTENTS
The course is about understanding how to operate and program microprocessors (and generally large-scale digital circuits). It includes extensive reference to the architecture and programming of the AVR microcontrollers, in particular the ATmega328, various sensors and actuators, as well as the electronics needed to integrate them all into a single integrated system. In addition, issues of architecture and programming of Broadcom BCM2835 microprocessors will be discussed.

### LEARNING OUTCOMES / GENERAL COMPETENCES
Upon successful completion of the course, students gain knowledge and understanding of the following topics:
- Understanding the architecture of microprocessors.
- Understand how to program microcontrollers and microprocessors in machine language, the data path to the processors, the connection of peripherals and sensors to the central processing unit, of channels memory function, of controlling the processor via assembly commands. Upon successful completion of the laboratory part of the course, students gain knowledge and understanding of the following topics:
  - Programming in assembly language, programming and debugging in assembly language for ARM processors and AVR microcontrollers, input / output in assembly language on AVR and ARM microprocessors,

### PREREQUISITES
Digital Design
### Teaching -

**Assessment Methods**

Final exams theory 50%, Final exams lab 50%

**Language of Instruction/Exams**

Greek

**Recommended Bibliography**

2. Ν. Πετρελής, Γ. Αλεξίου, Μικροεπεξεργαστές Και Σχεδίασμος Μικρούπολογιστικών Συστημάτων, Κλειδαράθμος, Έκδοση: 2η/2012.
4. Παπάζογλου Παναγιώτης, Μικροεπεξεργαστές, Εκδοσεις Α. Τζιολα, Έκδοση: 1η/2015.
5. Καλοφωλιάς Δημήτριος, Προγραμματισμός Του Μικροελεγκτή

**Communication Systems**
### COURSE UNIT CODE
MK29-H

### COURSE UNIT TYPE
Specialization

### LEVEL OF STUDY
Undergraduate

### YEAR OF STUDIES
3rd

### SEMESTER
6th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://eclass.uowm.gr/courses/ICTE330/

### TEACHING WEEKLY HOURS
5

### INSTRUCTOR

### COURSE CONTENTS
The aim of the course is to provide students with knowledge about basic concepts of telecommunication systems. Specifically, the course focuses on the principles of signal theory, studying the properties of telecommunication signals and mathematical transformations (Fourier, Hilbert) as essential tools for communication signal analysis. The main objective of the course is to learn the process of modulation of signals of analog systems, through the study of Amplitude Modulation (AM), AM systems, the process of decoding amplitude, systems of Angle Modulation (Frequency Modulation - Frequency Modulation - Frequency Modulation). Phase Modulation (PM)), and angle demodulation procedures. The effect of noise on both amplitude and angle modulation systems is also studied.
**LEARNING OUTCOMES/GENERAL COMPETENCES**

Learning the following basic concepts:
- Telecommunication System (Analog and Digital Communications)
- Representation of Signals and Systems with emphasis on the Frequency field
- Fourier transforms and their applications in Telecommunications
- Filters and Signal Transmission through them
- Width Modulation and Demodulation
- Rectangular Amplitude Configuration - Frequency Division Multiplexing
- Angle Configuration and Demodulation
- Familiarity with the environment of telecommunication systems laboratories
- Use of Laboratory Equipment
- Conducting laboratory exercises:
  - Laboratory Exercise in AM.
  - Laboratory Exercise in FM.
  - Laboratory Exercise in PM.

**PREREQUISITES**

- 

**TEACHING METHODS**

- Lectures
- Exercises
- Laboratory Exercises

**ASSESSMENT METHODS**

- Final written exam (70%), Laboratory exercises (30%)

**LANGUAGE OF INSTRUCTION/EXAMS**

- Greek

**RECOMMENDED BIBLIOGRAPHY**

1. Γεώργιος Καραγιαννίδης, Κοραλία Παππή, Τηλεπικοινωνιακά Συστήματα, 3η εκδοση, 2016.
2. Αθανάσιος Κανάτας, Εισαγωγή στις Τηλεπικοινωνίες, 2η έκδοση, 2017.

**DATABASES**
### COURSE UNIT CODE
MK38

### COURSE UNIT TYPE
Specialization

### LEVEL OF STUDY
Undergraduate

### YEAR OF STUDIES
3rd

### SEMESTER
6th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://eclass.uowm.gr/courses/ICTE215/

### TEACHING WEEKLY HOURS
4

### INSTRUCTOR
Stergiou K.

### COURSE CONTENTS
1. Introduction to databases (DBs) and DB Management Systems.
3. Entity-Relationship model.
4. Relational Model.
5. Relational Algebra.
7. Functional Dependencies and Normalization.
8. Physical organization of DBs and means of storage.
9. Indexes.

### LEARNING OUTCOMES/
GENERAL COMPETENCES
The expected learning outcomes are the following:
1. Understanding the basic principles of design and implementation of Database Systems
2. Familiarity with using Entity Relationship Diagrams
3. Understanding the Relational Model
4. Acquisition of basic knowledge of Relational Algebra and SQL
5. Acquisition of advanced SQL capabilities knowledge
6. Experience with MySQL
7. Understanding the basic principles of normalization
8. Acquisition of knowledge about the storage of Databases and basic indexing structures
9. Experience in collaborative database implementation

### PREREQUISITES
-

### TEACHING METHODS
Lectures, exercises, lab exercises
The evaluation is done through:
1. written examination at the end of the semester that includes short answer questions and resolution of exercises
2. scoring the report and the code of the project carried out during the semester. The scoring is done separately for each of the four phases of the project and in total at the end
3. oral presentation of the various phases of the project carried out during the semester

The evaluation criteria are as follows:
- correctness
- clarity
- accuracy
- efficiency

- Recommended Book Resources:

- Recommended Article/Paper Resources:
ACM Transactions on Database Systems, VLDB Journal, IEEE Transactions on Knowledge and Data Engineering, Information Systems
CONTROL SYSTEMS I
<table>
<thead>
<tr>
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<td><strong>COURSE WEBSITE</strong></td>
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<td>5</td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Parisis K.</td>
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</tbody>
</table>

**COURSE CONTENTS**

The purpose of this course is to provide the student with a comprehensive introduction to the theory and applications of Control Systems with emphasis in the analysis.

The student will deal with the simulation of physical systems on a computer and finding design criteria performance through assignments and solving selected exercises.

In addition, the student will complete a series of selected laboratory exercises that implement experimental devices and use Operational Amplifiers (OPAMPs) in the simulation of systems.

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

1. Distinguish the meaning of open and closed loop and to understand the process of feedback and comparison.
2. Develop the mathematical model that describes the physical system to be examined and derive the differential equation that characterizes it.
3. Familiarize himself with the use of the Laplace transform to be able to calculate systems response.
4. Be able to describe a system with the help of the transfer function and state equations.
5. Learn the use of operating diagrams and flowcharts for system representation.
6. Design Root Locus plots.
7. Implement experimental devices and to use operational amplifier circuits (OPAMPs) in systems simulation.

General Competences:
- Search, analyze and synthesize data and information with the use of the necessary technologies
- Individual Work
- Teamwork
- Design and Project Management

Knowledge of the course is required:
Applied Mathematics I

TEACHING METHODS
- Face to Face
**Assessment Methods**

I. Written final examination (70%) comprising:
- Solving problems related to quantitative data

II. Final laboratory test (30%), which includes mandatory individual assignments (30% of the laboratory examination)

**Language of Instruction/Exams**

Greek

**Recommended Bibliography**


2. Συστήματα Αυτομάτου Ελέγχου, Ogata K., ΓΡΗΓΟΡΙΟΣ ΧΡΥ-ΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ, 2011.


5. Π. Ν. Παρασκευόπουλος, Εισαγωγή στον Αυτόματο Έλεγχο. Τόμος Α Θεωρία, Αθήνα 2001.
COMPUTER NETWORKS
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<tr>
<td>INSTRUCTOR</td>
<td>Fragkoulis G.</td>
</tr>
<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>Upon successful completion of this course, students will be able to: • understand the central theories, and protocols in the fields of computer networks • describe and analyze the hardware, software, components of a network and the interrelations. • explain networking protocols and their hierarchical relationship hardware and software. • compare protocol models and select appropriate protocols for a particular design. • explain concepts and theories of networking and apply them to various situations, classifying networks, analyzing performance, and implementing new technologies.</td>
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<td>PREREQUISITES</td>
<td>-</td>
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<td>TEACHING METHODS</td>
<td>Lectures, laboratory sessions</td>
</tr>
</tbody>
</table>
**Assessment Methods**

Final exam (30%), Presentation (exercise) (20%), Lab exam (50%)

**Language of Instruction/Exams**

Greek

**Recommended Bibliography**

1. Δικτύωση Υπολογιστών, 7η Έκδοση, J. F. Kurose, Keith W. Ross
2. Δικτύα Υπολογιστών, A. S. Tanenbaum, David J. Wetherall
3. Οργάνωση και Αρχιτεκτονική Υπολογιστών, 11η Έκδοση, Stallings William

**Electrical Machines I**
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<td><strong>INSTRUCTOR</strong></td>
<td>Tsiamitros D.</td>
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</tbody>
</table>
COURSE CONTENTS

Dc machines II
- Generator operation –series excitation, compound excitation.
- motor operation – series excitation, compound excitation
- motor start.
- speed control.
- motor brake.
Three-phase transformers
- Construction characteristics, equivalent circuit.
- 3-phase connection types
- open and short circuit tests.
- 3-phase transformers loading.
- Parallel transformers
Synchronous generators
- Structure. Operation principle and types.
Turbo-generators:
- Speed control,
- voltage control,
- Equivalent circuit,
- Power control,
- Operation limits
- parallel generators,
Salient pole generators
- Structure
- Equivalent circuit
Transients
Asynchronous motors
- Torque-speed characteristics,
- Start,
- Special applications motors (one-phase, universal, others)

LEARNING OUTCOMES / GENERAL COMPETENCES

On successful completion of this module the learner will be able to:
1. Understand adequately the ac motors and generators, DC-Machines and Transformers operational principles.
2. Predict the machine operation under different conditions
3. Solve electric machines problems using the applicable equivalent circuit

PREREQUISITES

Electric Circuits I and II, Mathematical Analysis I and II, Electromagnetics

TEACHING METHODS

Lectures, Problems solving in class, Laboratory exercises, Homework-study
### Assessment Methods
- Evaluation of laboratory exercises (20%)
- Two unannounced tests and one progress test (30%)
- Final exams (50%)

### Language of Instruction/Exams
- Greek

### Recommended Bibliography

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7th Semester - Division of Energy
ELECTRIC POWER TRANSMISSION AND DISTRIBUTION
<table>
<thead>
<tr>
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<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
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<tr>
<td>INSTRUCTOR</td>
<td>Bouhouras A.</td>
</tr>
</tbody>
</table>
| COURSE CONTENTS  | The course consists of the following subjects/entities: 1. Power lines electrical characteristics  
  • overhead power lines and underground cables, calculation of suspension arrow and forces in over-head power lines  
  2. Electrical models of power lines  
  • short line model, medium and long line models, two-terminal models, power transfer and lines’ operational limits  
  3. Voltage regulation  
  • reactive power compensation, special types of transformers and synchronous compensators, transformer tap-changer  
  4. AC power flow analysis  
  • basic concepts, power flow in radial networks, simplified power flow methods, Gauss-Seidel method, complex power flow in large systems Newton-Raphson method, decoupled power flow  
  5. Distribution network topologies in Low and Medium Voltage  
  • distribution network types, distribution network operation, medium voltage substations  
  6. Distribution network analysis  
  • voltage drop computation in distribution network with distributed loads, distribution network power loss computation, distribution network node voltage regulation  
  7. Distribution network load  
  • load curve, peak load, energy demand, mean load, demand factor, usage factor, synchronization coefficient, load demand patterns. |
After successful completion of the course, students will be to:

- Understand and recognize the structural and operations differences between transmission and distribution power systems.
- Compute the electrical characteristics of different power line models and understand their single-phase circuits.
- Apply the suitable reactive power compensation type and voltage regulation method in power lines.
- Understand power flow in power lines and its mathematical modelling.
- Compute AC power flow in a power circuit and compute voltage drop.
- Compute power loss in a power line.
- Know the distribution network topologies and their structural characteristics.
- Understand different load demand patterns and compute the demand characteristics.
- Analyze and simulate power systems via software packages (e.g., DigSILENT).

General Competences:

- Search for, analysis and synthesis of data and information by the use of appropriate technologies.
- Decision-making.
- Group/Team work.
- Project planning and management.
- Development of free, creative and inductive thinking.
- Development of new research ideas.

PREREQUISITES

- 

TEACHING METHODS

- Face-to-face
- Distance learning availability
The language of evaluation is Greek. The overall rating is divided as follows:
- Laboratory exercises (30%)
- Written work (30%)
- Final exams (40%) consisting of:
  1) problem solving
  2) short-answer questions
  3) multiple choice tests

The laboratory exercises are based on the analysis of a circuit-case study through a software tool.

The essay writing is based either on the literature review for the development of a topic description work based on scientific publications, or on the development of algorithms and methodologies for solving research problems for innovative research actions on Power Systems.

The course examination process includes short answer questions and solving tutorial exercises.

The answers of the exam questions are posted in eclass, and the grade of each subject in which they are evaluated is known in advance to the students.

Each student can request a demonstration of the writing and his/her grade will be analyzed.

**Greek**

**Recommended Bibliography**


Relevant scientific journals:
- IEEE Transactions on Power Systems
- IEEE Transactions on Smart Grid
- Electric Power System Research (Elsevier)
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
<th>YEH2</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE UNIT TYPE</td>
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<tr>
<td>LEVEL OF STUDY</td>
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<td>YEAR OF STUDIES</td>
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<td>COURSE WEBSITE (URL)</td>
<td><a href="https://eclass.uowm.gr/courses/ECE386/">https://eclass.uowm.gr/courses/ECE386/</a></td>
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<tr>
<td>INSTRUCTOR</td>
<td>Tsiamitros D.</td>
</tr>
</tbody>
</table>
### COURSE CONTENTS

- **Dc machines II**
  - Generator operation – series excitation, compound excitation.
  - Motor operation – series excitation, compound excitation
  - Motor start.
  - Speed control.
  - Motor brake.
  - Three-phase transformers
  - Construction characteristics, equivalent circuit.
  - 3-phase connection types
  - Open and short circuit tests.
  - 3-phase transformers loading.
  - Parallel transformers
    - Synchronous generators
    - Structure. Operation principle and types.
  - Turbo-generators:
    - Speed control,
    - Voltage control,
    - Equivalent circuit,
    - Power control,
    - Operation limits
    - Parallel generators,
      - Salient pole generators
      - Structure
      - Equivalent circuit
  - Transients
    - Asynchronous motors
    - Torque-speed characteristics,
    - Start,
    - Special applications motors (one-phase, universal, others)

### LEARNING OUTCOMES / GENERAL COMPETENCES

On successful completion of this module the learner will be able to:

1. Understand adequately the ac motors and generators, DC-Machines and Transformers operational principles.
2. Predict the machine operation under different conditions
3. Solve electric machines problems using the applicable equivalent circuit
4. Adequately install and operate electric machines

### PREREQUISITES

Electric Circuits I and II, Electromagnetics, Electric machines I

### TEACHING METHODS

Lectures, Problems solving in class, Laboratory exercises, Homework-study
<table>
<thead>
<tr>
<th>ASSESSMENT METHODS</th>
<th>Evaluation of laboratory exercises (20%)</th>
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<tbody>
<tr>
<td></td>
<td>Two unannounced tests and one progress test (30%)</td>
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<tr>
<td></td>
<td>Final exams (50%)</td>
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| LANGUAGE OF INSTRUCTION/EXAMS | Greek                                  |

<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ν. Σκραπαρλής, Β. Μολασιώτης, Δ. Τσιαμήτρος, «Εργαστηριακές Ασκήσεις Ηλεκτρικών Μηχανών Συνεχούς και Εναλλασσομένου Ρεύματος», Εκδόσεις Σύγχρονη Παιδεία.</td>
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POWER ELECTRONICS I
<table>
<thead>
<tr>
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<td><strong>INSTRUCTOR</strong></td>
<td>Ourelidis K.</td>
</tr>
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</table>
| **COURSE CONTENTS**  | The course of Power Electronics I consists of the following sections:  
1. Power Semiconductors: Types of power semiconductors used as switches in Power Electronics systems (e.g., diodes, thyristors, MOSFET, IGBT, etc.). Operating characteristics, uses, loss calculation, benchmarking.  
3. Controllable Rectifiers: Single-phase, three-phase, DC / DC, harmonic resolution, transition effect, power reversing function  
The aim of the course is to introduce the student to the theory and applications of power electronics systems. In the first part of the course, 2 categories of electronic power converters are studied: rectifiers (AC-DC) and AC-AC converters.

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

• Identify, compare and describe the main power semiconductor devices, while the student should also calculate their losses;
• Understand and explain the principles of power electronics;
• Explain in detail the basic functions of the different types of power converters examined in the 1st part of the course;
• Compare and evaluate the individual circuits of each type of power converters;
• Implement experimental devices in the laboratory and analyze their operation;
• Simulate and explain the operation of basic power converters;
• Design power converter circuits belonging to the categories of AC-DC and AC-AC converter;
• Use the knowledge acquired to understand converter topologies in practical applications;
• Collaborate with his fellow students to prepare teamwork essays.

General Competences:

• Search for, analysis and synthesis of data and information by the use of appropriate technologies
• Adapting to new situations
• Decision-making
• Autonomous work
• Teamwork
• Project planning and management
• Critical thinking of complex concepts

PREREQUISITES
Electrical Circuits I and II

TEACHING METHODS
• Teaching in the classroom with a video projector and tutorial exercises
• Laboratory exercises on AC-DC and AC-AC converters
• Possibility of modern distance education
### Assessment Methods
- Laboratory exercises with group work (30%)
- Individual work in the design / analysis of inverters using and simulations (30%)
- Final exams (40%)

### Language of Instruction/Exams
Greek

### Recommended Bibliography

- **Recommended Book**
  3. Mania St., 2017, Power Electronics, Kalamara Elli Publications

- **Recommended Article/Paper**
  - IEEE Transactions on Power Electronics
  - IET Power Electronics
MODERN ELECTRICAL INSTALLATIONS
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Stimoniaris D.</td>
</tr>
</tbody>
</table>
| **COURSE CONTENTS** | Dangers from electricity, protection devices. Types of low voltage conductors and cables.  
-Cable charging capacity according to the standards of ELOT HD384, VDE, IEC, DIN.  
-Overvoltage and short circuit protection devices, load switches, power relays (relays), thermal protection relays for asynchronous three-phase motors.  
-Calculation of power supply lines. Calculation of the voltage drop in Low Voltage networks.  
-Electrical Panels. Voltage sinking.  
-Complete electrical study of a house, shop, boiler room, electric elevator engine room.  
-Special Electrical Installations.  
-Introduction to building energy management automation in smart buildings (KNX) |
**LEARNING OUTCOMES**

This course provides the basic knowledge and techniques for the preparation of design and construction of internal electrical installations of buildings in accordance with applicable standards and national regulations, with the development of the following topics:

- Basic concepts in electricity distribution systems. Electrification process of low voltage internal electrical installations, ways of connection to the PPC network. Low voltage overhead power line.
- Low current installations.
- Outdoor installations. Installations of special buildings.
- Standards and Regulations of electrical installations. (HD384). Control of an internal electrical installations.
- Modern household electrical installations (EIB / KNX).

Study and design of electrical installations with a computer. The student is required to complete a series of selected laboratory exercises in the above material. In addition, the student is required to prepare and submit at the end of the semester a written assignment on the subject of electrical design of a building.

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

1. Have the theoretical background to prepare and compile Electrical Studies of buildings.
2. Effectively implement regulations and standards regarding the requirements for electrical
### PREREQUISITES
Introduction to RES, Electrical Circuits I and II

### TEACHING METHODS
- Teaching in the classroom using a video projector.
- Laboratory exercises.
- Learning process support through the electronic platform e-class.
- Use of specialized software.

### ASSESSMENT METHODS
1. **I)** Type: Deliveries (50% of the total)
   - Description: Theoretical Background
   - Exam Date: End of Semester

2. **II)** Type: Laboratory (30% of the total)
   - Description: Laboratory Exercises
   - Exam Date: End of Semester

3. **III)** Type: Presentation (Work / Technical Study) (20% of the total)
   - Description: Complete Design of Internal Electrical Installation
   - Exam Date: End of Semester

### LANGUAGE OF INSTRUCTION/EXAMS
Greek

### RECOMMENDED BIBLIOGRAPHY
1. Βασιλης Δ. Μπιτζιωνης Βιομηχανες Ηλεκτρικες Εγκαταστασεις 2010 Εκδοσεις Τζιωλα
2. Τουλόγλου Στέφανος Ηλεκτρικες Εγκαταστασεις Κτιριων 2004 Εκδοσεις Ιων
3. IEC 60364: Low-voltage electrical installations
4. ΕΛΟΤ HD384, «Απαιτήσεις για ηλεκτρικές εγκαταστάσεις»
5. Schneider-Electric, Electrical Installation Guide.
INTRODUCTION TO NUCLEAR TECHNOLOGY
COURSE UNIT CODE: EEH17
COURSE UNIT TYPE: Specialization
LEVEL OF STUDY: Undergraduate
YEAR OF STUDIES: 4th
SEMESTER: 7th
ECTS CREDITS: 5
COURSE WEB SITE (URL):
TEACHING WEEKLY HOURS: 4
INSTRUCTOR:
LEARNING OUTCOMES / GENERAL COMPETENCES: Upon successful completion of the course the student will be able to:
- Understand the concepts of radioactive decay and the interaction of radiation with matter
- Know the industrial applications of radiation
- Describe and know the safety measures for the operation of nuclear power plants and radiation protection.
- Make radiation measurements using the appropriate instruments
- Know the structure and operation of power plants with nuclear reactors.
- Understand the biological effects of radiation
PREREQUISITES: -
TEACHING METHODS: - Classroom teaching and tutoring exercises
- Learning process support through e-class
ASSESSMENT METHODS: Individual assignment (50%)
- Final exams (50%)
<table>
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<th><strong>LANGUAGE OF INSTRUCTION/EXAMS</strong></th>
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<tbody>
<tr>
<td><strong>RECOMMENDED BIBLIOGRAPHY</strong></td>
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<tr>
<td>1. ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΠΥΡΗΝΙΚΗ ΤΕΧΝΟΛΟΓΙΑ, Αντωνόπουλος -Ντόμης Μιχάλης, Εκδόσεις Ζήτη, Κωδ. Εύδοξος: 11266</td>
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<tr>
<td>2. Εισαγωγή στην Πυρηνική Τεχνολογία, J. Lamarsh, A. Baratta, 4η έκδοση, επιμέλεια Ν. Πετρόπουλος , Εκδόσεις Τζιόλα.</td>
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</tbody>
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LIGHTING
### Course Information

<table>
<thead>
<tr>
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<td><strong>Teaching Weekly Hours</strong></td>
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<tr>
<td><strong>Instructor</strong></td>
<td>Z. Datsios</td>
</tr>
</tbody>
</table>

### Course Contents

The contents of the “Lighting” course are:
- Electromagnetic radiation and light
- Human vision
- Color temperature, colorimetry
- Fundamental laws, photometric quantities and units
- Light sources: modern lamps, properties and comparison
- Interior lighting
- Exterior lighting
- Daylighting
- Energy management and lighting economics
- Photometric measurements
- Software for interior and exterior lighting
The aim of this course is to introduce undergraduate students to lighting and photometry, including both theory and applications. Undergraduate students attending and completing successfully the “Lighting” course will be able to:

• Comprehend the fundamental laws and basic principles of lighting, as well as the photometric quantities.
• Identify, compare and describe light sources and fixtures.
• Comprehend the basic principles and techniques for interior and exterior lighting.
• Conduct studies for interior and exterior lighting.
• Use up-to-date software tools.
• Cooperate with other students in the context of projects.

General Competences:
• Search for, analysis and synthesis of data and information by the use of appropriate technologies.
• Individual/Independent work
• Group/Team work
• Development of free, creative and inductive thinking

PREREQUISITES
- 

TEACHING METHODS
- Lecturing (theory and exercises) in the classroom using projector
- The course is supported by the UOWM Open eClass platform
- Laboratory exercises using specialized software
- Semester project for interior and exterior lighting

ASSESSMENT METHODS
Language of evaluation: Greek

- Semester project for interior and exterior lighting (50%)
- Final examination (50%)

Final examination: Presentation, oral exam

The evaluation process is:
• announced to the undergraduate students during the first lecture and the first laboratory exercise
• uploaded to the OWM Open eClass platform

LANGUAGE OF INSTRUCTION/EXAMS
Greek
### Recommended Bibliography

**Recommended Book**


**Additional Educational Material**


**Recommended Article/Paper**

- Energy and Buildings
- Lighting Research & Technology
AUTOMATION OF ENERGY SYSTEMS
<table>
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<td><a href="https://eclass.uowm.gr/courses/ECE387">https://eclass.uowm.gr/courses/ECE387</a></td>
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<tr>
<td>INSTRUCTOR</td>
<td>Christoforidis G.</td>
</tr>
</tbody>
</table>
| COURSE CONTENTS  | • Introduction to programmable controllers.  
|                  | • Components and systems: processors, memory systems, discrete I / O systems, analog I / O systems, dedicated I / O function and serial communication interface.  
|                  | • Basic PLC Programming: PLC language types, Structure List (STL), Ladder, SFC and Functional Block Diagram (FBD).  
|                  | • Solve automations with KARNAUGH arrays and BOOLE algebra.  
|                  | • Advanced PLC Programming  
|                  | • Operation and cooperation of AC Drive and PLC.  
|                  | • Input-output devices: control transformers, fuses, switches, switches, relays, analog signal (voltage, current, power, temperature, pressure, liquid level, flow, etc.) transducers / transmitters.  
|                  | • Conversion and processing of analog signals.  
|                  | • Design programs with emphasis on power supply and management applications |
Upon successful completion of the course the student will be able to:

- identify and explain the main features of the design, the internal architecture, and the operating principles of the programmable logic controllers (PLC),
- use input and output devices used in PLC systems,
- use the basic communication links involved in PLC systems,
- implement advanced automation in all PLC programming languages.
- use LADDER, FBD programs that include internal relays (memories or flag), timers, counters, shift registers, clocks and handle application data, PI and PID controllers.
- configure AC DRIVES and implement PLC and AC DRIVES collaboration programs to drive propulsion systems and reduce energy consumption.
- Study and implement industrial production processes
- to detect security issues with PLC systems,
- use methods to save energy through automation.
- use methods for fault diagnosis and tests.

General Competences:

- Search for, analysis and synthesis of data and information using appropriate technologies,
- Adapting to new situations
- Decision-making
- Individual/Independent work
- Group/Teamwork
- Introduction of innovative research
- Project planning and management
- Critical thinking
- Development of free, creative, and inductive thinking

PREREQUISITES

TEACHING METHODS

- Teaching in the classroom using a video projector and tutorial exercises
- Laboratory exercises with assignments,
- Learning process support through the electronic platform e-class.
### ASSESSMENT METHODS

The evaluation is performed in Greek language. It consists of 30% of the laboratory exercises (Problem Solving), 20% of the written work and its public presentation and 50% of the final exam. For the successful completion of the course, the average of the above criteria must be equal to or greater than 5. The criteria are accessible by everyone on the course website.

### LANGUAGE OF INSTRUCTION/EXAMS

Greek

### RECOMMENDED BIBLIOGRAPHY

5. GOURGOULIS D. - PAPASTAMOULIS A. - PRASSAS CH. "Digital systems - Computer networks", Chapter 3 - Programmable logic controllers, EVGENIDOU FOUNDATION.
HEAT TRANSFER
<table>
<thead>
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<tr>
<td>INSTRUCTOR</td>
<td>Florini</td>
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<tr>
<td>COURSE CONTENTS</td>
<td>The Heat Transfer course consists of the following sections:</td>
</tr>
<tr>
<td></td>
<td>• Introduction to heat transfer mechanisms</td>
</tr>
<tr>
<td></td>
<td>• Heat transfer with conduction, conduction equation, thermal resistance</td>
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<tr>
<td></td>
<td>• Heat transfer with convection, boundary layers, flow types</td>
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<tr>
<td></td>
<td>• Extending surfaces / fins, performance, optimization</td>
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<td></td>
<td>• Heat exchangers, heat permeability, energy balance, temperature difference</td>
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<tr>
<td></td>
<td>• Transient phenomena – concentrated capacity, temperature / space ratio, Heisler chart</td>
</tr>
<tr>
<td></td>
<td>• Heat transfer via radiation – black body, zone and surface emission, Kirchoff’s law, thermal radiation transaction</td>
</tr>
</tbody>
</table>
### Learning Outcomes / General Competences

After the successful completion of the Heat Transfer course the student would be able to:

- Comprehend and explain the basic heat transfer mechanism
- Develop the specific characteristics of the heat transfer mechanisms as well as compare the heat transfer mechanisms
- Comprehend and analyze the operation and the specific characteristics of heat exchangers
- Calculate heat transfer parameters in typical problems with heat transfer phenomena
- Comprehend and describe transient conduction phenomena

After the successful completion of the Heat Transfer course the student would develop:

- Ability of searching, analyzing and synthesizing raw data and processing information applying appropriate technology tools
- Ability to adapt in new situations

### Prerequisites

Thermodynamics

### Teaching Methods

- Face – to – face education
- Simultaneous distance education

### Assessment Methods

Students’ assessment will be performed via written examination process at the end of the Semester (80 %) as well as via individual projects (20 %) which will be assigned to the students during the Semester.

Both exams and projects consist of questions examining various heat transfer topics.

### Language of Instruction/Exams

Greek, English
### RECOMMENDED BIBLIOGRAPHY

- **Recommended Book RECOMMENDED BIBLIOGRAPHY:**

- **Recommended Article/Paper RECOMMENDED BIBLIOGRAPHY:**
  - Applied thermal Engineering, Elsevier
  - Journal of Thermal Engineering, Springer
  - International Journal of Refrigeration, Elsevier

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**8TH SEMESTER — DIVISION OF ENERGY**
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<tr>
<td>INSTRUCTOR</td>
<td>Stimoniaris D.</td>
</tr>
</tbody>
</table>
COURSE CONTENTS

Outline of Theory:

• Methods of analysis of solar radiation. Solar panels, types, efficiency, calculations.
• Active and passive solar systems for heating and cooling. Heat storage methods.
• Photovoltaic method of electricity production. Agricultural and industrial applications of solar energy.
• Wind and mechanical power generation systems. Wind generators. Methods for estimating wind potential, selection of wind turbine location.
• Production, storage and utilization systems of biomass products.
• Energy from the sea (waves, tide, temperature difference). Geothermal. Small hydroelectric projects.
• Parameter optimization when exploiting mild forms of energy.

Lab Outline:

• Familiarity with the real hybrid network of electricity generation from renewable sources, with an installed capacity of 3 kW of the laboratory. Demonstration, familiarization and measurements of photovoltaic panels with their inverters, small wind turbine and battery packs.
• Introduction to the concept of smart microgrid, description of its architecture taking and processing of measurements in real time with the measurement collection system from the PC and from the screen of the autonomous inverter (island inverter).
• Autonomous operation of the network with energy sources, photovoltaic panels, wind turbine, batteries and as an auxiliary source, the strong network of PPC and vice versa. Taking measurements and receiving meteorological data.
• Introduction to the technology of electricity production from ethanol solution, beer, wine. Introduction to the technology of production and storage of hydrogen using electricity from a wind turbine. Real-time measurements on PC.
• Performance comparison for different fuel type (ethanol solution, beer wine). Effect of temperature on the process. Comparison of water electrolysis process with the use of wind turbine and batteries. Measurement of output quantities of the hydrogen fuel cell for various electrical charges.
The aim of the course is to introduce students to the production and management of energy from renewable sources. Almost all methods of energy production, management and storage are analyzed, emphasizing the most dynamic and applied in our country. The students’ approach to the above methods is strengthened during the laboratory teaching during which they manage the actually installed systems of renewable sources. Students are required to participate in a sufficient number of laboratory exercises that include all the basic renewable sources and are required to submit weekly assignments. They are also familiar with the simulation of facilities with renewable sources and the use of specialized software that supports the operation of such facilities.

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

1. Understand the operation of the various systems for the utilization of solar, wind energy, biomass and geothermal energy.
2. To know the measurement and calculation of their performance.
3. To evaluate a system of renewable energy sources in relation to its energy, environmental and social dimension.
4. Understand the concept and operation of hybrid systems and smart grids.
5. To dimension and monitor the operation of real energy production facilities from renewable sources.

PREREQUISITES
Introduction to RES

TEACHING METHODS
- Teaching in the classroom using a video projector.
- Laboratory exercises.
- Learning process support through the electronic platform e-class.

ASSESSMENT METHODS
I) - Type: Deliveries (50% of the total)
   - Description: Theoretical Background
   - Exam Date: End of Semester
II) - Type: Laboratory Exercises (50% of the total)
   - Description: Combination of understanding and application
   - Exam Date: End of Semester

LANGUAGE OF INSTRUCTION/EXAMS
Greek
**RECOMMENDED BIBLIOGRAPHY**


**HIGH VOLTAGE ENGINEERING I**
### COURSE UNIT CODE
EEHS

### COURSE UNIT TYPE
Specialization

### LEVEL OF STUDY
Undergraduate

### YEAR OF STUDIES
4th

### SEMESTER
8th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://ece.uowm.gr/courses.php?view_course=142&lan=en

### TEACHING WEEKLY HOURS
4

### INSTRUCTOR

### COURSE CONTENTS
The contents of the “High Voltage Engineering I” course are:
- Introduction to high voltage engineering
- Introduction to high voltage engineering general applications
- Electromagnetic transients, overvoltages and insulation coordination for power systems
- Generation and measurement of high voltages (AC, DC and impulse voltages)
- Generation and measurement of impulse currents
- Dielectric measurements
- Partial discharges
The aim of this course is to introduce undergraduate students to the theory, the applications and laboratory techniques of the broad field of High Voltage Engineering.

Undergraduate students attending and completing successfully the “High Voltage Engineering I” course will be able to:

- Comprehend and identify high voltage engineering applications.
- Comprehend and identify the causes of overvoltages in electric power systems, the process of insulation coordination, as well as overvoltage protection equipment and techniques.
- Comprehend the basic principles of high voltage and impulse current laboratory generation and measurement techniques.
- Comprehend the basic principles of laboratory measurements associated with dielectrics and partial discharges.
- Employ up-to-date techniques and tools in high voltage engineering problems and applications.
- Simulate the steady state of power systems, as well as power system transients.
- Cooperate with other students in the context of semester projects.

General Competences:

- Search for, analysis and synthesis of data and information by the use of appropriate technologies.
- Individual/Independent work
- Group/Team work
- Development of free, creative and inductive thinking

Introduction to Electric Power Systems (MK7)

- Lecturing (theory and exercises) in the classroom using projector
- The course is supported by the UOWM Open eClass platform
- Laboratory exercises on the simulation of the steady state and electromagnetic transients in power systems
- Laboratory exercises on high voltage generation and measurement
ASSESSMENT METHODS

Language of evaluation: Greek

- Laboratory exercises with team projects (40%)
- Final examination (60 %)

Final examination: Short-answer questions, Comparative assessment of theory elements, Exercise solving

Final examination on the specialized software used for the laboratory exercises

The evaluation process is:
• announced to the undergraduate students during the first lecture and the first laboratory exercise
• uploaded to the OWM Open eClass platform

LANGUAGE OF INSTRUCTION/EXAMS

Greek

RECOMMENDED BIBLIOGRAPHY

- Recommended Book RECOMMENDED BIBLIOGRAPHY:

- Additional educational material:

- Recommended Article/Paper RECOMMENDED BIBLIOGRAPHY:
  • IEEE Transactions on Dielectrics and Electrical Insulation
  • IEEE Transactions on Power Delivery
  • IEEE Transactions on Electromagnetic Compatibility
  • Electric Power Systems Research
  • Journal of Electrostatics
  • High Voltage
ELECTRO HYDRAULIC AND ELECTROPNEUMATIC POWER SYSTEMS
<table>
<thead>
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<th><strong>COURSE UNIT CODE</strong></th>
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<td><a href="https://eclass.uowm.gr/courses/HMMY126/">https://eclass.uowm.gr/courses/HMMY126/</a></td>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Bouhouras A.</td>
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</table>
The course constitutes an introduction to Hydraulic and Pneumatic Systems Analysis and Application. The course examines the advantages of such systems in regard to electrical ones and analyzes the basic circuit components of hydraulic and pneumatic systems. Some basic circuits are analyzed in theory and their functional characteristics are fully explained via respective exercises. The laboratory circuits are analyzed via appropriate software simulations. The latter is implemented by the Automation Studio v5.0 software package for the simulation of a series of pneumatic and hydraulic circuits along with control capabilities regarding their operation. Students are expected to attend demonstrations about basic and circuits and in turn, to be able to structure circuits and analyze their operational behavior. After each lab exercise, every student is expected to deliver a completed document form which will contain the detailed description of the circuit operation along with various measurements describing its operational characteristics. Furthermore, attention is given in the design of hydraulic and pneumatic systems for real applications.

The course consists of the following main topics:

1. Hydraulic power systems
   - Hydraulic fluids
   - Hydraulic fundamental principles
   - Hydraulic pumps, motors, actuators
   - Various power and control valves and other control elements
   - Other hydraulic elements
   Proportional hydraulics
   - Applications

2. Pneumatic power systems
   - Fundamental principles
   - Pneumatic actuators, motors, compressors
   - Circuits and applications
   - Electrical control
   - Simulate pneumatic control systems

3. Electric Control
   - Simple electric control with switches and contacts
   - Control with PLC

4. Design and simulation of control circuits in hydraulic and pneumatic power applications
LEARNING OUTCOMES / GENERAL COMPETENCES

After successfully completing this course, students will be able to:

Recognize and describe the basic hydraulic and pneumatic circuit components

- Understand and explain the basic principles of the hydraulic systems
- Evaluate the benefits and drawbacks of the hydraulic and pneumatic systems in comparison to electric systems
- Implement laboratory circuits and analyze their operation
- Simulate and explain the operation of hydraulic and pneumatic circuits. Measure properly all the operational characteristics of the circuit
- Design and analyze hydraulic and pneumatic power circuits
- Design the control schemes and electric circuits (basic or PLC) for various controls in hydraulic and pneumatic power systems
- Design control systems for hydraulic and pneumatic circuits and define the nominal values of the circuit components for real applications

General Competences:

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Decision-making
- Project planning and management
- Development of free, creative and inductive thinking
- Development of new research ideas

PREREQUISITES

- 

TEACHING METHODS

- Face-to-face
- Distance learning availability
## ASSESSMENT METHODS

The language of evaluation is Greek. The overall rating is divided as follows:

- Laboratory exercises (30%)
- Written work (30%)
- Final exams (40%) consisting of:
  1) problem solving
  2) short-answer questions
  3) multiple choice tests

The laboratory exercises are based on the analysis of a circuit-case study through a software tool.

The essay writing is based either on the literature review for the development of a topic description work based on scientific publications, or on the development of algorithms and methodologies for solving research problems for innovative research actions on Hydraulic and Pneumatic Power Systems.

The course examination process includes short answer questions and solving tutorial exercises.

The answers of the exam questions are posted in eclass, and the grade of each subject in which they are evaluated is known in advance to the students.

Each student can request a demonstration of the writing and his/her grade will be analyzed.

## LANGUAGE OF INSTRUCTION/EXAMS

Greek

## RECOMMENDED BIBLIOGRAPHY


## POWER ELECTRONICS II
### COURSE CONTENTS

The course of Power Electronics II consists of the following sections:

1. **DC-DC converters:** Basic circuits (step-down, step-up, buck-boost), other circuits (Cuk, fly-back). Analysis, design, applications.
2. **Switching DC power supplies:** Converters with isolation (flyback, forward, push-pull), half- and full-bridge converters, control, power factor correction, design.
3. **DC-AC converters (inverters):** Single-phase, three-phase, harmonic resolution, square-output inverters, amplitude and harmonic control, multi-level inverters, pulse amplitude inverters, sinusoidal PWM, applications.
The aim of the course is to introduce the student to the theory and applications of power electronics systems. The second part mainly studies DC-DC converters and DC-AC converters.

Upon successful completion of the course, the student will be able to:
- Explain in detail the basic functions of the types of power converters examined in the 1st part of the lesson;
- Compare and evaluate the individual circuits of each class of power converters;
- Implement experimental equipment in the laboratory on DC-DC converters and DC-AC inverters and analyzes their operation;
- Simulate and explain the operation of basic DC-DC and DC-AC power converters;
- Design power converter circuits belonging to the categories of DC-DC and DC-AC converters;
- Design MOSFET-IGBT drive circuits, as well as snubbers circuits and cooling systems;
- Collaborate with his fellow students to prepare teamwork essays.

General Competences:
- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Autonomous work
- Teamwork
- Project planning and management
- Critical thinking

PREREQUISITES
Power Electronics I

TEACHING METHODS
- Teaching in the classroom with a video projector and tutorial exercises
- Laboratory exercises
- Possibility of modern distance education

ASSESSMENT METHODS
- Laboratory exercises with teamwork (25%)
- Individual work in the design / analysis of inverters using and simulations (35%)
- Final exams (40%)

LANGUAGE OF INSTRUCTION/EXAMS
Greek
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<tr>
<th><strong>RECOMMENDED BIBLIOGRAPHY</strong></th>
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<tr>
<td>- Recommended Book Resources:</td>
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<td>3. Mania St., 2017, Power Electronics, Kalamara Elli Publications</td>
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<tr>
<td>- Recommended Article/Paper Resources:</td>
<td></td>
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<tr>
<td>5. IEEE Transactions on Power Electronics</td>
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<td>6. IET Power Electronics</td>
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**SPECIAL TOPICS OF ELECTRIC POWER SYSTEMS**
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<td><strong>INSTRUCTOR</strong></td>
<td>Christoforidis G.</td>
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<tr>
<td>COURSE CONTENTS</td>
<td>The course consists of the following main topics:</td>
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<tr>
<td></td>
<td>1. Operation of Transmission Networks (Weeks 1-3)</td>
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<tr>
<td></td>
<td>• DC power flow, optimal power flow, optimal sting of PMUs</td>
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<td></td>
<td>2. FACTs (Week 4)</td>
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<tr>
<td></td>
<td>• Types of available FACTs, power transfer, AC power flow calculations with FACTs</td>
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<td></td>
<td>3. DC power systems (Week 5)</td>
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<td></td>
<td>• DC power transfer with converters</td>
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<td>4. Transmission system reliability and interruptions (Week 6)</td>
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<td></td>
<td>• reliability indices, reliability improvement, power interruptions in transmission networks</td>
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<td></td>
<td>5. Operation of distribution networks (Weeks 7-8)</td>
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<tr>
<td></td>
<td>• current status and transition towards the Smart Grid concept, ancillary services of distribution network to transmission systems</td>
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<td>• central and distributed siting of ESSs</td>
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<td>6. Distribution networks with DG (Weeks 9-10)</td>
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<tr>
<td></td>
<td>• optimal sizing and siting of DGs and RESs in distribution networks, penetration of EVs and their impact on distribution network</td>
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<td>7. Optimal management of distribution networks (Week 11)</td>
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<td>• automation upgrade in distribution networks, energy billing, network reconfiguration of distribution networks, distribution network expansion</td>
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<td>8. Distribution network reliability (Week 12)</td>
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<tr>
<td></td>
<td>• reliability and unreliability indices, reliability improvement, power outages and power restoration schemes in distribution networks</td>
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<td>9. Power quality (Week 13)</td>
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<tr>
<td></td>
<td>• power quality issues (harmonics, voltage drop, flicker etc.), origin of power quality issues and ways to deal with them, standard IEC 50160</td>
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</table>
LEARNING OUTCOMES

After successfully completing this course, students will be able to:

1. Perform DC load flow and optimal power flow analysis
2. Understand the benefits and drawbacks for either AC or DV power transmission, know and analyze the characteristics of flexible power systems (FACTs)
3. Evaluate the reliability level of both transmission and distribution networks by computing the respective reliability indices
4. Understand the impact of DG and RES penetration on distribution networks – have knowledge about the raised issues due to EVs penetration and ESS installation
5. Be aware of the current trend regarding the operational status of transmission and distribution networks both on control schemes and equipment upgrade
6. Solve optimization problems regarding the upgrade and expansion of power networks, know the reconfiguration scheme of distribution networks towards the improvement of the operational characteristics
7. Identify power quality issues in power systems and apply methodologies to deal with them

PREREQUISITES

- Transmission and distribution of electric energy

TEACHING METHODS

- Lectures (PowerPoint slides via projections) and tutorials
- Learning process support via e-class platform
- Laboratory exercises (software simulations)

ASSESSMENT METHODS

- Individual or group assignment (30%)
- Laboratory exercises (30%)
- Final exams (40%)

LANGUAGE OF INSTRUCTION/EXAMS

Greek

RECOMMENDED BIBLIOGRAPHY

1. Ανάλυση Συστημάτων Ηλεκτρικής Ενέργειας, Βοβός Α. Νικόλαος, Γιαννακόπουλος Β. Γαβριήλ
2. Αναλυση Συστηματων Ηλεκτρικης Ενεργειας, Grainger/Stevenson
ELECTROMECHANICAL INSTALLATIONS AND ENERGY ANALYSIS OF BUILDINGS
<table>
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<tr>
<td>INSTRUCTOR</td>
<td>Stimoniaris D.</td>
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</tbody>
</table>
| COURSE CONTENTS  | 1. Thermal insulation and Thermal losses of buildings.  
|                  | 2. Building materials and building components - Thermal resistance and heat permeability - Calculation method.  
|                  | 3. Heating, cooling and air conditioning systems in buildings - Methods for calculating the thermal / cooling load design.  
|                  | 4. Energy Efficiency of Buildings (Methodology for elaboration of calculations of the energy efficiency of a building in accordance with the requirements and specifications of the legislation and the Regulation of Energy Efficiency of Buildings – KENAK.  
|                  | 5. Fire safety (active and passive fire protection).  
|                  | 7. Pumping stations. |
LEARNING OUTCOMES / GENERAL COMPETENCES

This course provides the basic knowledge and techniques for the preparation of studies of electromechanical installations of buildings and proposes methods for the correct and safe dimensioning of devices - applications of electricity in accordance with applicable standards and national regulations, with the development of issues related to professional rights of the graduates of the department. Upon completion of the course the student should:

• Effectively implements regulations and standards regarding the requirements for the electromechanical installations of buildings.
• Effectively implements the regulations and the current standards regarding the safe dimensioning of the devices - applications of electricity.
• Handles technical software packages, which are widely used in the preparation of studies of electromechanical installations and energy efficiency of buildings.
• Has the theoretical background to prepare and compile E / M studies of facilities related to
• the course material.

PREREQUISITES
- None

TEACHING METHODS
- Classroom teaching and tutoring exercises.
- Learning process support through e-class.
- Specialized Software (energy efficiency of buildings, etc.).

ASSESSMENT METHODS
I. Written final exam (35%) which includes:
- Multiple choice questions.
- Questions for understanding the basic concepts of the course - Problem solving-exercises.
II. Group work (15%) on the analysis of a complete case study.
III. Individual work in the laboratory (20%).
IV. Final laboratory test (30%).

LANGUAGE OF INSTRUCTION/EXAMS
Greek

RECOMMENDED BIBLIOGRAPHY
1. ΗΛΕΚΤΡΟΛΟΓΙΚΕΣ ΚΑΙ ΜΗΧΑΝΟΛΟΓΙΚΕΣ ΕΓΚΑΤΑΣΤΑΣΕΙΣ ΣΕ ΚΤΙΡΙΑ, Σ. ΚΟΥΡΗΣ, Β.ΣΩΤΗΡΟΠΟΥΛΟΣ
ENERGY ECONOMICS AND ENERGY MARKETS
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<td><strong>INSTRUCTOR</strong></td>
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The theoretical part of the course provides an overview of the power systems at national and pan-European level, while also includes lectures related to energy economics, types of electricity markets, and current challenges in the energy sector. Tutorials and exercises include representative types of problems related to the operation and the clearing of electricity markets. Laboratory courses aim to teach the GAMS (General Algebraic Modeling System) software. In the field of energy economics and energy markets, the use of optimization techniques and mathematical programming is well-established. Indicatively, mathematical models can be used in order to determine optimal long-term energy road maps at national and/or regional levels as well as to simulate and analyze the operation and clearing of energy markets on a daily and/or annual scale.

In summary, the course aims to cover the following topics:

- Energy and international relations, security of energy supply, interactions between energy sector, economy and environment.
- Teaching the basic principles of energy markets by examining the Greek and the European energy market.
- Unit commitment and optimal dispatch of generation units.
- Power systems with high penetration levels of distributed renewable energy sources.
- Long-term energy planning (current reality and future challenges).
- Overview of the key features of Greek and European energy policies by focusing on the power systems of Greece and Southeast Europe and by presenting the main features of the most advanced power systems of Europe (most advanced in terms of high penetration levels of distributed renewable energy sources).
LEARNING OUTCOMES / GENERAL COMPETENCES

The main objective of the course is to examine and analyze concepts related with energy economics and energy markets.

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

- Know the basic technologies for energy production and the basic sectors of energy consumption.
- To understand the key challenges of modern energy sector and the impact of the energy economics on the energy environment.
- To understand and analyze the key economic attributes related to the planning and operation of power systems.
- Know the structure and the operation of energy markets.
- Understand the basic features of the Greek and European energy markets.
- Understand the short-, medium-, and long-term operation of electricity markets.
- Model, simulate and analyze, using optimization tools and software, common problems related with energy economics, energy policies, and energy markets.
- Estimate the financial viability of energy investments.
- Understand the current state as well as the future challenges of the energy sector on a national and European level.

PREREQUISITES

- 

TEACHING METHODS

- Teaching via video projector
- Support of learning process through the e-class platform
- Use of the General Algebraic Modeling System (GAMS) tool
- Use of the Long-range Energy Alternatives Planning System (LEAP) tool
- Tutorial and workshops for the teaching of optimization applications in power systems.

ASSESSMENT METHODS

- Groups assignments (50 % of the final grade)
- Final examination (50 % of the final grade)

The exams include: a) multiple-choice questions or right-wrong type questions, b) developmental questions, and c) exercises related to the basic concepts of the course.

LANGUAGE OF INSTRUCTION/EXAMS

Greek
9TH SEMESTER – DIVISION OF ENERGY

RECOMMENDED BIBLIOGRAPHY

- Recommended Book Resources:


- Recommended Article/Paper Resources:

1. IEEE Transactions on Power Systems
2. IEEE Transactions on Power Delivery
3. Electric Power System Research
INDUSTRIAL ELECTRICAL INSTALLATIONS
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<tr>
<td><strong>COURSE CONTENTS</strong></td>
<td>The course consists of the following main topics:</td>
</tr>
<tr>
<td></td>
<td>• Low Voltage and Medium Voltage installations grounding (types of grounding systems, measurement of grounding resistance)</td>
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<td></td>
<td>• Calculation of short circuit currents and power</td>
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<td>• Analysis of motor installations (asynchronous motor start-up, motor breaking, choosing the right motor, electrical characteristics of motors, defining motor’s load, protection and connection of motors)</td>
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<td></td>
<td>• Medium voltage substations (coupling equipment, means of protection, types of substations, substation grounding,)</td>
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<td></td>
<td>• Feasibility study for substations, reactive power compensation (electricity billing, improving power factor)</td>
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<td></td>
<td>• Lightning protection of buildings and installations (surge arresters, special protection)</td>
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<td>• Switches (relays, load switches, sectionalizers, fuses)</td>
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<td>• Lighting installations (types of lamps, lighting installation studies)</td>
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</tbody>
</table>
LEARNING OUTCOMES

After successful completion of the course, students will be to:

• Choose of materials, cables and appliances industrial electrical installations from technical catalogues companies and analysis of these characteristics.
• Study of integrated industrial installations simple and automated production of specific units of the industry.
• Study and calculations supporting regional facilities in industrial facilities.
• Perform earthing and lightning analysis in industrial buildings.
• Perform outdoor lighting analysis in industrial buildings.
• Perform reactive power compensation and selecting invoices from their suppliers of electricity (electricity and individuals) for industrial use.
• Study and perform calculations of electrical industrial automation panels for use on individual machines and production cooperation with these main electrical panels feeding an industrial installation.
• Know the standards and regulations for industrial electrical installations.
• Know how to protect from industrial accidents.
• Know about low and medium voltage consumers’ substations.
• Study saving electricity and other energy sources in industrial plant.

General Competences:

• Search for, analysis and synthesis of data and information by the use of appropriate technologies
• Decision-making
• Group/Team work
• Project planning and management
• Development of free, creative and inductive thinking
• Development of new research ideas

PREREQUISITES

• Modern Electric Power Systems

TEACHING METHODS

Face-to-face
Distance learning availability
### ASSESSMENT METHODS

The language of evaluation is Greek. The overall rating is divided as follows:

- Laboratory exercises (30%)
- Written work – essay presentation (30%)
- Final exams (40%) consisting of:
  1) problem solving
  2) short-answer questions
  3) multiple choice tests

The laboratory exercises are based on the analysis of a circuit-case study through a software tool and practical work with hardware equipment.

The essay concerns a complete study for a case of industrial application.

The course examination process includes short answer questions and solving tutorial exercises.

The answers of the exam questions are posted in eclass, and the grade of each subject in which they are evaluated is known in advance to the students.

Each student can request a demonstration of the writing and his / her grade will be analyzed.

### LANGUAGE OF INSTRUCTION/EXAMS

Greek

### RECOMMENDED BIBLIOGRAPHY

1. V. Bitzionis, Industrial electrical installations, Tziola Publications, Code Eudoxus: 41958897
2. S. Touloglou, Industrial electrical installations and Medium Voltage Substations, Code Eudoxus: 14582
3. P. Dokopoulos, Electrical installations for consumers, Ziti publications, Code Eudoxus: 11044

Relevant scientific journals:
- IEEE Transactions on Power Systems
- IEEE Transactions on Smart Grid
- Electric Power System Research (Elsevier)
ELECTRIC DRIVE SYSTEMS
The course consists of the following main topics:

I. Introduction to Electric Drive Systems (EDS)
   a. Description, requirements of classic and modern EDS
   b. Parameters influencing the selection of an EDS
   c. Movement profile
   d. Torque-speed characteristics of mechanical loads

II. DC motor drives
   a. Control of field magnetic flux
   b. Control of stator voltage
   c. Control of rotor resistance
   d. Power electronics control
      i. Rectifiers
      ii. Dc-Dc converters

III. AC motor drives
   a. Change in stator voltage
   b. Frequency control
   c. Change in rotor resistance
   d. Rotor voltage injection
   e. Slip energy recovery
   f. Voltage/frequency control
   g. Power electronics control
      i. Inverters
      ii. AC controllers

IV. Braking of Electric Motors
LEARNING OUTCOMES / GENERAL COMPETENCES

Scope of the course is to introduce the students into the theory and mainly the applications of Electric Drive Systems. The basic electric drive systems and the cooperation between motor-load are examined. The theory behind AC and DC motor control is analyzed. The main methods for controlling DC and AC motors using classical ways and power electronics systems are studied. The student learns to scale and study simple electric drive systems found in industry.

On successful completion of this module the student will be able to:

• Identify the key parameters for selecting an electric drive system
• Know the basic methods for transfer of movement and the characteristics of main loads
• Understand and compare the ways of DC motors control
• Analyze and design a DC motor drive system
• Understand and compare the ways of AC motors control
• Analyze and design an AC motor drive system
• Acquire practical skills in the laboratory for controlling various types of electric motors
• Know the braking methods of electric motors

PREREQUISITES

• Power Electronics I and II, Electrical Machines I and II

TEACHING METHODS

- Lectures (PowerPoint slides via projections) and tutorials
- Learning process support via e-class platform
- Laboratory exercises

ASSESSMENT METHODS

- Individual assignment (40%)
- Group assignment in the laboratory (30%)
- Final examination (30%)

LANGUAGE OF INSTRUCTION/EXAMS

Greek

RECOMMENDED BIBLIOGRAPHY

1. Π. Μαλατέστας, Ηλεκτρική Κίνηση, Εκδόσεις Τζιόλα, 2010.
6. Krishnan, Ηλεκτρικά Κινητήρια Συστήματα, Κλειδάριθμος 2009
PROTECTION AND STABILITY OF POWER SYSTEMS
COURSE UNIT CODE  |  EEH21
LEVEL UNIT TYPE  |  Specialization
LEVEL OF STUDY   |  Undergraduate
YEAR OF STUDIES  |  5th
SEMESTER         |  9th
ECTS CREDITS     |  5
COURSE WEBSITE (URL) |  https://eclass.uowm.gr/courses/HMMY102/
TEACHING WEEKLY HOURS |  4
INSTRUCTOR       |  Nouslidis

COURSE CONTENTS
- Transient phenomena in power systems (wave phenomena in transmission lines, traveling waves, etc.)
- Couplings, disconnections and short circuits in power systems (connections and disconnections of single- and three-phase loads)
- Steady-state and transient stability (dynamics of synchronous machines, equal area criterion)
- Analysis of short circuits (IEC 60909, symmetrical and asymmetrical short circuits, calculation of currents and voltages of the faulted node, numerical methods for short circuit analysis)
- Power system protection (general concepts, selectivity, types of relays, operating principles of electromechanical relays, line protection with distance / overvoltage relays and fuses, etc.)

LEARNING OUTCOMES / GENERAL COMPETENCES
Upon successful completion of the course, the student shall be able to:
- Understand the termination of transmission lines, analyze the stress of power transformers and insulators from traveling waves
- Compute over-voltages and over-currents, caused either due to connection/disconnection of power system components or due to short circuits
- Analyze symmetrical and asymmetrical short circuits
- Assess power system transient stability using the equal area criterion

General Competences:
- Decision making
- Group work
<table>
<thead>
<tr>
<th><strong>PREREQUISITES</strong></th>
<th>• Transmission and distribution of electrical energy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEACHING METHODS</strong></td>
<td>• Face to face</td>
</tr>
<tr>
<td></td>
<td>• Distance learning</td>
</tr>
<tr>
<td><strong>ASSESSMENT METHODS</strong></td>
<td>Course evaluation is carried out through intermediate exams (it constitutes 30% of the final grade) and a final exam (constitutes 70% of the final grade). Exams include: a) multiple choice questions or right-wrong type questions, b) open-ended and short-answer questions and c) exercises related to the basic concepts of the course</td>
</tr>
<tr>
<td><strong>LANGUAGE OF INSTRUCTION/EXAMS</strong></td>
<td>Greek</td>
</tr>
<tr>
<td><strong>RECOMMENDED BIBLIOGRAPHY</strong></td>
<td>- Recommended Book Resources:</td>
</tr>
<tr>
<td></td>
<td>1. Ν. Βοβός, Γ. Γιαννακόπουλος, “Έλεγχος και ευστάθεια συστημάτων ηλεκτρικής ενέργειας”, 2017, Κωδικός Εύδοξος: 68379841</td>
</tr>
<tr>
<td></td>
<td>2. Ν. Βοβός, “Προστασία συστημάτων ηλεκτρικής ενέργειας”, 2009, Κωδικός Εύδοξος: 59384925</td>
</tr>
<tr>
<td></td>
<td>- Recommended Article/Paper Resources:</td>
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<tr>
<td></td>
<td>IEEE Transactions on Power Systems</td>
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<td></td>
<td>IEEE Transactions on Power Delivery</td>
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<td>Electric Power System Research</td>
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</table>
OPTIMIZATION METHODS IN ELECTRIC POWER SYSTEMS
<table>
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<tr>
<th>COURSE UNIT CODE</th>
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<td>COURSE WEBSITE (URL)</td>
<td><a href="https://eclass.uowm.gr/courses/ECE376/">https://eclass.uowm.gr/courses/ECE376/</a></td>
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<tr>
<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
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<tr>
<td>INSTRUCTOR</td>
<td>P. Gaidatzis</td>
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</tbody>
</table>
COURSE CONTENTS

The General Algebraic Modeling System (GAMS) is a computational modeling tool for solving various mathematical programming and optimization problems. The purpose of the course is to present the main optimization problems associated with the modeling of energy systems and in particular, power systems, both in their theoretical formulation (objective function, equations constraints), as well as in the computational methods and techniques used to solve them (modeling in GAMS modeling tool).

The course introduces undergraduate students to the applied optimization with a focus on energy systems. It includes the mathematical formulation of a series of problems related to energy systems and the laboratorial part of the course their computational modeling in the General Algebraic Modeling System (GAMS).

More specifically, the subjects covered are:

- Linear Programming, Quadratic Programming, Mixed Integer Linear and Nonlinear Programming,
- Economic dispatch problem including thermal power units and renewable energy sources (static and dynamic formulation),
- Unit commitment problem,
- Long-term generation expansion planning of power systems,
- Optimal planning and production scheduling of distributed energy resources
- Impacts of electric vehicles’ penetration and energy storage systems.
**LEARNING OUTCOMES**  
Upon successful completion of the course, the student will be able to:

- Understand the basic principles of programming in a computing environment.
- Understand the computational applications of modern energy applications and the added value of optimization in decision making.
- Be able to provide mathematical formulations for the energy systems problems.
- Be able to understand the short-term dynamics of the operation of electricity markets, as well as the medium- and long-term dynamics of energy planning.
- Formulate, model, and solve in a computational optimization tool the main problems of energy policy, economy, and energy markets.

**PREREQUISITES**

- 

**TEACHING METHODS**

- Onsite learning
- Option of Modern distance learning courses

**ASSESSMENT METHODS**

- Laboratory exercises in groups (30%)
- Individual project for modeling an energy systems optimization problem (30%)
- Final exams (40%)

**LANGUAGE OF INSTRUCTION/EXAMS**

- Greek

**RECOMMENDED BIBLIOGRAPHY**

2. Nonlinear Optimization Applications Using the GAMS Technology [electronic resource], Neculai Andrei, Code Eudoxos: 73248321
3. Continuous Nonlinear Optimization for Engineering Applications in GAMS Technology [electronic resource], Neculai Andrei, Code Eudoxos: 75483709
INTRODUCTION TO SMART GRIDS
COURSE UNIT CODE: EEH15
COURSE UNIT TYPE: Specialization
LEVEL OF STUDY: Undergraduate
YEAR OF STUDIES: 5th
SEMESTER: 9th
ECTS CREDITS: 5
COURSE WEBSITE (URL): https://eclass.uowm.gr/courses/HMY114/
TEACHING WEEKLY HOURS: 4
INSTRUCTOR: A. Bouhouras
| COURSE CONTENTS | 1. Introduction to Smart Grids,  
|                | • Introductory remarks, terms and definitions,  
|                | • Regulatory framework  
|                | • Smart grid concepts  
|                | 2. Smart Grid elements,  
|                | • Smart Grid Architecture  
|                | • Operational monitoring and measurements  
|                | • Connectivity and standards  
|                | 3. Smart Grid communications,  
|                | • Management systems of distribution and transmission systems  
|                | • Communication Requirements in the face of Distributed Generation and microgrids  
|                | • Advanced SCADA systems  
|                | • Data Analysis  
|                | 4. Smart Grid security  
|                | • Motives  
|                | • Weaknesses  
|                | • Requirements for security and privacy  
|                | • Cyberattacks definitions, technical characteristics and counter-measures  
|                | 5. Flexibility in Smart Grids  
|                | • Generation Flexibility  
|                | • Load Flexibility  
|                | • Active Distribution Networks  
|                | 6. Latest trends in Smart Grids  
|                | • Smart Buildings  
|                | • E-mobility  
|                | • Energy Storage Systems  
|                | 7. Generation/Consumption Forecasting  
|                | • Load Forecasting techniques  
|                | • Generation Forecasting techniques  
|                | • Variable time horizons  
|                | 8. Case studies and Tools  
|                | • Peer-to-peer and other transactions in smart grid electricity markets  
|                | • Microgrids  
|                | • Local Energy communities |
LEARNING OUTCOMES

/ GENERAL COMPETENCES

With the completion of this course the student:

• Will have grasped the fundamental concepts and characteristics of the smart grids.
• Will be familiarized with modern smart grids subjects, such as, cybersecurity, flexibility.
• Will be able to identify and analyze smart grid architecture
• Will be able to describe and analyze issues such as forecasting of energy generation and consumption, as well as peer-to-peer transactions, blockchain integration in power systems etc.
• Will become familiar with the concepts of microgrids, Virtual Power Plants and Local energy communities.

PREREQUISITES

• Transmission and Distribution of Electrical Energy, Stability of Power systems, Renewable Energy Sources, Power electronics, Electricity Market,

TEACHING METHODS

1. Physical sessions
2. Possibility of remote training sessions

ASSESSMENT METHODS

The assessment method adopted in this course will be two-fold:
1. Written exam comprising 70% of the final course grade, consisting of: multiple-choice tests, short-answer questions and problem solving.
2. Written work, essay/report, oral exam, presentation comprising 30% of the final course grade. The students will be evaluated according to the content as well as the presentation of their work.

LANGUAGE OF INSTRUCTION/EXAMS

Greek, English
RECOMMENDED BIBLIOGRAPHY

- Recommended Book Resources:


- Recommended Article/Paper Resources:

IEEE Transactions on Smart Grids
IEEE Transactions on Power Systems
IEEE Transactions on Power Delivery
IEEE Power & Energy Magazine
ENERGY STORAGE TECHNOLOGIES
## Course Contents

Course contents:
- Introductions. Importance of energy storage systems in modern power systems
- Electromechanical storage (pumped hydro storage systems, compressed air energy storage systems, flywheels)
- Electromagnetic and electrochemical storage systems (batteries, supercapacitors, super magnetic energy storage systems, fuel cells, flow batteries)
- Comparative assessment of energy storage technologies. Energy density, power density, efficiency, lifetime, cost, viability
- Sizing of battery storage systems
- Practical examples and study cases

In the laboratory part, special software is used for the dimensioning of storage systems. Moreover, the laboratory infrastructure of the Department (including superconducting energy storage system, electronic load for battery control, PV system with battery storage) is used to demonstrate basic principles.
<table>
<thead>
<tr>
<th>LEARNING OUTCOMES / GENERAL COMPETENCES</th>
<th>Upon successful completion of the course, the student shall be able to:</th>
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<tbody>
<tr>
<td>• Understand the differences on main energy storage technologies and analyze their individual characteristics</td>
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<tr>
<td>• Understand the importance of energy storage in modern power systems</td>
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<tr>
<td>• Compare and evaluate energy storage technologies based on their cost and individual characteristics</td>
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<tr>
<td>• Model energy storage systems and perform simulations in software environment</td>
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<tr>
<td>• Analyze storage applications and the individual advantages of each storage technology</td>
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<tr>
<td>• Design battery storage energy systems</td>
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<tr>
<th>PREREQUISITES</th>
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<td>• Distance learning</td>
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<tr>
<th>ASSESSMENT METHODS</th>
<th>- Laboratory exercises with group reports (30% of the final grade)</th>
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<tbody>
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<td>- Individual project -dimensioning of storage systems- (30% of the final grade)</td>
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<td>- Final exams (40% of the final grade)</td>
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<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
<th>- Recommended Book Resources:</th>
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<tr>
<td>1. Βιβλίο [59385727]: Συστήματα παραγωγής ηλεκτρικής ισχύος από ανανεώσιμες πηγές ενέργειας, Gilbert M. Masters</td>
<td></td>
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<tr>
<td>2. Βιβλίο [94645169]: Σταθμοί Παραγωγής Ηλεκτρικής Ισχύος, Πολυζάκης Απόστολος</td>
<td></td>
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<tr>
<td>- Recommended Article/Paper Resources:</td>
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<tr>
<td>Journal of Energy Storage</td>
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</table>
HIGH VOLTAGE ENGINEERING II
<table>
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<tr>
<th>COURSE UNIT CODE</th>
<th>EEH22</th>
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<tbody>
<tr>
<td>COURSE UNIT TYPE</td>
<td>Specialization</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>Undergraduate</td>
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<tr>
<td>YEAR OF STUDIES</td>
<td>5th</td>
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<td>SEMESTER</td>
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<td>ECTS CREDITS</td>
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<tr>
<td>COURSE WEBSITE (URL)</td>
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<tr>
<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
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<tr>
<td>INSTRUCTOR</td>
<td>Z. Datsios</td>
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</tbody>
</table>

**COURSE CONTENTS**

The contents of the “High Voltage Engineering II” course are:

- High voltage engineering applications in power systems:
  - Insulators
  - High voltage power cables
  - Circuit breakers, disconnectors
  - Gas Insulated Lines (GIL), Gas Insulated Substations (GIS)
  - High voltage capacitors and inductors
- Lightning: mechanism, effects, surge protection
- Grounding systems for high voltage installations and associated measurements
- Electrical breakdown in gaseous, liquid and solid dielectrics
- Surface flashover
- Vacuum breakdown
- Electric arc
The aim of this course is to introduce undergraduate students to the applications of High Voltage Engineering and the physical mechanisms related to electrical breakdown.

Undergraduate students attending and completing successfully the “High Voltage Engineering II” course will be able to:

- Comprehend and identify high voltage engineering applications with emphasis in electric power systems.
- Comprehend the mechanism of lightning, the effects of lightning on power systems, as well as the basic principles of lightning protection.
- Comprehend and apply the basic principles of grounding.
- Comprehend the physical mechanisms related to electrical breakdown.
- Employ up-to-date techniques and tools in high voltage engineering problems and applications.
- Simulate the steady state of power systems, as well as power system transients.
- Perform field measurements of soil resistivity and ground resistance.
- Perform laboratory tests for the evaluation of the dielectric strength of insulating oils.
- Cooperate with other students in the context of semester projects.

PREREQUISITES

- 

TEACHING METHODS

- Lecturing (theory and exercises) in the classroom using projector
- The course is supported by the UOWM Open eClass platform
- Laboratory exercises on the simulation of the steady state and electromagnetic transients in power systems
- Laboratory exercises on field measurements of soil resistivity and ground resistance and on the evaluation of the dielectric strength of insulating oils
### ASSESSMENT METHODS

Language of evaluation: Greek

- Laboratory exercises with team projects (40%)
- Final examination (60 %)

Final examination: Short-answer questions, Comparative assessment of theory elements, Exercise solving

Final examination on the specialized software used for the laboratory exercises

The evaluation process is:
- announced to the undergraduate students during the first lecture and the first laboratory exercise
- uploaded to the OWM Open eClass platform

### LANGUAGE OF INSTRUCTION/EXAMS

Greek

### RECOMMENDED BIBLIOGRAPHY

<table>
<thead>
<tr>
<th>Recommended Book</th>
<th>RECOMMENDED BIBLIOGRAPHY:</th>
</tr>
</thead>
</table>

- Additional educational material:

- Recommended Article/Paper RECOMMENDED BIBLIOGRAPHY:
  IEEE Transactions on Dielectrics and Electrical Insulation
  IEEE Transactions on Power Delivery
  IEEE Transactions on Electromagnetic Compatibility
  Electric Power Systems Research
  Journal of Electrostatics
  High Voltage

### SELECTED TOPICS IN POWER ELECTRONICS
**COURSE UNIT CODE**  
EEH23

**COURSE UNIT TYPE**  
Specialization

**LEVEL OF STUDY**  
Undergraduate

**YEAR OF STUDIES**  
5th

**SEMESTER**  
9th

**ECTS CREDITS**  
5

**COURSE WEBSITE (URL)**  
https://eclass.uowm.gr/courses/HMMY115/

**TEACHING WEEKLY HOURS**  
4

**INSTRUCTOR**  
Oureilidis K.

**COURSE CONTENTS**  
The course of Selected Topics in Power Electronics consists of the following sections:
1. Control of DC-DC converters and switching DC power suppliers: Feedback circuits and small-signal analysis, power factor correction, state-space averaging equations.
2. Drive circuits & snubbers: Semiconductor drive circuits (MOSFET-IGBT, Thyristor), snubber circuits, thermal semiconductor management and heat sinks.

**LEARNING OUTCOMES / GENERAL COMPETENCES**  
Upon successful completion of the course the student will be able to:
- Analyze the dynamic operation of DC-DC converters;
- Design control systems of DC-DC converters and switching DC power suppliers;
- Design drive circuits of MOSFET, IGBT and Thyristors;
- Compute and select snubbers circuits to protect switches;
- Identify the appropriate cooling systems for the switches;
- Know, analyze and compare resonant converters;
- Simulate and explain the operation of special converters and power electronics systems;
- Collaborates with fellow students in order to prepare teamwork essays.

**PREREQUISITES**  
Power Electronics I, Power Electronics II
| **TEACHING METHODS** | • Teaching in the classroom with a video projector and tutorial exercises  
| | • Laboratory exercises  
| | • Possibility of modern distance education |
| **ASSESSMENT METHODS** | - Laboratory exercises with teamwork (25%)  
| | - Individual work in the design / analysis of inverters using and simulations (35%)  
| | - Final exams (40%) |
| **LANGUAGE OF INSTRUCTION/EXAMS** | Greek |
| **RECOMMENDED BIBLIOGRAPHY** | - Recommended Book Resources:  
| | 3. Mania St., 2017, Power Electronics, Kalamara Elli Publications  
| | - Recommended Article/Paper Resources:  
| | IEEE Transactions on Power Electronics  
| | IEEE Transactions on Industrial Electronics  
| | IEEE Transactions on Industry Applications  
| | IET Power Electronics  
| | Power Electronics (MDPI) |
PV SYSTEMS AND APPLICATIONS
<table>
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<tr>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>G. Christoforidis</td>
</tr>
</tbody>
</table>
| **COURSE CONTENTS**  | • Autonomous and grid-connected PV systems  
• Grid Connection methods  
• problems with grid connected large PV systems  
• Islanding: operation, avoidance and exploitation  
• Calculation of estimated generation and parameter impact assessment.  
• Design and Selection of suitable equipment  
• Suitability & advantages of next generation inverters  
• PV systems applications: Rooftop PV system and large PV plants.  
• Impact of consumption on prosumers  
• Forecasting  
• Current policies and regulations  
• Hybris systems including Storage. Topologies and equipment.  
• Techno-economic analysis and feasibility studies. |
**LEARNING OUTCOMES / GENERAL COMPETENCES**

With the completion of this course the student will be able to:

- Calculate the estimated generation of a PV system, taking into consideration all the necessary parameters.
- Identify and explain all the possible connections of a PV system with the rest of the grid.
- Be aware of current policies and regulations framing the PV operation and participation in the electricity market.
- Study simple PV systems to be connected to the rest of the grid, or operate autonomously.
- Design simple PV systems including suitable PV modules, inverters and their optimized topology.
- Analyze PV systems integrated with energy storage systems.
- Investigate financial feasibility of such systems.
- Learn and use related software.
- Cooperate with other students in team projects.

**PREREQUISITES**

Transmission and Distribution of Electrical Energy, Renewable Energy Sources, Power electronics

**TEACHING METHODS**

Physical sessions for lectures, lab exercises

**ASSESSMENT METHODS**

Individual project in study and design a PV system (100%)

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

- Recommended Book RECOMMENDED BIBLIOGRAPHY:

- Recommended Article/Paper RECOMMENDED BIBLIOGRAPHY:
  Journal of Renewable Energy (Elsevier)
  IEEE Transactions of Sustainable Energy
  IET Renewable Power Generation

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**7TH SEMESTER – DIVISION OF TELECOMMUNICATIONS AND NETWORKS**
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<tr>
<td><strong>COURSE UNIT TYPE</strong></td>
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<tr>
<td><strong>LEVEL OF STUDY</strong></td>
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<td><strong>YEAR OF STUDIES</strong></td>
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<td><strong>SEMESTER</strong></td>
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<td><strong>COURSE WEBSITE (URL)</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE175/">https://eclass.uowm.gr/courses/ICTE175/</a></td>
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<tr>
<td><strong>TEACHING WEEKLY HOURS</strong></td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Sarigiannidis P.</td>
</tr>
</tbody>
</table>
Upon completion of this course, on knowledge level, students will:

- Gain knowledge and broad understanding of topics in the areas of analysis, modelling, and simulation of communication networks, as well as in the area of event-driven programming.
- Be able to identify and describe problems through the Monte Carlo modelling approach and solve real-world problems using event-driven simulation. Moreover, students will be able to identify the prerequisites of applying randomness to simple and complicated problems by leveraging the theory of large numbers and the use of methods of pseudo-random number generation.

Upon completion of this course, on skills level, students will:

- Be able to comprehend, explain, and infer in terms of entities, input and output variables, performance metrics, constants, and other critical factors of simulation techniques. They will also be to identify the required evaluation variables, the limits of the performance metrics, and the required simulation time for the correct generation of results and conclusions.
- Be able to autonomously solve simple and complicated problems using event-driven simulation and verify the simulation results using analytical methods, such as probability theory and large number theory. Furthermore, students will be able to interpret the related elements that will enable the generalization of the conclusions during the problem-solving in order to publish and disseminate information, ideas, and conclusions to an inexpert audience.

Upon the completion of this course, on competencies level, students will:

- Be able to manage complicated techniques, effective methodologies, solution strategies, and professional activities by assuming responsibility for the decision-making through event-driven simulation. They will be able to simulate simple and complicated problems through a wide range of simulation platforms such as Matlab, ns-2, ns-3, and OMNeT++. In addition, students will gain the required skills to analyze and simulate problems in unpredictable, heterogeneous, and competitive work environments by assuming responsibility for the management of professional development of persons and teams without risks and costly capital expenditures.
- Leverage their knowledge, comprehension, and problem-solving skills in various applications towards addressing problems in new and unknown environments, that are regulated by interdisciplinary and heterogeneous frameworks, towards exploiting the results that originate from applying event-driven simulation on research, societal, and collaboration levels.
<table>
<thead>
<tr>
<th>PREREQUISITES</th>
<th>-</th>
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</thead>
<tbody>
<tr>
<td>TEACHING METHODS</td>
<td>- Face-to-face - Distance-learning capability</td>
</tr>
<tr>
<td>ASSESSMENT METHODS</td>
<td>- Final written examination (60%), Greek - Laboratory exercises (30%) - Presentation of semester assignment (10%) - Oral examination (±20%)</td>
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<tr>
<td>LANGUAGE OF INSTRUCTION/EXAMS</td>
<td>Greek</td>
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| RECOMMENDED BIBLIOGRAPHY | - Recommended Book Resources: 
- Recommended Article/Paper Resources: 

**Antenna Systems and Wireless Propagation**
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<tr>
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<tr>
<td><strong>YEAR OF STUDIES</strong></td>
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<td><strong>SEMESTER</strong></td>
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<td><strong>COURSE WEBSITE (URL)</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE289/">https://eclass.uowm.gr/courses/ICTE289/</a></td>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>A. Pitilakis</td>
</tr>
</tbody>
</table>
### COURSE CONTENTS

Radiated and guided electromagnetic (EM) waves in the radio wave and microwave spectrum. Basic antenna properties (radiation pattern, directivity and gain, polarization, input impedance, matching and resonance). Wireless propagation principles (reciprocity, Friis equation and RADAR equation). Linear wire antennas (dipoles and monopoles), image theory and effect of conduction ground. Loop antennas (small loop, wavelength-circumference loop). Antenna arrays (analysis and synthesis, broadside, end-fire, and phased arrays). Special wire antennas (folded dipoles, Yagi-Uda, log-periodic antennas). Horn antennas (pyramidal), reflector antennas (flat, angular and parabolic), microstrip and patch antennas. Special antennas and analysis/design techniques.

Lab exercises based on education equipment (Lab Volt/Festo Didactir) for measurement of basic antennas (dipoles, loops, Yagi-Uda, horns, etc.).


### LEARNING OUTCOMES / GENERAL COMPETENCES

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

- Understand basic concepts of simple antennas
- Categorize and utilize antennas depending on the application
- Design antennas with defined specifications
- Understand basic concepts of RF links
- Categorize and utilize wireless channels
- Design simple RF links and calculate power budget
- Recognize real antenna systems and conduct measurements
**PREREQUISITES**  
- 

**TEACHING METHODS**  
Lectures, exercises, lab measurement exercises and lab reports.

**ASSESSMENT METHODS**  
Grade from lab reports, 25%, final written exams, 75%. Optional homework assignments.

**LANGUAGE OF INSTRUCTION/EXAMS**  
Greek

**RECOMMENDED BIBLIOGRAPHY**

1. Μπαλάνης Κ., Θεωρία Κεραιών, 4η εκδ., Παπασωτηρίου, 2019.
3. Καψάλης Χ., Κωττής Π., Κεραιές ασύρματες ζεύξεις, Εκδοσεις Α. Τζιολα & Υιοι, 2008.

**DIGITAL COMMUNICATIONS**
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
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**INSTRUCTOR**

**COURSE CONTENTS**
The course deals with concepts and techniques that are the basis of communication of all modern (wired and wireless) digital communication systems including fiber optic systems, fifth generation wireless communications and satellite communications. Modern textbooks and teaching techniques are used to transmit the above basic knowledge, as well as a series of well-organized laboratory exercises. The laboratory exercises are accompanied by corresponding laboratory examinations allowing the students to capitalize on the theoretical knowledge and to face practical problems.

- Pulse Analogue Configuration.
- Sampling Theorem.
- Sampling of Bandpass Signals.
- TDM multiplexing.
- Pulse Width, Pulse Positioning. Digital Pulse Configuration.
- Configuration Codes, Memory Configuration Signals.
- Pulse coding.
- ASK, FSK, PSK, QPSK, MSK, DPSK Configuration Systems.
- Trellis Chart.
- Maximum Likelihood Detector.
- Digital Channel Transmission with Additional Gaussian White Noise.
- Inter-Symbolic Noise Interference Phenomenon
LEARNING OUTCOMES / GENERAL COMPETENCES

By successfully passing the course "Digital Communications", students gain proven knowledge and understanding of the following key concepts and topics:

- Analysis, design and optimization of telecommunication systems
- Performance measures of digital communication systems (error rate, possibility of communication interruption, energy and spectral efficiency, etc.)

Upon successful completion of the laboratory exercises, students will be able to:

- Use the material part of the laboratory
- Develop experimental analog-to-digital and digital-to-analog signal conversion systems, as well as integrated digital communication systems.
- Design new digital communication systems
- Solve problems within the lab and consider scenarios

In this way, they acquire and sharpen critical thinking and understanding around problems related to the subject matter of the course, as well as they can support the solution of relevant problems with arguments, formulate judgments that include reflections on related scientific issues, and communicate conclusions with clarity and clarity to specialized and non-specialized audiences. In other words, upon successful examination of the course, the student will have the necessary learning skills that allow them to continue their studies in a highly autonomous or autonomous way.

PREREQUISITES
- 

TEACHING METHODS
- Lectures
- Exercises
- Laboratory Exercises

ASSESSMENT METHODS
Written Final Exam (100%)

LANGUAGE OF INSTRUCTION/EXAMS
Greek
- Recommended Book Resources:


3. Simon Haykin, Ψηφιακά Συστήματα Επικοινωνιών, Α. ΠΑΠΑ-ΣΩΤΗΡΙΟΥ, Έκδοση: 1η Έκδ./2014

- Recommended Article/Paper Resources:

IEEE Transactions on Communications
IEEE Transactions on Wireless Communications
IEEE Survey and Tutorials on Communications
IEEE Wireless Communications Letters
IEEE Communications Letters

**ELECTROMAGNETIC COMPATIBILITY**
<table>
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**COURSE WEBSITE (URL)**

**TEACHING WEEKLY HOURS**

4

**INSTRUCTOR**

Kollatou T.

**COURSE CONTENTS**

LEARNING OUTCOMES / GENERAL COMPETENCES

1) Familiarity with the basic concepts and definitions of electromagnetic compatibility, linking to fundamental knowledge of electromagnetism.
2) Understand the mechanisms of development and suppression of interference, the non-linear operation of the main circuit components, and the mechanisms of cross talk.
3) In-depth understanding of shielding systems and grounding through realistic examples.
4) Understand the methodologies for measuring basic quantities and indicators of electromagnetic compatibility.
5) Learning measurement techniques and familiarity with the operation of the sound chamber.
6) Defining the concepts of electromagnetic compatibility through a series of selected works including the theoretical analysis of the electromagnetic phenomena involved, the design and construction of a prototype, the simulation and parametric analysis of its main features, and the evaluation of its functionality through series and comparisons.

PREREQUISITES

- 

TEACHING METHODS

Lectures

ASSESSMENT METHODS

Exams (60%), assignments (40%)

LANGUAGE OF INSTRUCTION/EXAMS

Greek

RECOMMENDED BIBLIOGRAPHY

2. Χ. Καψάλης ανδ Π. Τρακάδας, Ηλεκτρομαγνητική Συμβατότητα (EMC), Εκδόσεις Τζιόλα & Υιοι Α.Ε., Θεσσαλονίκη, 2010.

QUEUING THEORY
<table>
<thead>
<tr>
<th><strong>Course Unit Code</strong></th>
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<tr>
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<tr>
<td><strong>Instructor</strong></td>
<td>An Introduction to Queues and Queueing Theory. Study and Evaluation Techniques for Queueing Systems, Telecommunication and Computational Model Systems. Little’s Law. Basic Queueing Theory - I (Analysis of M/M/-/- Type Queues), Basic Queueing Theory - II (Departures, Method of Stages, Batch Arrivals), Birth-Death Processes. Analysis of the simple M/M/1 and M/G/1 Queue. M/M/1/N Queues and Multi-Server Systems : M/M/m, M/M/m/K, M/M/m/m (Erlang – B). Applications and Simulation to Packet Scheduling in High-Speed Networks and Modern Wireless Networks.</td>
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</tbody>
</table>
Upon completion of this course, on knowledge level, students will:
- Gain knowledge and broad understanding of topics in the areas of queuing systems, stochastic processes, as well as simple and advanced queuing system models.
- Be able to identify and describe problems that can be solved using queuing systems, as well as interpret and solve real-world problems using modelling approaches based on their knowledge of queuing systems.

Upon completion of this course, on skills level, students will:
- Be able to comprehend, explain, and infer in terms of the entities and variables of simple and complicated problems that originate from various scientific areas using queuing models such as M/M/1, M/M/m, M/M/∞, M/M/1/m, M/M/m/m, M/M/1/K, M/G/1, and G/M/1.
- Be able to autonomously solve simple and complicated stochastic-class problems and interpret the related elements that will enable the generalization of the conclusions during the problem-solving in order to publish and disseminate information, ideas, and conclusions to an inexpert audience.

Upon the completion of this course, on competencies level, students will:
- Be able to manage complicated techniques, effective methodologies, solution strategies, and professional activities by assuming responsibility for the decision-making by using queuing system modelling in unpredictable, heterogeneous, and competitive work environments by assuming responsibility for the management of professional development of persons and teams without risks and costly capital expenditures. To this end, the knowledge gained through this course will equip students with the skills and techniques to generate useful remarks and conclusions using simulations prior to real-world implementation.
- Leverage their knowledge, comprehension, and problem-solving skills in various applications towards addressing problems in new and unknown environments, that are regulated by interdisciplinary and heterogeneous frameworks, towards exploiting the results that originate from applying queuing systems theory on research societal, and collaboration levels.

**PREREQUISITES**
- 

**TEACHING METHODS**
- Face-to-face
- Distance-learning capability

**ASSESSMENT METHODS**
- Final written examination (70%), Greek
- Laboratory exercises (30%)
<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION/EXAMS</th>
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<td>- Recommended Book Resources:</td>
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<td>- Recommended Article/Paper Resources:</td>
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**Mobile and Satellite Communications**
### COURSE UNIT CODE
E48

### COURSE UNIT TYPE
Specialization

### LEVEL OF STUDY
Undergraduate

### YEAR OF STUDIES
4th

### SEMESTER
7th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://eclass.uowm.gr/courses/ICTE328/

### TEACHING WEEKLY HOURS
4

### INSTRUCTOR

### COURSE CONTENTS
- Introduction to mobile and satellite communications.
- Wireless propagation channel (pathloss, multipath fading).
- Transmission and reception diversity, MIMO, CoMP.
- Transmissions schemes (OFDM, SC-FDMA).
- Relaying
- Satellite channels
- Multi-beam access in satellite systems

### LEARNING OUTCOMES / GENERAL COMPETENCES
- The student understands the basic mechanisms of propagation in mobile and satellite communications and becomes familiar with the deterministic and contemplative models that describe them.
- Familiarize yourself with the basic performance measures (expected value of signal to noise ratio (SNR) and signal to interference plus noise ratio (SINR), bit error rate (BER), symbol error rate (SER), outage probability and capacity) as well and with their theoretical calculation in intermittent channels.
- Be familiar with modern interrupt control techniques and system performance enhancement techniques (such as adaptive modulation coding, multiple-input multiple-output transmission techniques, and transponders).
- Familiarize yourself with the main components of satellite

### PREREQUISITES
-
TEACHING METHODS
- Face to Face
- Teleconference tools, Moodle website
- Videos
- GNURadio/Matlab/Octave

ASSESSMENT METHODS
Final exams

LANGUAGE OF INSTRUCTION/EXAMS
Greek

RECOMMENDED BIBLIOGRAPHY
- Recommended Book Resources:
1. T. Rapaport, “Ασύρματες επικοινωνίες,” εκδόσεις Χ. ΓΚΙΟΥΡΔΑ & ΣΙΑ ΕΕ
2. W. Stalling, B. Cory, “ΑΣΥΡΜΑΤΕΣ ΕΠΙΚΟΙΝΩΝΙΕΣ ΚΑΙ ΔΙΚΤΥΑ”, εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

- Recommended Article/Paper Resources:
IEEE Transactions on Communications
IEEE Transactions on Wireless Communications
IEEE Survey and Tutorials on Communications
IEEE Wireless Communications Letters
IEEE Communications Letters

INFORMATION AND CODING THEORY
<table>
<thead>
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<td>COURSE WEBSITE (URL)</td>
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<tr>
<td>INSTRUCTOR</td>
<td>K. Hatzisavvas</td>
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</table>
COURSE CONTENTS

- Coding; basic principles and applications
- Prefix free codes
- Information and entropy.
- Communication channel-capacity of communication channel. Shannon’s first theorem.
- Information transmission. Mutual information.
- Data compression. Data compression algorithms.
- Numerical coding. Lexicographic coding.
- Noisy communication channel. Hamming distance. Error detection-error correction codes.
- Noisy channel coding theorem. Shannon’s second theorem.
- Linear codes (Hamming, Bauer, Golay, MDS)
- Non-linear codes (Reed-Muller)
- Cyclic codes.
- Cryptography; basic principles and applications
- Popular encryption schemes
- Public key cryptography
- RSA encryption
- Quantum cryptography
The aim of the course is to introduce information theory, which is the basis for the scientific field of electrical engineering with a wide range of applications, such as coding and cryptography. After the successful completion of the course the learning outcomes are, in summary, the following:

A. Knowledge
- Have proven knowledge and understanding of key concepts and topics such as information, information entropy, communication systems and Shannon theorems. Also, comprehend basic coding methodologies, data compression and error correction codes. Finally, basic concepts and forms of cryptography, public key cryptography and RSA encryption.
- Able to understand basic concepts in cutting-edge applications of information theory, such as quantum cryptography
- Able to identify and describe simple and complex coding and encryption problems solved using information theory.
- Understand basic mathematical tools of information-coding theory, such as probability distributions-entropy, elements of number theory, elements of groups, finite fields, and vector spaces.

B. Skills and capabilities
- Able to understand and explain key entities such as information, information entropy, capacity of a communication channel, size and rate of transmission of a code, number of errors that can be detected and/or corrected.
- Able to interpret relevant elements that will allow them to generalize their conclusions when solving problems and to publish their results to a non-specialist audience.
- They can manage simple and complex techniques-methodologies related to problem solving using information theory. These techniques include probability theory, advanced algebra, and number theory. They are able to simulate and solve simple and complex problems of information theory, coding and encryption, using software packages (with emphasis on open-source software packages, e.g., R and Python).
- Able to use the knowledge gained in the course to negotiate issues and problems in new, unfamiliar environments characterized by interdisciplinarity, as well as to recognize solutions and applications in various fields.
<table>
<thead>
<tr>
<th><strong>PREREQUISITES</strong></th>
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</thead>
</table>
| **TEACHING METHODS** | Face-to-face  
(Distant learning is supported, if necessary) |
| **ASSESSMENT METHODS** | • Four sets of exercises during the semester  
• Written examination at the end of the semester (multiple choice questions, short development questions, problem solving questions) |
| **LANGUAGE OF INSTRUCTION/EXAMS** | Greek (English) |
**COURSE UNIT CODE**  
ETH3

**COURSE UNIT TYPE**  
Specialization

**LEVEL OF STUDY**  
Undergraduate

**YEAR OF STUDIES**  
4th

**SEMESTER**  
7th

**ECTS CREDITS**  
5

**COURSE WEBSITE (URL)**  
https://eclass.uowm.gr/courses/HMMY105/

**TEACHING WEEKLY HOURS**  
4

**INSTRUCTOR**  
Michalas A.

**COURSE CONTENTS**  
The course outline covers the following topics:

- Basic development tools on the World Wide Web
- The asynchronous client-server model
- Application architectures (client-server, n-tier), middleware architectures
- Markup languages (HTML, CSS) and programming languages (JavaScript / PHP / Java) for the development of web applications
- Database connectivity using XML, DTD and DOM APIs
- Asynchronous server-client communication via AJAX and JSON and web services
- Packages for the development of integrated Internet applications (Java / Spring Boot, PHP / Laravel, Java / Heroku, PHP / Symfony),
- Versioning Control Systems - use of git.
**LEARNING OUTCOMES / GENERAL COMPETENCES**

On successful completion of this module the student will be able to:

- Have good knowledge of Internet protocols (HTTP (S) / TCP / IP)
- Be familiar with the three-tier application development model and how it applies to web-based applications.
- Understand how Internet applications are being executed.
- Know how to implement web servers, their structural elements and their functionality.
- Build dynamic web applications utilizing existing technologies and languages.
- Use application programming interfaces (APIs) to communicate network system applications.
- Be able to continuously educate himself on the latest internet technologies

**PREREQUISITES**

- 

**TEACHING METHODS**

- Theoretical treatment in class, aided by active discussion and participation of students.
- Teaching material is presented by Power-Point presentations.
- Laboratory exercises are provided for understanding the course material.
- Provisioning of Online learning resources

**ASSESSMENT METHODS**

Final examination weighted at 50%, examination of laboratory exercises weighted at 20% and examination of the course assignment weighted at 30%.

1. The final exam includes:
   - Multiple choice questions.
   - Problem solving by applying the acquired knowledge.
   - Comparative evaluation of theoretical issues.

2. The examination of the laboratory exercises includes the evaluation of the laboratory skills acquired using laboratory equipment and software platforms.

3. The examination of the course assignment includes the evaluation of a web application implemented by the student.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
- Recommended Book Resources:

1. "Τεχνολογίες κ Προγραμματισμός στον Παγκόσμιο Ιστό" Δουληγέρης, Μαυροπόδη, Κοπανάκη, Καραλής Εκδόσεις Νέων Τεχνολογιών, Μάιος 2017.


**Basic Principles of The Internet Of Things**
<table>
<thead>
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<tbody>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Sarigiannidis P.</td>
</tr>
</tbody>
</table>
LEARNING OUTCOMES / GENERAL COMPETENCES

• Upon completion of this course, on knowledge level, students will:
  • Gain knowledge and broad understanding of topics in the areas of Internet of Things and Wireless Sensor Networks.
  • Be able to identify and develop solutions for real-world problems by leveraging Internet of Things applications.

• Upon completion of this course, on skills level, students will:
  • Be able to comprehend architectures, standards, components, applications, and tools of the Internet of Things. Furthermore, they will be able to understand and interpret the role of Internet of Things in information and communication technologies, and gain skills relevant to the integration of data and infrastructure security mechanisms.
  • Be able to autonomously solve simple and complicated problems of designing and implementing intelligent applications and environments in the Internet of Things, as well as interpret the related elements that will enable the generalization of the conclusions during the problem-solving in order to publish and disseminate information, ideas, and conclusions to an inexpert audience.

• Upon the completion of this course, on competencies level, students will:
  • Be able to manage complicated techniques, effective methodologies, solution strategies, and professional activities by assuming responsibility for the decision-making through the inference of Internet of Things data.
  • Leverage their knowledge, comprehension, and problem-solving skills in various applications towards addressing problems in new and unknown environments, that are regulated by interdisciplinary and heterogeneous frameworks, towards exploiting the results that originate from solving problems in Internet of Things environments, on research, societal, and collaboration levels.

PREREQUISITES

- 

TEACHING METHODS

• Face-to-face
• Distance-learning capability

ASSESSMENT METHODS

• Final written examination (90%), English
• Laboratory exercises (10%)
• Oral examination (±20%)
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<tr>
<td><strong>- Recommended Book Resources:</strong></td>
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<td>3. New York, 1975</td>
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<tr>
<td><strong>- Recommended Article/Paper Resources:</strong></td>
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8TH SEMESTER – DIVISION OF TELECOMMUNICATIONS & NETWORKS
MOBILE COMMUNICATION NETWORKS
**COURSE UNIT CODE**  
Y5

**COURSE UNIT TYPE**  
Specialization

**LEVEL OF STUDY**  
Undergraduate

**YEAR OF STUDIES**  
4th

**SEMESTER**  
8th

**ECTS CREDITS**  
5

**COURSE WEBSITE (URL)**  
https://eclass.uowm.gr/courses/ICTE202/

**TEACHING WEEKLY HOURS**  
4

**INSTRUCTOR**  
Louta M.

**COURSE CONTENTS**  

**LEARNING OUTCOMES / GENERAL COMPETENCES**  
The course objective is the comprehension and learning of the various mobile communication networking technologies. In this context, a wide range of issues are addressed, aiming to cover mobile communication networks and techniques for network design, development, management and evaluation.

**PREREQUISITES**  
-

**TEACHING METHODS**  
The course is taught via lectures, while students actively participate. The lectures are supported with presentations in power point, which are available to the students via the asynchronous tele-education platform. Exercises are solved.

**ASSESSMENT METHODS**  
Course assessment is conducted by written exams taking place at the middle and the end of the semester, including questions (both open and multiple choice) as well as exercises that cover the course content (30% and 70%, respectively).

**LANGUAGE OF INSTRUCTION/EXAMS**  
Greek
<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
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</thead>
</table>

**OPTICAL COMMUNICATIONS AND NETWORKS**
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<tbody>
<tr>
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<td><strong>COURSE WEBSITE</strong></td>
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<td><strong>INSTRUCTOR</strong></td>
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<tr>
<td><strong>COURSE CONTENTS</strong></td>
<td>Waveguiding in Optical Fibers, Optical Fibers, Attenuation, Dispersion, Non-Linear Effects, Generation and Reception of Optical Signals, Optical Transmitter and Receiver, Optical Amplifiers, WDM Optical Networks, Optical Switching and Routing in Access and Core Networks, Optical Burst Switching, Contemporary Optical Networks, Broadband Optical Networks, Passive Optical Networks, Hybrid Optical Wireless Optical Networks.</td>
</tr>
</tbody>
</table>
Upon completion of this course, on knowledge level, students will:

• Gain knowledge and broad understanding of topics in the areas of optical communication systems and technologies, as well as the characteristics of optical transmission and optical fibers.
• Be able to identify and solve real-world problems by using optical communication systems and technologies.

Upon completion of this course, on skills level, students will:

• Be able to comprehend, explain, and analyze various optical transmission phenomena, such as attenuation and dispersion, as well as the operating principles of optical devices (transmitter, receiver, amplifier), burst optical switching, and passive optical networking.
• Be able to autonomously solve simple and complicated problems in terms of designing and implementing optical communication systems. Additionally, students will be able to interpret the related elements that will enable the generalization of the conclusions during the problem-solving in order to publish and disseminate information, ideas, and conclusions to an inexpert audience.

Upon the completion of this course, on competencies level, students will:

• Be able to manage complicated techniques, effective methodologies, solution strategies, and professional activities by assuming responsibility for the decision-making related to the design and implementation of modern solutions by exploiting optical communication systems and technologies.
• Leverage their knowledge, comprehension, and problem-solving skills in various applications towards addressing problems in new and unknown environments, that are regulated by interdisciplinary and heterogeneous frameworks, towards exploiting the results that originate from solving problems through the use of optical communication technologies on research, societal, and collaboration levels.

**PREREQUISITES**

- 

**TEACHING METHODS**

• Face-to-face
• Distance-learning capability

**ASSESSMENT METHODS**

• Final written examination (60%), Greek
• Laboratory exercises (30%)
• Presentation of semester assignment (10%)

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
<th>- Recommended Book Resources:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. G. I. Papadimitriou, et al., &quot;WDM Optical Networks: Local and Metropolitan Networks&quot;, Kleidaritimos</td>
<td></td>
</tr>
<tr>
<td>5. B. Mukherjee, &quot;Optical WDM Networks&quot;, Springer, 2006</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Recommended Article/Paper Resources:</th>
</tr>
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**Computer and Network Security**
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<th><strong>COURSE UNIT CODE</strong></th>
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<td><strong>COURSE WEBSITE (URL)</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE198/">https://eclass.uowm.gr/courses/ICTE198/</a></td>
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<tr>
<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Sarigiannidis P.</td>
</tr>
</tbody>
</table>
Upon completion of this course, on knowledge level, students will:

• Gain knowledge and broad understanding of topics in the areas of computer and network security and protection of privacy.
• Be able to identify and describe the challenges of security and protection of data, systems, communication networks, databases, and infrastructures. Interpret and solve issues regarding secrecy, digital signature, and information integrity by using the knowledge and tools gained in this course. Moreover, students will be able to identify the needs and requirements in terms of selecting and applying cryptographic schemes in simple and complicated problems by leveraging the knowledge of cryptography, number theory, as well as the extension of cryptography to communication networks.

Upon completion of this course, on skills level, students will:

• Be able to comprehend, explain, and infer in terms of the needs, the requirements, and the complexity of public and private key cryptographic schemes. Also, students will be able to identify the principles, concepts, and applications of authentication mechanisms. digital signatures, and cryptographic hash functions such as Hash and MAC.
• Be able to autonomously solve simple and complicated problems of security systems and communication networks using various monitoring and firewall software, intrusion detection systems, and proxy services. Additionally, students will be able to interpret the related elements that will enable the generalization of the conclusions during the problem-solving in order to publish and disseminate information, ideas, and conclusions to an inexpert audience.

Upon the completion of this course, on competencies level, students will:

• Be able to manage complicated techniques, effective methodologies, solution strategies, and professional activities by assuming responsibility for the decision-making in both small and large projects related to providing security and privacy services in public and private organizations. Furthermore, students will be equipped with the appropriate skills for assessing and estimating the required actions for the design and development in unpredictable, heterogeneous, and competitive work environments by assuming responsibility for the management of professional development of persons and teams that takes into account relevant regulations, such as the GDPR for the protection of private data.
• Leverage their knowledge, comprehension, and problem-solving skills in various applications towards addressing problems in new and unknown environments, that are regulated by interdisciplinary and heterogeneous frameworks, towards
### PREREQUISITES

- 

### TEACHING METHODS

- Face-to-face
- Distance-learning capability

### ASSESSMENT METHODS

- Final written examination (60%), Greek
- Laboratory exercises (30%)
- Presentation of semester assignment (10%)
- Oral examination (±20%)

### LANGUAGE OF INSTRUCTION/EXAMS

Greek

### RECOMMENDED BIBLIOGRAPHY

- **Recommended Book Resources:**

- **Recommended Article/Paper Resources:**

**Wireless Sensor Networks**
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
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<tbody>
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<td><a href="http://wsnlab.ict.e.uowm.gr/">http://wsnlab.ict.e.uowm.gr/</a></td>
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<td><a href="http://eclass.uowm.gr/courses/ICTE165/">http://eclass.uowm.gr/courses/ICTE165/</a></td>
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<td>TEACHING WEEKLY HOURS</td>
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<tr>
<td>INSTRUCTOR</td>
<td>Aggelidis P.</td>
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</tbody>
</table>
The course covers leading edge topics in Wireless Sensor Networks. The use of distributed wireless sensor networks has surged in popularity in recent years with applications ranging from environmental monitoring and body area networks to people- and object-tracking in both cooperative and hostile environments. The goal of this course is to give an overview of fundamental problems in the area of Wireless Sensor Networks and study the existing solutions for some of these problems. The course is targeted at understanding and obtaining hands-on experience with the state of the art in such wireless sensor networks which are often composed using relatively inexpensive sensor nodes that have low power consumption, low processing power and bandwidth. The course covers a variety of topics ranging from radio communications, network stack (with emphasis in 802.11.x Bluetooth and 802.15.4/Zigbee), systems infrastructure including QoS support and energy management, programming paradigms, distributed algorithms and example applications. Data aggregation, information dissemination, security issues, power management, localization are topics also covered in this course.

**LEARNING OUTCOMES / GENERAL COMPETENCES**

Upon completion students will be able to:

- Understand concepts such as wireless sensor network, sensor nodes, gateways, routing, security
- Use the material part of the laboratory
- Develop experimental sensor networks based on multilevel protocols
- Create relevant algorithmic software
- Implement electronic circuits
- Design applications of precision agriculture, monitoring of quality of life and health parameters and environmental interventions
- Solve problems within the lab and consider scenarios
- Program sensor nodes
- Understand the roles of participants in WSNs

**PREREQUISITES**

- 

**TEACHING METHODS**

Lectures
Labs
Remote

**ASSESSMENT METHODS**

30% test (multiple choice, short answer questions)
70% project

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek-English

**RECOMMENDED BIBLIOGRAPHY**

2. *Τεχνολογία Μετρήσεων - Αισθητήρια*, Γαστεράτος, Μουρούτσος, Ανδρεάδης

**BIOMEDICAL TECHNOLOGY**
<table>
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<td><strong>SEMESTER</strong></td>
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<td><a href="http://eclass.uowm.gr/courses/ICTE149/">http://eclass.uowm.gr/courses/ICTE149/</a></td>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
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<tr>
<td><strong>INSTRUCTOR</strong></td>
<td>Aggelidis P.</td>
</tr>
</tbody>
</table>
COURSE CONTENTS


LEARNING OUTCOMES / GENERAL COMPETENCIES

The aim of the course is the introduction to the evolving research field of biomedical technology, in which the application of the principles of science and technology is to provide services and solutions to problems and address challenges in the critical social field of Health. Due to the interdisciplinary nature of the course, students come into contact with different scientific fields, such as the production of biomarkers, their analysis and the use of appropriate instruments for their study and analysis.

PREREQUISITES

-

TEACHING METHODS

Lectures
Labs
Remote
ASSESSMENT METHODS
40% final exam
40% lab test.
20% homework.

LANGUAGE OF INSTRUCTION/EXAMS
Greek

RECOMMENDED BIBLIOGRAPHY
- Recommended Book Resources:
<table>
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<td><strong>COURSE WEBSITE (URL)</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ECE392/">https://eclass.uowm.gr/courses/ECE392/</a></td>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>INSTRUCTOR</strong></td>
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</tbody>
</table>
• Geometrical optics – Approximation of geometrical optics, geometrical optics laws, ray tracing, Huygens principle, Fermat principle and optical length
• Gaussian optics - Ray tracing, optical system and transition matrix, mirror formation, basics of optical system, lenses, applications.
• Apertures – Entrance apertures and optical system irises, field apertures and optical system windows, optical field, focal and field depth.
• Aberration elements – Aberration types, aberration of wavefront ray aberration, monochromatic aberrations: spherical, coma, astigmatism, curvature of the field of the image, distortion, chromatic aberration
• Light interference – Interference of two waves, conditions of existence and coherence, fringes, interference of point sources, young experiment and fundamental interference structures
• Interferometry – Operation principle of interferometers, Michelson interferometer, Mach-Zehnder and Fabry-Perot interferometers, resolution and free spectral range
• Fourier optics - The propagation of a light disturbance in the spatial frequency domain. Angular spectrum. The propagation as a frequency filter. Transmittance function. Elementary optical processes.
• Holography – Hologram construction, reconstruction, hologram types and applications
The course includes an introduction to the concepts of classical optics and its applications. The context of the course targets to the introduction of the basic parameters of optics and the knowledge of characteristic properties along with an association with the other domains of electrical engineering. Moreover, the course offers an update on the applications of optics and optic devices along with their functionality and the relevant applications. Finally, this course offers to the students the opportunity to get prepared for the forthcoming courses of photonic technology and optical communications. Additionally, it offers the capability of development of a rational analytical and structural way of thinking.

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

- Understand the basic concepts of transmission of optical waves,
- Recognize optical structures and analyze their functionality,
- Familiarize with design methodologies for complex structures,
- Aware of a broad spectrum of practical classical and modern applications of optics.

**PREREQUISITES**

KNOWLEDGE OF THE COURSE:

“ELECTROMAGNETIC WAVES”

**TEACHING METHODS**

- Face to face
- Possibility of remote education
**ASSESSMENT METHODS**

The final degree is calculated from a final written examination. There is a need of a degree of 5 out of 10, or greater for considering the examination as successful. Moreover, the possibility of optional semester exercises that can offer an additive degree, in the case that the degree of the written examination exceeds 5, can be given.

Students’ evaluation means:
- Written examination through short-answer questions (Formative, conclusive)
- Written examination through open-ended questions (Formative, conclusive)
- Written work (Formative, conclusive)
- Written examination via problem solving (Formative, conclusive)

The utilization of multiple literature sources is realized whereas the students are being monitored while executing the optional exercises.

The final evaluation is being announced through the electronic course platform, where all the students that have are officially listed to the course have access. Moreover, after the evaluation announcement, timeslots for discussion regarding the examination are set, so that the students see their exam answers and any possible mistakes.

The outline of the course, the course targets and the valuation criteria are announced both orally during the lectures and through the course website (e-class).

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
# Recommended Bibliography

- **Recommended Book Resources:**
  1. Hecht Eugene, Οπτική, Γ. ΔΑΡΔΑΝΟΣ - Κ. ΔΑΡΔΑΝΟΣ Ο.Ε., 1η Έκδοση/2018 (επιστ. επιμ. Βές Σωτήρης).
  2. Γιώργος Ασημέλλης, Γιάννης Βαμβακάς, Πάνος Δρακόπουλος, Γεωμετρική Οπτική, Έκδοση 1η/2012.

- **Recommended Article/Paper Resources:**
  - Journal of Optical Technology – OSA
  - Applied Optics – OSA
  - Journal of Optics – IOPscience
  - Optics – MDPI
  - IEEE Photonics Journal
  - IEEE Photonics Technology Letters

# Teletraffic Theory
<table>
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<td>TEACHING WEEKLY HOURS</td>
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<td>INSTRUCTOR</td>
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<tr>
<td>COURSE CONTENTS</td>
<td>Introduction to communication systems’ analysis as the tool to assess the performance and define the dimension of a communication network. Analytical methods for the determination of critical network performance metrics (blocking probability, capacity utilization, etc.) that define the quality of the communication in a communication network. These methods include the Markovian and Birth-Death processes, the Erlang and Engset models, the Kaufman-Roberts recursion, the equivalent random theory, the alternative routing modeling, and the reduced load approximation. Simulation techniques for assessing the performance of</td>
</tr>
</tbody>
</table>
## LEARNING OUTCOMES / GENERAL COMPETENCES

Comprehension of the following main theory parts:
- Analysis of communication networks
- Methodology for assessing the performance and defining the dimensions of communication networks
- Application of statistical methods, probability theory, and stochastic processes on communication network performance problems
- Analytical methods for the determination of communication-networks’ performance metrics
- Knowledge on the derivation of analytical methodologies for the assessment of the performance of communication networks
- Knowledge on simulation methods for the analysis of communication networks

Competences:
- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Decision-making
- Individual/Independent work

## PREREQUISITES
- 

## TEACHING METHODS
- Live lectures

## ASSESSMENT METHODS
- Assignments (30%)
- Final exams (70%)

## LANGUAGE OF INSTRUCTION/EXAMS
- Greek

## RECOMMENDED BIBLIOGRAPHY
2. Related papers from journals/conference proceedings

## CLOUD COMPUTING
<table>
<thead>
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<tr>
<td>INSTRUCTOR</td>
<td>Michalas A.</td>
</tr>
</tbody>
</table>
| COURSE CONTENTS  | The course outline covers the following topics:  
|                  | • Distributed systems management,  
|                  | • Performance measurement in shared distributed systems and Cloud Computing, Service-oriented implementations of applications and infrastructures,  
|                  | • Quality of service on distributed systems and cloud computing, workflow and monitoring of distributed applications,  
|                  | • Forecasting techniques, execution study and modeling of service-oriented applications and distributed infrastructures,  
|                  | • Assigning resources to applications on distributed systems,  
|                  | • Use, data management and comparison / selection of multiple clouds,  
|                  | • Intermediate systems. |
The course aims to understand the basic concepts and principles that govern Cloud Computing, so as to enable the solution of technological problems as well as the performance analysis, management, optimization and design of modern distributed systems. Upon completion of the course the student acquires knowledge and understanding of the following topics:

- distributed systems management
- cloud computing technologies and models
- cloud computing features
- performance measurement on shared distributed systems and cloud computing
- service-oriented implementations of applications and infrastructures
- workflow and monitoring in distributed applications
- cloud computing system load forecasting techniques
- intermediate systems

**LEARNING OUTCOMES / GENERAL COMPETENCES**

**PREREQUISITES**

- 

**TEACHING METHODS**

- Theoretical treatment in class, aided by active discussion and participation of students.
- Teaching material is presented by Power-Point presentations.
- Laboratory exercises are provided for understanding the course material.
- Provisioning of Online learning resources

**ASSESSMENT METHODS**

Final examination weighted at 50%, examination of laboratory exercises weighted at 20% and examination of the course assignment weighted at 30%.

1. The final exam includes:
   - Multiple choice questions.
   - Problem solving by applying the acquired knowledge.
   - Comparative evaluation of theoretical issues.
2. The examination of the laboratory exercises includes the evaluation of the laboratory skills acquired using laboratory equipment and software platforms.
3. The examination of the course assignment includes the evaluation of a cloud-based application implemented by the student.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
- Recommended Book Resources:


- Recommended Article/Paper Resources:

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<td><strong>TEACHING WEEKLY HOURS</strong></td>
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</table>

**INSTRUCTOR**

**COURSE CONTENTS**

Extra contents:
- Educational laboratory kit of a full optical communication system (laser source, modulator, optical fiber, receiver/demodulator photodiode), to be demonstrated to students.
- Introduction to scientific programming and use of specialized software for analysis and design of photonic and optical devices.
<table>
<thead>
<tr>
<th>LEARNING OUTCOMES / GENERAL COMPETENCES</th>
<th>This course is an introduction to photonics while also covering fundamental optical principles. After successful completion of the course, the students will...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Comprehend the principles of waveguiding in optical structures</td>
<td></td>
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<tr>
<td>• Break-down complex photonic/optical structures into the constituting components</td>
<td></td>
</tr>
<tr>
<td>• Design and implement simple photonic components for telecom/datacom applications</td>
<td></td>
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<tr>
<td>• Familiarize with methodologies for the design of advanced devices</td>
<td></td>
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<tr>
<td>• Acquaintance with technologies for the fabrication of photonic/optical devices and associated challenges.</td>
<td></td>
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<tr>
<td>• Identify photonic components and understand their role in optical communication systems.</td>
<td></td>
</tr>
<tr>
<td>• Be able to explain to non-experts the relation of these technologies with society, economy, and human welfare, and identify opportunities and threats.</td>
<td></td>
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| PREREQUISITES | None. However, knowledge from course “Electromagnetic waves” (5th semester) is essential. |

<table>
<thead>
<tr>
<th>TEACHING METHODS</th>
<th>Face-to-face (theory and exercises)</th>
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<tbody>
<tr>
<td></td>
<td>Remote teaching when needed</td>
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</tbody>
</table>

| ASSESSMENT METHODS | • Final score from written exams: Basic understanding and judgement (theory), solution of simple exercises/problems (analysis or design). Students can pick from a set of questions due to the large corpus. |
|                   | • Homework projects to improve final grade, only if combined score of exams & lab is greater than 5. Projects are only undertaken during the teaching semester (spring). |

| LANGUAGE OF INSTRUCTION/EXAMS | Greek |
- **Recommended Book Resources:**
  1. Οπτοηλεκτρονική, Αλεξανδρής Α.
  2. Εφαρμοσμένη Οπτική, 3η Έκδοση, Ζευγώλης Δ.
  3. ΟΠΤΙΚΗ ΚΑΙ ΛΕΙΖΕΡ, M. Young
  4. Οπτοηλεκτρονική, Νέα Βελτιωμένη, Singh Jasprit
  5. Συστήματα Επικοινωνιών με Οπτικές Ίνες, Agrawal G. P.

- **Recommended Article/Paper Resources:**

   Online content (URL) provided from course website.

**BIG DATA AND COGNITIVE INTERNET OF THINGS APPLICATIONS**
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
<th>ETH11</th>
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<tbody>
<tr>
<td>COURSE UNIT TYPE</td>
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<td>SEMESTER</td>
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<tr>
<td>INSTRUCTORS</td>
<td>Sarigiannidis P.</td>
</tr>
</tbody>
</table>
LEARNING OUTCOMES / GENERAL COMPETENCES

- Upon completion of this course, on knowledge level, students will:
  - Gain knowledge and broad understanding of topics in the areas of Big Data and cognitive applications, as well as their integration in the Internet of Things.
  - Be able to identify and develop solutions for real-world problems by using Machine Learning-based cognitive applications that leverage Big Data.
- Upon completion of this course, on skills level, students will:
  - Be able to comprehend architectures and distributed computing systems in Internet of Things environments. Furthermore, students will gain the required skills for designing and implementing Big Data scenarios in Internet of Things environments and integrate security mechanisms for data and infrastructure.
  - Be able to autonomously solve simple and complicated problems of designing and implementing cognitive Big Data applications by using modelling and energy evaluation techniques. Moreover, students will be able to interpret the related elements that will enable the generalization of the conclusions during the problem-solving in order to publish and disseminate information, ideas, and conclusions to an inexpert audience.
- Upon the completion of this course, on competencies level, students will:
  - Be able to manage complicated techniques, effective methodologies, solution strategies, and professional activities by assuming responsibility for the decision-making through the leverage of Big Data and cognitive applications.
  - Leverage their knowledge, comprehension, and problem-solving skills in various applications towards addressing problems in new and unknown environments, that are regulated by interdisciplinary and heterogeneous frameworks, towards exploiting the results that originate from solving problems in Big Data environments, on research, societal, and collaboration levels.

PREREQUISITES

- 

TEACHING METHODS

- Face-to-face
- Distance-learning capability
<table>
<thead>
<tr>
<th>ASSESSMENT METHODS</th>
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<tbody>
<tr>
<td>Final written examination (90%), English</td>
<td></td>
</tr>
<tr>
<td>Laboratory exercises (10%)</td>
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<td>Oral examination (±20%)</td>
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</table>

| LANGUAGE OF INSTRUCTION/EXAMS | Greek |

<table>
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<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
<th>- Recommended Book Resources:</th>
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9TH SEMESTER – DIVISION OF TELECOMMUNICATIONS & NETWORKS
MICROWAVE COMMUNICATIONS
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<td><strong>INSTRUCTORS</strong></td>
<td>S. Amanatiadis</td>
</tr>
</tbody>
</table>
Fundamentals on transmission lines
- Electromagnetic analysis – Electromagnetic equations and their solutions for transmission lines.
- Circuit analysis – Circuit models of transmission lines and their analysis.
- Transmission line characteristics – Basic transmission line properties, as propagation constant, characteristic impedance, phase velocity and group velocity.
- Propagating modes – Characterization of propagating modes in transmission lines (TEM, quasi TEM, TE, TM, hybrid).
- Transmission line examples – Co-axial cable, waveguides, planar transmission lines.

Transmission line analysis
- Properties of transmission lines – Input impedance, reflection coefficient and SWR.
- Impedance matching – The concept of matching in microwave transmission lines and matching elements like splitters.
- Smith chart – Fundamentals on Smith chart and its utilization for the calculation of reflection coefficient, the input impedance and the SWR. Utilization of the Smith chart for the design of microwave circuits.

Fundamentals on waveguides
- Waveguide types – Rectangular, cylindrical, dielectric and plasmonic.
- Rectangular and cylindrical waveguides – Propagation modes, Cut-off frequency, propagation constant, dispersion diagram, characteristic impedance, phase velocity, group velocity, finite conductivity losses. Dielectric waveguides.

Planar transmission lines
- Integrated microwave circuits – Planar transmission line circuits and their advantages in microwave frequencies.
- Strip line – Supported modes and characteristic impedance, dispersion diagram and losses. The concept of effective width.
- Microstrip transmission line – Supported modes and characteristic impedance, dispersion diagram and losses. The concepts of effective dielectric constant and parasitic radiation.
- Other planar transmission lines – Alternative planar transmission lines such as slot lines and co-planar waveguides.

Transmission line parameters
- Transmission line parameters – Parameters for the description of microwave circuits, scattering parameters, ABCD parameters and their relationship.
LEARNING OUTCOMES / GENERAL COMPETENCES

The lesson includes the fundamentals of transmission lines, waveguide structures and microwave circuits. The main targets of this lesson are divided into three categories.

1. The first target is the understanding of the basic characteristic metrics that are utilized for assessing the functionality of transmission lines along with the basic analysis techniques for investigating their performance. In parallel, students will get familiar with the most utilized waveguiding structures, their applications and the fundamental configurations for achieving impedance matching, while they will get familiar with the utilization of the Smith chart.

2. The second target is to offer the capability of analyzing microwave circuits and designing realistic systems based on specific demands and being aligned with the relevant applications. For this purpose, students are getting familiar with the utilization of the Smith chart and the analysis of microwave circuits through PC.

3. Finally, the lesson also targets to the practical familiarization of the students with realistic microwave structures and circuits through laboratory exercises.

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

- Understand the basic concepts of transmission lines, the functionality of waveguiding structures and calculating the associated parameters,
- Categorize and analyze planar transmission lines,
- Utilize the Smith chart for extract the characteristic performance parameters through it,
- Utilize matching techniques depending on the application and calculate the associated parameters,
- Analyze the response of microwave circuits,
- Categorize and utilize microwave components depending on the application,
- Design simple waveguiding structures,
- Recognize and characterize realistic microwave structures.

PREREQUISITES

- 

TEACHING METHODS

- Face to face
- Possibility of remote education
### ASSESSMENT METHODS

The final degree is calculated from the summation of a final written examination (80%) and the laboratory exercise degree (20%), that is derived from the laboratory student reports. There is a need of a degree of 5 out of 10, or greater for considering the examination as successful. Moreover, the possibility of optional semester exercises can be given that can offer an additive degree, in the case that the degree of the written examination exceeds 5.

Students’ evaluation means:
- Written examination through short-answer questions (Formative, conclusive)
- Written examination through open-ended questions (Formative, conclusive)
- Written work (Formative, conclusive)
- Written examination via problem solving (Formative, conclusive)

The utilization of multiple literature sources is realized whereas the students are being monitored while executing the laboratory exercises.

The final evaluation is being announced through the electronic course platform, where all the students that have are officially listed to the course have access. Moreover, after the evaluation announcement, timeslots for discussion regarding the examination are set, so that the students see their exam answers and any possible mistakes.

The outline of the course, the course targets and the valuation criteria are announced both orally during the lectures and through the course website (e-Class).

### LANGUAGE OF INSTRUCTION/EXAMS

Greek
## RECOMMENDED BIBLIOGRAPHY

- **Recommended Book Resources:**
  1. Μικροκύματα, Γιούλτσης Τραϊανός - Κριεζής Εμμανουήλ, Εκδοσεις Α. Τζιολα & Υιοι Α.Ε., 2016, Κωδ. Εύδοξου [59379582]
  4. Ουζούνογλου Νικόλαος Κ., Εισαγωγή στα Μικροκύματα, Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ, 1999, κωδικός Εύδοξου [9624]

- **Recommended Article/Paper Resources:**
  - IEEE Transactions on Microwave Theory and Techniques
  - IEEE Journal of Microwaves
  - IET Microwaves, Antennas & Propagation
  - IEEE Microwave and Wireless Components Letters
  - IEEE Microwave Magazine
  - International Journal of Microwave and Wireless Technologies

### DESIGN AND ANALYSIS OF COMPUTER NETWORKS
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<td><strong>INSTRUCTORS</strong></td>
<td>Lazaridis V.</td>
</tr>
</tbody>
</table>

**COURSE CONTENTS**


**LEARNING OUTCOMES / GENERAL COMPETENCES**

After successful completion of the course, students will be able to:

- comprehend modern techniques, protocols and computer network applications
- search, analyze and substantiate basic issues and demands in order to construct effective computer networks
- adjust their knowledge to new and emerging technologies, such as MPLS networks, cloud computing as well as modern Internet technologies, such as IPv6, IoT etc. based on the comprehension of the respective regulating principles

**PREREQUISITES**

- 

**TEACHING METHODS**

Face to face
Contemporary distance learning available

**ASSESSMENT METHODS**

Assessment method: Multiple-choice tests

**LANGUAGE OF INSTRUCTION / EXAMS**

Greek
RECOMMENDED BIBLIOGRAPHY

1. Andrew S. Tanenbaum, Δίκτυα Υπολογιστών, 4η έκδοση, Εκδόσεις Κλειδάριθμος.
2. William Stallings, Επικοινωνίες Υπολογιστών και Δεδομένων, 6η έκδοση, Εκδόσεις Τζιόλα.
3. Douglas Comer, Διαδίκτυα και Δίκτυα Υπολογιστών, 4η έκδοση, Εκδόσεις Κλειδάριθμος.
4. Douglas Comer, Διαδίκτυα με TCP/IP (Α Τόμος), 4η έκδοση, Εκδόσεις Κλειδάριθμος.
5. Jean Walrand, Δίκτυα Επικοινωνιών, Εκδόσεις Παπασωτηρίου
MANAGEMENT AND OPTIMIZATION OF COMMUNICATION NETWORKS
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<tr>
<td>INSTRUCTORS</td>
<td>Michalas A.</td>
</tr>
</tbody>
</table>

**COURSE CONTENTS**

The aim of the course is twofold: Initially the course focuses on the techniques of management and evaluation of communication networks as well as their applications, through the presentation of methods and models for managing and monitoring the performance of networks. Following, the course covers the theory of telecommunications network optimization, where methods and algorithms are presented, which take into account the limitations of the network, as well as the requirements of the supported
# LEARNING OUTCOMES / GENERAL COMPETENCES

1. acquiring knowledge concerning fault management, performance, security, and telecommunications networking configurations,
2. the acquisition of knowledge on the techniques of management, and evaluation of communication networks,
3. understanding of management methods through the presentation of methods and models of managing and monitoring network performance,
4. the acquisition of knowledge and the evaluation of network monitoring and management protocols
5. the acquisition of knowledge on graph theory and its application in optimization processes,
6. the acquisition of knowledge and evaluation of the process of solving basic problems of telecommunication networks, such as the problem of minimum route, maximum flow, minimum cost, etc,
7. the acquisition of knowledge and evaluation of optimization problem solving methods.
8. the analysis of the problems and the evaluation of the methods of solving non-linear optimization of telecommunication networks.

## PREREQUISITES

Telecommunication Networks and Computer Networks I.

## TEACHING METHODS

- Theoretical treatment in class, aided by active discussion and participation of students.
- Teaching material is presented by Power-Point presentations.
- Laboratory exercises are provided for understanding the course material.

## ASSESSMENT METHODS

Final examination weighted at 30%, examination of laboratory exercises weighted at 30% and examination of the course assignment weighted at 40%.

1. The final exam includes:
   - Multiple choice questions.
   - Problem solving by applying the acquired knowledge.
   - Comparative evaluation of theoretical issues.
2. The examination of the laboratory exercises includes the evaluation of the laboratory skills acquired using laboratory equipment and network simulation tools.
3. The examination of the course assignment includes the evaluation of an extensive written report provided by the student on topics presented by the international scientific literature.
Next Generation Networks and Services

Recommended Book Resources:

Recommended Article/Paper Resources:
4. CCNA: Introduction to Networks
5. CCNA: Routing, Switching and Wireless Essentials
6. CCNA: Enterprise Networking, Security, and Automation
7. «Ανάπτυξη και διαχείριση δικτύων υπολογιστών», Π. Φουληράς, Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα, 2015 (Κωδικός Βιβλίου στον Εύδοξο: 320059)

Language of Instruction/Exams: Greek

Recommended Bibliography:

- Recommended Book Resources:

- Recommended Article/Paper Resources:
  4. CCNA: Introduction to Networks
  5. CCNA: Routing, Switching and Wireless Essentials
  6. CCNA: Enterprise Networking, Security, and Automation
  7. «Ανάπτυξη και διαχείριση δικτύων υπολογιστών», Π. Φουληράς, Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα, 2015 (Κωδικός Βιβλίου στον Εύδοξο: 320059)
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<td>4</td>
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<tr>
<td>INSTRUCTORS</td>
<td>Louta M.</td>
</tr>
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</table>
The course objective is the presentation of the latest developments and the state-of-the-art solutions in the field of next generation networks and services. In this context, a wide range of issues are addressed, aiming to cover technologies, techniques and methods that could be adopted for the design, development, management and evaluation of next generation networks and creation, provisioning and management of services. Research challenges and issues that should be addressed are indicated, while potential solutions are highlighted. The students actively participate, while their research activity is reinforced. During the semester they study and present research papers from related literature and conduct a survey on a selected topic. Upon successful completion of the course, students will acquire the following knowledge, skills and competence:

- to explain, classify, evaluate the technologies and methods used to design, deploy and manage next generation networks and services,
- to highlight, organize, classify, analyze and evaluate challenges and open issues that should be successfully addressed concerning design, deployment and management of next generation networks and services,
- to highlight, organize, classify, organize and evaluate potential solutions concerning design, deployment and management of next generation networks and services.

**PREREQUISITES**
- 

**TEACHING METHODS**

Face to face, supported by e-learning asynchronous & synchronous). The course is taught via lectures, while students actively participate. The lectures are supported with presentations in power point, which are available to the students via the asynchronous tele-education platform. During the semester, students’ study and present papers from related research literature. Additionally, students write and present a survey on a selected topic.
## Assessment Methods

Course assessment is conducted through:

1. written exams taking place at the end of the semester, including questions (both open and multiple choice) (30%)
2. presentation of papers from related research literature (30%)
3. writing and presentation of a survey on a selected topic (40%)

Language of evaluation: Greek

Defined evaluation criteria are announced during the first lecture and are accessible to the students through the asynchronous tele-education platform.

## Language of Instruction/Exams

Greek

## Recommended Bibliography

1. Χ. Βασιλόπουλος, κ.α., Δίκτυα Πρόσβασης Νέας Γενιάς, Εκδόσεις Κλειδάρθμος, 2010.

- Scientific journals

<table>
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<td>S. Amanatiadis</td>
</tr>
<tr>
<td><strong>COURSE CONTENTS</strong></td>
<td>The Mobile Computing course targets to provide knowledge on mobile computing aspects, such as: a) protocols related to mobile networks (communication, clustering routing), b) methods for management and storing data in mobile networks, c) mobile phone operating systems, d) services related to mobile computing (e.g., location services, IoT), e) design methods for mobile computing apps, f) programming mobile devices, g) design and implementation of mobile apps using the Android platform.</td>
</tr>
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</table>
| **LEARNING OUTCOMES / GENERAL COMPETENCES** | • Principles of mobile computing  
• Knowledge on communication protocols, clustering methods, and routing in mobile networks  
• Knowledge on data management methods for mobile computing  
• Knowledge on mobile computing services  
• Knowledge on operating systems and platforms of cellular phones  
• Principles of mobile cloud computing and mobile edge computing  
• Knowledge on app design principles using the Android platform |
| **PREREQUISITES**    | - |
| **TEACHING METHODS** | Lectures, Labs, Projects |
| **ASSESSMENT METHODS** | Assignments (30%)  
Final exams (70%) |
REMOTE SENSING
<table>
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<td><strong>SEMESTER</strong></td>
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<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
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<tr>
<td><strong>INSTRUCTORS</strong></td>
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</table>
Theoretical knowledge such as satellite systems, multispectral satellite images, color composites, geometric and radiometric errors, spectral signatures, methods of supervised and unsupervised classification, and accuracy assessment complete the theoretical background. Practical experience in managing and analysis of satellite data is realized with laboratory exercises that are accomplished via a specific software.

The course consists of these parts:

1) Basic principles: definition, history, electromagnetic spectrum, structure of multispectral satellite images, resolution (spatial, temporal, radiometric, spectral).
2) Aerial photographs: cameras, films, photo interpretation, photogrammetry, 3D photographs, distortions, ortho-maps, organizations providing aerial photos.
3) Sensors and satellites: sensors, passive and active, low medium high and very high spatial resolution, optical, hyperspectral, radar sensors, satellites, Landsat-SPOT-IKONOS satellite images.
4) Preprocessing of satellite images: geometric errors, geometric corrections, Greek, European and global coordinate reference systems, Global Positioning System (GPS).
5) Radiometric and atmospheric correction: radiometric errors, radiometric enhancement
6) Satellite images histograms: linear stretching, logarithmic and exponential stretching, piecewise linear stretching, histogram equalization, histogram matching, histogram slicing.
7) Multispectral image transformations: Numerical and logical operations, indexes, principal component analysis, Kauth Thomas transformation.
8) Spatial enhancement with filters: description and different kinds of filters, filters based on statistical measures, edge optimization filter, directional filter, textural filter etc.
9) Image fusion: resolution merge, pan sharpening (example)
10) Spectral signatures: radiation, radiometric measurements and main land cover spectral signatures.
13) Trends and applications: todays and future applications and sensors, data in remote sensing, radar images of very high spatial resolution, unmanned aerial vehicles.
**LEARNING OUTCOMES / GENERAL COMPETENCES**

Remote Sensing is a scientific field based theoretically and practically at the processing of digital multispectral images issues from satellites. Specific software is dedicated to satellite image analysis. Students will be able to:

- Understand the structure of multispectral satellite images and apply processing methods for this kind of images.
- Compose various color composite images issues from different combination of spectral band aiming at recognising specific land covers of the earth surface.
- Acquire the knowledge of geometric and radiometric corrections of satellite images.
- Make the optimum choice of different land cover sampling areas in order to extract their spectral signatures.
- Apply unsupervised classifications of satellite images.
- Apply supervised classifications of satellite images.
- Control and use technological tools (Cross Classification Table, KHAIT Index, etc) in order to measure the applied classification accuracy.
- To accomplish specific thematic research in Remote Sensing as temporal changes, natural disaster estimation, but also to be able to resolve technical matters as filter optimization, boolean algebra operations in digital binary images.

**PREREQUISITES**

- 

**TEACHING METHODS**

face to face.

**ASSESSMENT METHODS**

60% Final Theory Exams, 40% Semester Assignments.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

7TH SEMESTER — DIVISION OF COMPUTERS
AUTOMATIC CONTROL SYSTEMS II
<table>
<thead>
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<th>COURSE UNIT CODE</th>
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<td>COURSE WEBSITE</td>
<td><a href="https://eclass.uowm.gr/courses/ECE367/">URL</a></td>
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<tr>
<td>INSTRUCTORS</td>
<td>Parisis K.</td>
</tr>
<tr>
<td>COURSE CONTENTS</td>
<td>The CS II course is the continuation of the CS I course. Its main purpose is to demonstrate the practical value and applications of control systems theory and to provide students with useful knowledge of immediate application. The course is combined with the use of appropriate software to solve automatic control problems. Includes sections: Frequency domain systems analysis methods. Stability in the frequency domain. Design of feedback control systems with Root Locus and Bode Diagrams (Phase-Lead, Phase-Lag, three terms (Proportional - Integral – Differential (PID) controllers). Prefilters. Design of state variable feedback systems (controllability and observability, full-state feedback, observer design, optimal control systems, internal model design).</td>
</tr>
</tbody>
</table>
The purpose of this course is to provide the student with a comprehensive introduction to the theory and applications of Control Systems with emphasis in design. The student will deal with the simulation of physical systems on a computer and finding the proper controller through assignments and solving selected exercises. In addition, the student will complete a series of selected laboratory exercises covering all the different types of compensators in control systems. Upon successful completion of this course the student will be able to:

1. Identify and describe the different types of compensators.
2. Understand and explain their operation in the closed loop system.
3. Analyze and design a control system (via transfer functions and state equations).
4. Compare and evaluate the designed control system based on set design specifications.
5. Implement compensator circuits.
6. Implement experimental devices in the laboratory and analyze their operation.
7. Simulate on PC and explain the operation of control systems.

Knowledge of the course is required:
- Applied Mathematics I
- Control System I

Face to Face
- Lectures, assignments, Laboratory

I. Written final examination (60%) comprising:
   - Solving problems related to quantitative data
II. Individual work (10%).
III. Final laboratory test (30%).

Greek (in English to Erasmus students)
2. Συστήματα Αυτομάτου Ελέγχου, Ogata K., ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ, 2011.
4. Πετρίδης Βασίλειος, Συστήματα Αυτόματου Ελέγχου. Τόμος Β. Ζήτη Πελαγία & Σια Ι.Κ.Ε..
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<td>SEMESTER</td>
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<td>4</td>
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<tr>
<td>INSTRUCTORS</td>
<td>Lazaridis V.</td>
</tr>
</tbody>
</table>
Upon successful completion of this course, students will be able to demonstrate knowledge and understanding of:

- the historical development of operating systems,
- the various process states and context switching,
- the benefits of using an operating system,
- how applications interact with the operating system and each other
- the major operating system modules (process management, deadlock, storage management, paging, caching, virtual memory, file system, protection and security),
- the scheduling algorithms,
- the filesystem operations,
- the memory paging and segmentation,
- the input/output mechanisms,

From the laboratory assignments, students will gain the abilities to:
- fully utilize and program the Microsoft windows and Unix shell using scripts,
- fully utilize the UNIX operating systems as a development platform for POSIX C,
- use all the major POSIX system calls for designing single or multithreaded, host only or interconnected processes,
- write programs that interface to the operating system at the system-call level,
- use a variety of user level tools to monitor the behavior of operating systems.

**PREREQUISITES**

Computer Architecture (not compulsory)

**TEACHING METHODS**

Lectures, PowerPoint slides, Lecture Notes, in class quizzes, e-class, automated examination system i-exams, open courses video lectures, laboratory exercises, semester group project.
The final grade is the sum of the laboratory grade and theory grade. The Maximum for these grades is 5, totaling both in 10. The students have to pass the Laboratory (at least 2.5/5) and Theory (at least 2.5/5), and also be present at the 85% of the laboratory sessions.

Theory Examination (max 5 grades)
- Multiple Choice Questions Examination – 3
- Theory Exercises – 2

Lab Examination (max 5 grades)
- Labpoints (completing code challenges) - 2
- Semester Project - 2
- Lab Examination (code writing) - 1

Greek

4. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Λειτουργι-
<table>
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<tr>
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<tr>
<td>INSTRUCTORS</td>
<td>Stergiou K.</td>
</tr>
</tbody>
</table>
**LEARNING OUTCOMES / GENERAL COMPETENCES**

The expected learning outcomes are the following:
1. Understanding of basic concepts of Artificial Intelligence and Intelligent Systems.
2. Understanding methods of solving search problems in Artificial Intelligence.
3. Application of methods of solving to unknown problems.
4. Understanding of basic approaches to Knowledge Representation.
5. Develop experience in the implementation of search algorithms and logical inference.
7. Development of problem-solving skills.
8. Gain experience in collaborative management and problem solving.

Upon successful completion of the course, students will:
1. understand the basics of intelligent systems
2. know how to implement uninformed and informed search algorithms
3. are capable of reasoning in propositional logic
4. know the basic principles of action planning
5. understand the basics of machine learning

**PREREQUISITES**

- 

**TEACHING METHODS**

Lectures, exercises, projects

**ASSESSMENT METHODS**

The evaluation is done through:
1. written examination at the end of the semester that includes short answer questions and resolution of exercises
2. scoring the report and the code of the work carried out during the semester
3. oral presentation of the work carried out during the semester

The evaluation criteria are as follows:
- correctness
- clarity
- accuracy
- efficiency

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
## Recommended Bibliography

1. Russell & Norvig, Τεχνητή Νοημοσύνη: Μια Σύγχρονη Προσέγγιση, Κλειδάριθμος, 2004

2. Βλαχάβας, Κεφαλάς, Βασιλειάδης, Κόκκορας, Σακελλαρίου, Τεχνητή Νοημοσύνη, Εκδόσεις Πανεπιστημίου Μακεδονίας, Γ’ Έκδοση.

## Recommended Article/Paper Resources:

- Artificial Intelligence, Journal of Artificial Intelligence Research,
- Machine Learning, Journal of Automated Reasoning,
- Autonomous Agents & Multi-Agent Systems,
- AI Communications

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## Robotics
<table>
<thead>
<tr>
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<td>Fragulis G.</td>
</tr>
<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>Familiarize the student with the basic concepts of robotics with special emphasis on solving the main kinematic (position and velocity) problems of a robotic arm. After completion of this course the student will have the ability to understand basic robotics concepts, make kinematics analysis, position, velocity and acceleration robotic arm, to design controllers and plan trajectories of robotic arms. Retrieve, analyse and synthesise data and information, with the use of necessary technologies. Adapt to new situations. Make decisions. Work autonomously. Work in teams. Work in an international context. Appreciate diversity and multiculturality. Respect natural environment. Be critical and self-critical. Advance free, creative and causative thinking. Retrieve, analyse and synthesise data and information, with the use of necessary technologies. Advance free, creative and causative thinking.</td>
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<tr>
<td>TEACHING METHODS</td>
<td>Lectures using PowerPoint slides, Distance Learning using e-class platform.</td>
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</table>
**ASSESSMENT METHODS**

- Written final examination (80%):  
  - Multiple-choice questions  
  - Short Answers  
  - Laboratory Work  
  - Atomic / group project work (20%)

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

1. Εισαγωγή στη Ρομποτική, 4η Έκδοση, Craig John  
2. Ρομποτική, 4η Έκδοση, Εμίρης Δημήτριος, Κουλουριώτης Δ.  
3. Ρομποτική, Ιωάννης Μπούταλης  
4. ΡΟΜΠΟΤΙΚΗ, SICILIANO,SCIAVICCO, VILLANI, ORIOLO

**INDUSTRIAL COMMUNICATIONS**
## Course Information

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<tr>
<td>Instructors</td>
<td>Gavros K.</td>
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</table>

## Course Contents

**Part One GENERAL PRINCIPLES OF LOCAL NETWORKS**

1. Development of Industrial Automation
2. Advantages of Communication Networks in Industry
3. Hierarchical Control and Communication Networks
4. Data Handling in Industrial LANs
5. Topologies of LANs
6. Data Media in LANs
7. Modes for Data Transmission in LANs
8. Methods of Access to the LANs Channel
9. ISO / OSI Open Communication Model
10. Components of Network Architecture

**Part Two INDUSTRIAL NETWORKS**

1. Modbus Network
2. Ethernet Network
3. CAN Open Network
**LEARNING OUTCOMES / GENERAL COMPETENCES**

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

- Recognize and describe the Industrial network devices
- Explain the principles of Industrial network
- Explain in detail the basic functions of all types of Industrial Components
- Implement experiments in the laboratory and analyze their operation
- Simulate basic Industrial network
- Design simple industrial network system.
- Demonstrate the ability to use network topologies in various practical applications
- Collaborates with fellow students in project development
- Constructs simple Industrial network using the Lab equipment.

**PREREQUISITES**

- 

**TEACHING METHODS**

- Face to face
- Possibility of distance education

**ASSESSMENT METHODS**

The grade of the course theory derives from the grade of the written examination as well as that of the possible progress exams.

The grade of the course laboratory is that of the final exam (Project), in which the quality of the delivered assignments is taken into account qualitatively. The final grade of the course is calculated indicatively based on the following equation.

Final grade = 0.75 (Theory grade) + 0.25 (laboratory grade), if (THEORY grade) ≥ 5.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

- Recommended Book Resources:
  1. **INDUSTRIAL NETWORKS AND ADVANCED PLC PROGRAMMING** BY CHRISTOS B. PAPAZACHARIAS [ISBN: 978-960-98307-1-3]
  2. **INDUSTRIAL NETWORKS USING PLCs** A. MANESE PATRA 2003

**DIGITAL ELECTRONICS**
<table>
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<th>COURSE UNIT CODE</th>
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<td>INSTRUCTORS</td>
<td>Dasygenis M.</td>
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<tr>
<td>COURSE CONTENTS</td>
<td>The course aims to familiarize students with digital logic, synthesis and analysis of combinational circuits, learning the basics of sequential circuits and introduction to the techniques of design and implementation of digital circuits.</td>
</tr>
<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>After the lectures the students:</td>
</tr>
<tr>
<td></td>
<td>-will be familiar with the theory and operating principles of sequential digital circuits.</td>
</tr>
<tr>
<td></td>
<td>-will be familiar with the principles of design and design of sequential digital electronic circuits.</td>
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<tr>
<td></td>
<td>-will have understood the basic theory and principles of design and study of sequential digital electronic circuits.</td>
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<tr>
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<td>The laboratory part of the course includes the design of laboratory exercises and practical applications for the better understanding and familiarization of students with the basic theory and techniques that are necessary for the implementation of digital electronic circuits.</td>
</tr>
<tr>
<td></td>
<td>Students acquire the ability to instantly recognize known circuits to be able to understand the operation of the equipment.</td>
</tr>
<tr>
<td></td>
<td>Students are trained to identify faults in the aforementioned circuits.</td>
</tr>
<tr>
<td></td>
<td>The knowledge of the course can be used so that students are able to create their own Amplifier circuits.</td>
</tr>
<tr>
<td>PREREQUISITES</td>
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</table>
### Teaching Methods
Lectures, Power Point slide presentations, presentation simulations of technological applications. Assignments in groups for students to better understand the concepts and basic principles of digital logic.

### Assessment Methods
Assignments to students in groups. The grade that will result from them will be 20% of the final grade. 80% will result from the written final examination of the course.

### Language of Instruction/Exams
Greek

### Recommended Bibliography
1. Ψηφιακή Σχεδίαση, Mano Morris, Ciletti Michael
2. Μικροηλεκτρονική, Jaeger Richard - Blalock Travis
3. Μικροηλεκτρονικά κυκλώματα τόμος Β ADEL. S. SEDRA & KENNETH C. SMITH
4. KLEITZ, W., Ψηφιακά Ηλεκτρονικά, Εκδόσεις Τζόια, 2013.

### Object Oriented Programming II
<table>
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<tr>
<th>COURSE UNIT CODE</th>
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<tr>
<td>INSTRUCTORS</td>
<td>Bibi S.</td>
</tr>
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</table>
The course focuses on Object Oriented Programming with C ++ programming language. Emphasis is placed on the object-oriented programming model, as well as on some more advanced programming concepts (references, parameterization, dynamic memory allocation, friend functions). Students learn to design and implement object-oriented programs (classes, objects, encapsulation, subtraction, composition, hierarchies and inheritance, polymorphism) in C++.

By the end of the course students should be familiar with the advanced features of C++ and be able to design and implement complex programs of increased degree of difficulty.

Course modules:

- Section 1: Basic Concepts of Object-Oriented Programming, Java Comparison, C ++ History and Applications
- Section 2: C ++ Code Development, Objects and Classes, Constructor Functions, Input/Output
- Section 3: Classes & Objects, Objects as Arguments, Constructor’s overloading, Data Access Member Functions.
- Section 4: Global Functions, Friend Functions, Static Functions, *this pointer
- Section 5: Operator Overloading, Arguments and Return Values, Binary Operator Overloading (Numerical Operators, Comparison Operators, Input/Output Operators overloading)
- Section 6: Arrays, arrays as class member data, arrays of objects
- Section 7: Composition, objects as data members of classes, how to handle objects, examples of using composition
- Module 8: Inheritance, base and derived classes, access of base class members and functions, member functions overloading
- Section 9: Pointers, new and delete operators, object pointers, member references, pointers to arrays of objects
- Section 10: Class Hierarchies, Abstract Base Classes. Public and private inheritance.
- Section 11: Inheritance Levels, Multiple Inheritance, Classes within Classes
- Section 12: Files and streams, object input / output, file pointers.
**LEARNING OUTCOMES / GENERAL COMPETENCES**

Students who successfully complete the Object-Oriented Programming II course should be able to:

- Classify and understand existing programming models.
- Implement relationships between classes, such as inheritance, composition, polymorphism, C++ language content.
- Overload input/output operators, arithmetic operators, comparison operators.
- Handle global, friend and class member functions
- Successfully use const, static, final variables and functions.
- Store and retrieve information in text and binary files.
- Perform dynamic memory allocation, manipulate pointers.
- Implement templates

**PREREQUISITES**

- 

**TEACHING METHODS**

Lectures and Labs

**ASSESSMENT METHODS**

The evaluation of students is carried out with:

- Written evaluation
- Laboratory examination
- Application Development (Semester Project)

The written evaluation is intended to examine the students' knowledge of the taught material and to capture the degree of its assimilation. It includes multiple choice questions, free questions but also short answers, code evaluation, code development.

The purpose of the laboratory exams is to determine degree of familiarity of students with the development of C++ applications in real life problems. It includes short application development.

The application development (Semester project) is assigned in groups of 2 persons and include application development in C++. The works are submitted electronically via e-class platform.

The final evaluation of the students is as follows:

60% Grade of written examination + 20% Grade of application development + 20% Grade of Laboratory examination
<table>
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<th>Language of Instruction/Exams</th>
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<tr>
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<td>Journals</td>
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<td>Science of Computer programming, Elsevier</td>
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<td>Journal of Systems and Software, Elsevier</td>
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<tr>
<td>Proceedings of the ACM on Programming Languages, ACM</td>
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**Computer Graphics**
### COURSE UNIT CODE
E34

### COURSE UNIT TYPE
Specialization

### LEVEL OF STUDY
Undergraduate

### YEAR OF STUDIES
4th

### SEMESTER
7th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://eclass.uowm.gr/courses/ICTE275/

### TEACHING WEEKLY HOURS
4

### INSTRUCTORS
Protopsaltis A.

### COURSE CONTENTS

Laboratory:

### LEARNING OUTCOMES / GENERAL COMPETENCES
To understand the two- and three-dimensional geometry, learn the principles, algorithms and techniques, for designing, coloring, and lighting of real-time - photorealistic graphics. Students will have the opportunity to develop interactive 3D graphics rendering and visualization software through the laboratory course of programming graphics in OpenGL / C ++.

### PREREQUISITES
-

### TEACHING METHODS
- Face-to-face
- Laboratory exercises
- Possibility of remote courses
<table>
<thead>
<tr>
<th>ASSESSMENT METHODS</th>
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<tbody>
<tr>
<td>• Formative assessment</td>
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<tr>
<td>• Multiple choice tests</td>
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<tr>
<td>• Short-answer questions</td>
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<td>• Problem solving</td>
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<tr>
<td>• Laboratory work</td>
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<tr>
<td>• Oral exam</td>
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</table>

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

1. Theocharis T., Platis N., Papaioannou G., Patrikalakis N., Graphics and Visualization S. Athanasopoulos et al, A’ Publica
   tion/2010
2. Bakers H., Computer Graphics with Open GL, Publisher A. Tziola, 3rd ed. /2010

**eHEALTH**
<table>
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<td>Aggelidis P.</td>
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**COURSE CONTENTS**

Introduction to e-health and related concepts (including medical IT and knowledge management based on information technology): What is it? Why is it so important? The main research and policy issues in the application of information systems in health care, including the analysis of challenges and opportunities as well as an overview of specific tools such as patient electronic file systems and computer decision support systems. Basic principles in Medical Data Management. Computational Statistics. Introduction to clinical quality development as an integral part of clinical information systems. Online health care. Providing and requesting medical information online, medical interventions via internet (such as tele-therapy) and peer-to-peer support networks (p2p) in virtual e Health medical communities. The use of online search methods and the use of the Internet in support of clinical trials. Health Portals. Telemedicine services and applications. Mobile and Wireless Communications in Health Care. Introduction to medical vocational training using the internet and internships for health professionals. EHealth safety. Basics for Privacy & Confidentiality of Health Care. Moral values.
The aim of the course is the introduction to the evolving field of e-Health, which constitute the application of the principles of information technology and telecommunications to provide solutions and address the challenges of Prevention, Treatment and Health Quality. Due to the interdisciplinary nature of the course, students come into contact with different scientific fields, such as biology, medicine and the use of appropriate devices and software to study and analyze their problems. The course covers all current trends, such as e-wellness, independent living, Health 2.0, MedSocApps. Introduction to e-Health. Definition & importance of e-Health. Main research and policy issues to the application of informatics in medical care. Overview of basic specialized tools, like electronic patient systems and decision support systems. Management of medical data. Statistical informatics. Introduction to clinical quality development as a part of clinical system informatics. Web-based medical care. Online supply and demand of medical information, medical consultation through internet (like e-therapy) and p2p virtual medical societies. The usage of search engines and internet in clinical trials. Health Portals. eHealth services and applications. Mobile and wireless communication in medical care. Introduction to medical Vocational Education and Training through internet. Safety in eHealth. Privacy and confidentiality in medical care. Ethical principals.

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<th>PREREQUISITES</th>
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<th>ASSESSMENT METHODS</th>
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<th>Semester Workload</th>
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<td>Lecture</td>
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<td>Project</td>
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<tr>
<td>Autonomous study</td>
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<td><strong>Total</strong></td>
<td><strong>125</strong></td>
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</tbody>
</table>
RECOMMENDED BIBLIOGRAPHY

1. PANTELIS ANGELIDIS, Medical Informatics volume A, 2011.

DATA ANALYSIS
The course consists of these parts:

- Overview of confidence intervals and Statistical tests. Methodological applications and numerical examples.
- Regression Analysis: simple linear regression, linear model coefficients, correlation coefficient, Analysis of Variance (ANOVA). Various regression models: Parabolic, exponential, and multiple regression. Applications using SPSS or PSPP or EXCEL software.
- Clustering methods: Hierarchical and not hierarchical clustering methods. Nearest neighbor, Lance and Williams method. K-means clustering method: Euclidian distance analysis between items, group centers and between each item from groups centers. Numerical example using the SPSS statistical software.
**LEARNING OUTCOMES / GENERAL COMPETENCES**

Systematic data registration and analysis and applicable conclusion extraction by acquiring a solid theoretical background of contemporary methodologies (using well-known specific software), such as:

- Probabilistic and supervised sampling
- Correlation research between two or more variables
- Compact data in few variables having the maximum of variance
- Various methods of hierarchical and not clustering methods

**PREREQUISITES**

- 

**TEACHING METHODS**

In real time, face to face.

**ASSESSMENT METHODS**

70% Final Theory Exams, 30% Semester Assignments.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

1. Βιβλίο [94699890]: Στατιστική Επεξεργασία και Ανάλυση Πολυδιάστατων Δεδομένων II, Χρήστος Κων/νου Φράγκος
2. Η ανάλυση δεδομένων, Παπαδημητρίου Γιάννης

---

**8TH SEMESTER – DIVISION OF COMPUTERS & ELECTRONICS**
PARALLEL AND DISTRIBUTED SYSTEMS
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<tr>
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</table>
| COURSE WEBSITE (URL) | https://eclass.uowm.gr/courses/ICTE161/  
                        https://arch.icte.uowm.gr/courses/parallel/ |
| TEACHING WEEKLY HOURS | 4          |
| INSTRUCTORS        | Dasygenis M. |
Upon successful completion of this course, students will be able to demonstrate knowledge and understanding of:

- the reasons that the sequential computing has been abandoned,
- the similarities and differences of parallel architectures,
- the CPU cores interconnection networks,
- the memory coherency problems and the possible solutions,
- the significance of the clock synchronization of distributed systems,
- the multi-core CPU and GPU strengths and weaknesses,
- the granularity of the parallel processing.

From the laboratory assignments, students will gain the abilities to:

- scale an application,
- transform an application to exploit the available parallelism,
- develop and debug parallel programs,
- utilize the openmpi framework for distributed parallel systems,
- utilize the openmp framework for shared memory parallel systems,
- utilize the cuda framework for GPU parallel systems,
- utilize the POSIX threads for shared memory parallel systems,
- utilize a batch submission system for the grid,
- utilize a batch submission system for a computer cluster,
- analyze and locate application hotspots,
- measure the performance of parallel and distributed systems,
- identify the best architectures and system for solving a given computational problem.

**PREREQUISITES**
Operating Systems (not compulsory), Computer Architecture (not compulsory)

**TEACHING METHODS**
Lectures, PowerPoint slides, Lecture Notes, in class quizzes, e-class, automated examination system i-exams, open courses video lectures, laboratory exercises, semester group project.
The final grade is the sum of the laboratory grade and theory grade. The Maximum for these grades is 5, totaling both in 10. The students have to pass the Laboratory (at least 2.5/5) and Theory (at least 2.5/5), and also be present at the 85% of the laboratory sessions.

**Theory Examination (max 5 grades)**
- Multiple Choice Questions Examination – 3
- Theory Exercises – 2

**Lab Examination (max 5 grades)**
- Labpoints (completing code challenges) - 2
- Semester Project - 2

**Greek**

**1. Andrew S. Tanenbaum, Maarten Van Steen, Κατανεμημένα Συστήματα: Αρχές Και Υποδειγματα, Εκδοσεις Κλειδαριθμος, 2006.**

**2. David B. Kirk, Wen-Mei W. Hwu, Προγραμματισμός Μαζίκα Παράλληλων Επεξεργαστών, Κλειδαριθμος, 2010.**

**3. Σ. Παπαδακης, Κ. Διαμανταρας, Προγραμματισμός και Αρχιτε-**
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<tr>
<th>COURSE UNIT CODE</th>
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<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>Upon successful completion of this course, students will:</td>
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<td>• to perform analysis of algorithms</td>
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<td>• to study algorithms in terms of their complexity</td>
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<td>• to perform asymptotic analysis of algorithms</td>
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<td>• to design and implement recursive and greedy algorithms</td>
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<td></td>
<td>• to design and implement algorithms by applying the principles of dynamic programming,</td>
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<td>• to understand and apply algorithms for graphs and networks</td>
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<td>• to understand the P and NP classes</td>
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<td>PREREQUISITES</td>
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<tr>
<td>TEACHING METHODS</td>
<td>Lectures, labs</td>
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The language of evaluation is Greek. The assessment method consists of three assignments (30%) and a final written examination (70%). The final examination includes multiple choice questions, short answer questions, and problem-solving questions. The three assignments require the implementation of algorithms in the C programming language. The above evaluation criteria are posted on the course website.

**RECOMMENDED BIBLIOGRAPHY**

1. Thomas Cormen, Charles Leiserson, Ronald Rivest, Clifford Stein, Εισαγωγή στους αλγορίθμους, Πανεπιστημιακές Εκδόσεις Κρήτης, Έκδοση: 1η/2016
2. Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, Αλγόριθμοι, Εκδόσεις Κλειδάριθμος, Έκδοση: 1η/2009
3. Παναγιώτης Μποζάνης, Αλγόριθμοι, Εκδόσεις Τζιόλα, Έκδοση: 2η/2017
4. Jon Kleinberg, Eva Tardos, Σχεδιασμός αλγορίθμων, Εκδόσεις Κλειδάριθμος, Έκδοση: 1η/2009
5. Anany Levitin, Ανάλυση και σχεδίαση αλγορίθμων, Εκδόσεις Τζιόλα, Έκδοση: 3η/2018
6. Κωνσταντίνος Παπαρρίζος, Ανάλυση και σχεδίαση αλγορίθμων, Εκδόσεις Τζιόλα, Έκδοση: 1η/2010

- Related Scientific Journals:
  1. Algorithmica
  2. Journal of Algorithms
  3. ACM Transactions on Algorithms
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</table>
## COURSE CONTENTS


Course modules:

- **Section 1:** INTRODUCTION-BASIC CONCEPTS, definition of "Software Technology", software failures, common errors, software, software system, software development team roles
- **Section 2:** SOFTWARE PRODUCTION PROCESSES, software process models, waterfall model, component-based model, spiral model, agile development methodology, RUP model
- **Section 3:** PROJECT MANAGEMENT, project schedule, Risk management, project schedule, Gantt chart, critical path method.
- **Section 4:** REQUIREMENT ENGINEERING, functional, non-functional requirements, deliverables, elicitation process
- **Section 5:** UML, The UML language, use cases, use case diagram, detailed use case description.
- **Section 6:** ARCHITECTURAL DESIGN, software application architecture, three-part architecture, component design
- **Section 7:** UML - CLASS DIAGRAM, classes, relationships, relationship multiplicity
- **Section 8:** UML- SEQUENCE DIAGRAM, classes, messages, semiology
- **Section 9:** CODING - DESIGN PATTERNS, "Adapter", "Visitor", "Composite", "Bridge", "Unique" standards
- **Section 10:** CODING, converting class diagram relationships to code
- **Section 11:** TESTING, black and white box testing techniques, metric code quality
- **Section 12:** CASE TOOLS, versioning tools (git), testing tools (junit)
- **Section 13:** COST ESTIMATE, COCOMO method, function points method, use case points method.
### LEARNING OUTCOMES / GENERAL COMPETENCES

Students who successfully complete the course should be able to:

- Analyze and design software systems with UML language.
- Manage software projects, be able to estimate software costs and manage potential risks.
- Implement large object-oriented systems.
- Apply software testing techniques (white and black box testing).
- Design software using software design patterns such as "adapter", "visitor", "composite", "observer"
- Transfer the software design (class diagrams, sequence diagrams) consistently to verifiable and validable code.
- Calculate basic software code metrics like Halstead, Mc Cabe metrics.
- Know the basic software development models: waterfall, RUP, spiral model and agile models and be able to apply them in practice.

### PREREQUISITES

- 

### TEACHING METHODS

Lectures, exercises, practical examples in the lab

### ASSESSMENT METHODS

The evaluation of students is carried out with:

- Written evaluation
- Semester Project- Development of a complex application (Tasks / Deliverable)

The written evaluation is intended to examine the students' knowledge of the taught material and to capture the degree of its assimilation. Includes multiple choice questions, free questions but also short answers, evaluation of software development design problems.

The development of a complex application (Semester Project) takes place in large groups of 5-6 people and includes the specification of requirements, the design, implementation and control of a large complex application in an object-oriented language. The work includes the following deliverables: 1. Project plan 2. Requirements Specification document 3. Software design document 4. Code 5. Testing results. The works are submitted electronically and are followed by an oral examination of the students.

The final evaluation of the students is as follows: 60% Grade of Written Exam + 40% Semester project
**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

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**VLSI DESIGN**
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Upon successful completion of this course, students will be able to demonstrate knowledge and understanding of:

- the VLSI design flow from the schematic up to fabrication on silicon.
- the mathematical models of CMOS circuits simulation and analysis.
- the CMOS design at transistor level.
- the IC Design Rules and design rule checking.
- the layout and floorplaning.
- the usage of EDA/CAD tools for VLSI design, floorplan and mask preparation for fabrication.
- the implementation tradeoffs and the selection of the best choices (trade-offs consumption) according to the design requirements.
- the various optimizations realized on a transistor level.
- the common pitfalls of CMOS design.
- the design of regular VLSI structures (adders, multipliers, ROMS, PLAs, SRAMs).
- the clock skew and the noise problems and how to avoid it on a design.

Knowledge from the following courses is required:

- Digital Design,
- Electronics I, II

Lectures, lab exercises.

Written exam (50%), lab exam (50%).

Greek

2. Σχεδιασμός Ψηφιακών Συστημάτων σε FPGAs, Wayne Wolf, ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ, 2013.
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<tr>
<td>The course consists of the following sections:</td>
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<tr>
<td>E01 Introduction to Mechatronics</td>
</tr>
<tr>
<td>E02 Mechanical, electronic and computer parts of a mechatronic system. Systems interconnection. The concept of interface.</td>
</tr>
<tr>
<td>E03 Electronic / digital systems in mechatronics. Sensors, inverters and actuators.</td>
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<tr>
<td>E04 Electrical power management in mechatronic systems.</td>
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<tr>
<td>E05 Automated control systems. Embedded systems and controllers.</td>
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<td>E06 PLCs in mechatronic systems; programming</td>
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<tr>
<td>E07 Mechatronic system design: technologies, dynamic modeling, simulation, interconnection and system integration</td>
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<tr>
<td>E08 Mechatronic system design: Identification and troubleshooting</td>
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<tr>
<td>E09 Applications of mechatronics</td>
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<tr>
<td>E10 Elements of Artificial Intelligence (AI) and its relation to mechatronics.</td>
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In addition, the course will be accompanied by practical laboratory exercises so that the student can better understand the concepts developed in the theoretical part. These exercises will deal with practical applications in experimental setups and development of test structures, based on available infrastructure.
Upon successful completion of the course the student will be able to
• Understand the basic design principles, operation and limitations of mechatronic systems.
• Recognize and understand the key parts (mechanical, electronic and computational) of a mechatronic system
• Associate, categorize and analyze the subsystems of a mechatronic system and their respective operation
• Draw a block diagram of a mechatronics system integrating functional and information links into it.
• Understand, describe and analyze the control function of a mechatronic system.
• Analyze common problems in the design and programming of a mechatronic system and suggests ways to address them.

PREREQUISITES

TEACHING METHODS
- Classroom teaching with video projector and tutorial exercises
- Extensive use of the e-class platform

ASSESSMENT METHODS
• Written examination at the end of the semester (70%)
• Practical experiments and lab exercises (30%)

LANGUAGE OF INSTRUCTION/EXAMS
Greek-English

RECOMMENDED BIBLIOGRAPHY
1. Nesculescu D. “Μηχατρονική”, 2011, Εκδόσεις Τζιόλα

SCADA SYSTEMS
<table>
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<tr>
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| **COURSE CONTENTS**  | - Brief introduction to SCADA systems  
- LabVIEW and Virtual Instruments.  
- Data collection: Measurement of single analog signal and multiple analog voltage signals. Measurement of single and multiple current signals, 4-20mA transmitters  
- Use of Instruments in Data reception (communication protocols RS-232, GPIB, Ethernet)  
- Receive and exchange data between remote modules connected via a TCP network using DataSocket technology.  
- Connection to industrial control devices (PLC) and transfer of data and information to user applications using OPC Server. |
| **LEARNING OUTCOMES / GENERAL COMPETENCES** | Upon successful completion of the course the student will be able to:  
- create basic applications for downloading, transmitting and displaying them on HMI (Human - Machine Interfaces) screens using the LabVIEW graphical programming language,  
- know the connection techniques of analog sensors (0 - 10V) and transmitters (4 - 20 mA),  
- know the basic communication protocols with measuring instruments and be able to develop applications for receiving and processing measurements from instruments,  
- use the basic options of the Lab VIEW language as well as the capabilities of the http and TCP / IP communication protocols for the monitoring of remote units of measurement and control,  
- can record and control the parameters of industrial PLC devices using OPC Server. |
| **PREREQUISITES**    | - |
| **TEACHING METHODS** | Lectures, Lab exercises |
**Assessment Methods**

| Individual assignment (50%) | Final exams (50%) |

**Language of Instruction / Exams**

- Greek

**Recommended Bibliography**

1. "Industrial automation with SCADA – Concepts, communication, and security", K.S. Manoj, Notionpress.com

**Embedded Systems**
<table>
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<th>COURSE UNIT CODE</th>
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Upon successful completion of this course, students will be able to demonstrate knowledge and understanding of:

• the embedded systems and their specific requirements,
• the economics of the embedded system design,
• the interconnection networks,
• the hardware software codesign,
• the hardware accelerators,
• the popular embedded systems architecture and organization,
• the real time operating systems,
• the hard and soft deadlines,
• the performance of the embedded systems,
• the input/output mechanisms,
• the fundamental peripherals of an embedded system.

From the laboratory assignments, students will gain the abilities to:

• create and program embedded systems, according to the design requirements,
• program micro-controllers and peripherals (arduino & shields),
• understand the flexibility of the FPGA and utilize it in projects of embedded systems,
• create and optimize applications in terms of low power consumption and high performance,
• familiarize themselves with the ARM and TI integrated development environments,
• fully utilize the VHDL to describe modules of embedded systems,
• use the FPGA for application development,
• design an embedded system using soft-cores,
• design a system-on-chip (SoC),
• master the DTSE methodology for application optimization,
• use and glue together multiple intellectual property cores,
• co-design hardware (VHDL) and software (C).

PREREQUISITES
Operating Systems (not compulsory), Computer Architecture (not compulsory)

TEACHING METHODS
Lectures, PowerPoint slides, Lecture Notes, in class quizzes, e-class, automated examination system i-exams, open courses video lectures, laboratory exercises, semester group project.
## Assessment Methods

The final grade is the sum of the laboratory grade and theory grade. The Maximum for these grades is 5, totaling both in 10. The students have to pass the Laboratory (at least 3/6) and Theory (at least 2/4), and also be present at the 85% of the laboratory sessions.

- Theory Examination (max 4 grades)
  - Multiple Choice Questions Examination – 4

- Lab Examination (max 6 grades)

## Language of Instruction/Exams

- -

## Recommended Bibliography

1. Σχεδιασμός ενσωματωμένων συστημάτων, Σούντρης, Δημήτριος, Δασυγένης, Μηνάς
2. Ενσωματωμένα Συστήματα, Μηνας Δασυγενης, Δ. Σουντρης

## Digital Games Development
<table>
<thead>
<tr>
<th><strong>COURSE UNIT CODE</strong></th>
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<tr>
<td><strong>COURSE UNIT TYPE</strong></td>
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<tr>
<td><strong>COURSE WEBSITE</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE336/">https://eclass.uowm.gr/courses/ICTE336/</a></td>
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<td>4</td>
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<tr>
<td><strong>INSTRUCTORS</strong></td>
<td>Protopsaltis A.</td>
</tr>
</tbody>
</table>
| **COURSE CONTENTS**  | Main goal is to create and develop digital games: modeling, animation and photorealistic rendering through a step-by-step programming process focusing on  
|                      | • the visual style,  
|                      | • the knowledge of the suite of visual development tools and  
|                      | • the reusable software elements,  
|                      | Additionally, the evaluation of points and symbols through  
|                      | • the artistic creation (narrative design, visualization, images, sounds, scenarios, evolution of the story, journey of the hero, imaginary dimension). |
Upon successful completion of the course the students will be able to:

- design a digital Game Architecture, by analyzing the game requirements, constructing game structures, and distributing data to game structures
- use the Unity engine as a development environment and game creation framework, emphasizing on its features, understanding its internal structure, the utilizing 2D and 3D components and cameras, inserting objects (characters, 3D models, sound, etc.), adding 2D and 3D physics to the object space.
- create 2D and 3D models, using design or composition techniques, textures, animation, and photorealistic rendering.
- use of Unreal engine as a development environment and game creation framework, emphasizing on its features, understanding its internal structure, inserting 2D and 3D characters, designing the virtual environment, adding sound, applying physics properties within the game environment.

|---------------|----------------------------------------------------------------------------------------------------------------------|
| TEACHING METHODS | Face-to-face  
Laboratory exercises  
Use of eclass for the submission of assignments/projects/exams, as a repository of educational material, as medium for online conversations/questions.  
Use of laboratory computers with special software for programming: Unity3D, Python, graphics/model editing etc. |
| ASSESSMENT METHODS | Computerized Theory Assessment (50%)  
Semester Project (50%) |
| LANGUAGE OF INSTRUCTION/EXAMS | Greek |
RECOMMENDED BIBLIOGRAPHY


ADVANCED DATABASES
<table>
<thead>
<tr>
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<td>8th</td>
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<td><strong>COURSE WEBSITE (URL)</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE206/">https://eclass.uowm.gr/courses/ICTE206/</a></td>
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<tr>
<td><strong>INSTRUCTORS</strong></td>
<td>Michalas A.</td>
</tr>
</tbody>
</table>

**COURSE CONTENTS**

The course outline covers the following topics:

- Object Oriented Databases, Parallel and Distributed Databases
- Internet Databases, Databases for semi-structured data
- Introduction to Database for Big Data
- Introduction to document-oriented Databases and big table Databases. Learning MongoDB and the Apache Cassandra Database.
- Design and development of Database applications
- Introduction to Spatial-temporal Databases. Case study and implementation of an application with a space-time Database. Introduction to Inductive and Multimedia Databases.
- Transactions, synchronization control, data recovery.
- Fragmentation functions, dynamic fragmentation, expansive fragmentation, exponential list constraint fragmentation, linear fragmentation.
- Query optimization, algebraic transformations, heuristic optimization, operation implementation and cost estimation, result extraction.
## Learning Outcomes / General Competences

On successful completion of this module the student will be able to:

1. Understand the methods used by database systems to support their functions.
2. Understand the complex functions performed in relational database systems.
3. Understand and describe the distributed, parallel and object-oriented DB.
4. Understand how document databases and NoSQL databases work.
5. Design-implement applications interconnected with DB, to improve their performance and to manage transactions.
6. Design advanced types of queries and applications to support temporal, spatial, geographical and multimedia data.

## Prerequisites
- 

## Teaching Methods

- Theoretical treatment in class, aided by active discussion and participation of students.
- Teaching material is presented by Power-Point presentations.
- Laboratory exercises are provided for understanding the course material.
- Provisioning of Online learning resources.

## Assessment Methods

Final examination weighted at 60%, examination of laboratory exercises weighted at 20% and examination of the course assignment weighted at 20%.

1. The final exam includes:
   - Multiple choice questions.
   - Problem solving by applying the acquired knowledge.
   - Comparative evaluation of theoretical issues.
2. The examination of the laboratory exercises includes the evaluation of the laboratory skills acquired using DB and software platforms.
3. The examination of the course assignment includes the evaluation of a DB application implemented by the student.

## Language of Instruction/Exams

Greek
**RECOMMENDED BIBLIOGRAPHY**

<table>
<thead>
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<tr>
<td><strong>INSTRUCTORS</strong></td>
<td>Protopsaltis A.</td>
</tr>
<tr>
<td><strong>COURSE CONTENTS</strong></td>
<td>Human perception, Attention, Human Processor Model, GOMS, Fitts Law, Hick Hyman Law, Keystroke-level model, Cognitive Architectures, Mental models, Interactive technologies, Input/Output devices, Styles of interaction, Interactive Systems Design methodologies, Evaluation of interactive systems, Natural interfaces, Haptic interaction methodologies, Introduction to Virtual/Augmented/Mixed Reality Laboratory exercises on design and evaluation of interactive systems with the use of analytical, experimental and exploratory methods</td>
</tr>
<tr>
<td><strong>LEARNING OUTCOMES / GENERAL COMPETENCES</strong></td>
<td>Students will be able to understand theoretical models of human-machine interaction, make use of technologies, methods and tools for the design and development of interactive software systems. Based on human interaction models they will be able to evaluate interactive systems.</td>
</tr>
<tr>
<td><strong>PREREQUISITES</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>TEACHING METHODS</strong></td>
<td>• Face-to-face • Laboratory exercises • Possibility of remote courses</td>
</tr>
</tbody>
</table>
ASSESSMENT METHODS

- Language of evaluation: Greek/English
- Formative assessment
- Multiple choice tests
- Short-answer questions
- Problem solving
- Laboratory work
- Oral exam

LANGUAGE OF INSTRUCTION/EXAMS

Greek

RECOMMENDED BIBLIOGRAPHY

2. Αβούρης Ν., Κατσάνος Χ., Τσέλιος Ν., Εισαγωγή στην Αλληλεπίδραση Ανθρώπου Υπολογιστή, Πανεπιστήμιο Πάτρας 2016

MACHINE LEARNING
# Study Guide 2021 – 2022

## COURSE UNIT CODE
EYH6

## COURSE UNIT TYPE
Specialization

## LEVEL OF STUDY
Undergraduate

## YEAR OF STUDIES
4th

## SEMESTER
8th

## ECTS CREDITS
5

## COURSE WEBSITE (URL)
https://eclass.uowm.gr/courses/ECE393/

## TEACHING WEEKLY HOURS
4

## INSTRUCTORS
Fragulis G.

## COURSE CONTENTS
- Introduction to Machine Learning.
- Linear Models.
- Tree Models.
- Rule Models.
- Model Ensembles.
- Reinforcement Learning.
- CNN,
- GAN
- DEEP LEARNING

## LEARNING OUTCOMES / GENERAL COMPETENCES
Upon successful completion of the course, students will know what is involved in the field of engineering learning, as well as how algorithms for linear models, tree models, rule models, ensembles of models and reinforcement learning work. In addition, they will be able to apply such algorithms to real-world data and applications using Python's scikit-learn and gym libraries. Retrieve, analyse and synthesise data and information, with the use of necessary technologies. Adapt to new situations. Make decisions. Work autonomously. Work in teams. Work in an international context. Appreciate diversity and multiculturality. Respect natural environment. Be critical and self-critical. Advance free, creative and causative thinking. Retrieve, analyse and synthesise data and information, with the use of necessary technologies. Advance free, creative and causative thinking.

## PREREQUISITES
-

## TEACHING METHODS
Lectures using PowerPoint slides, Distance Learning using e-class platform.
| ASSESSMENT METHODS | Written final examination (80%):  
|                   | - Multiple-choice questions  
|                   | - Short Answers  
|                   | - Laboratory Work  
|                   | Atomic / group project work (20%) |

| LANGUAGE OF INSTRUCTION / EXAMS | Greek |

<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Αναγνώριση Προτύπων Και Μηχανική Μαθηση, C.M. Bishop, Έκδοση: 1/2019.</td>
</tr>
<tr>
<td>2. Μηχανική Μαθηση, Κωνσταντινος Διαμανταρας, Δημητρης Μποτσης, Έκδοση: 1η/2019.</td>
</tr>
<tr>
<td>3. Νευρωνικά Δίκτυα και Μηχανική Μάθηση, Haykin Simon, Έκδοση: 3η έκδ./2010.</td>
</tr>
<tr>
<td>4. Αναγνώριση Προτύπων, Theodoridis S., Έκδοση: 1η έκδ./2011.</td>
</tr>
</tbody>
</table>

**GEOGRAPHIC INFORMATION SYSTEMS**
G.I.S. can be applied to spatial dynamics using and analyzing Geographical Information of Databases, Digital Cartography and Visualization of spatial data. The principal course target is to acquire theoretical knowledge of G.I.S. in a way to understand possibilities and restrictions of G.I.S. software.

Course Parts:
1. Basic concepts of G.I.S. Vector (Point, Line, Polygon) and Raster data.
2. Introduction to free G.I.S. software. Spatial data insertion (Vector, Raster).
3. Introduction to cartography and mapping in a G.I.S.: map creation in different scales, basic concepts: thematic map, scale, projections and coordinate systems.
4. Georeference in G.I.S. Georeference of Raster data.
5. Digitize in a G.I.S. New layer creation using QGIS freeware with thematic map Raster data support.
7. Analytic spatial processes: select by location, select by attributes.
8. Proximity Analysis with buffer zones.
10. Digital Elevation Model (D.E.M.)
11. 3D applications.
12. Spatial Analysis and G.I.S.
13. Course overview. Preparation for the final exam.
**Learning Outcomes / General Competences**


The course introduces the potential to import, create, manage, update and correct Geographical databases.

With course completion the student will be able to:

- Create Vector Geographical Data of high spatial precision.
- Compare and evaluate existing Geographical Data.
- Analyze and adapt Geographical Data according to concrete prescription and need.
- Organize and add value to Geographical Data transforming them to Geographical Information.
- Combine Geographical Data with external Databases.
- Transform Geographical Coordinates from one Georeference System to another.

In general, with course completion, students will be able to apply G.I.S. in different domains (urban and natural environment, civil and military uses, national and international cooperation’s).

<table>
<thead>
<tr>
<th><strong>Prerequisites</strong></th>
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<tbody>
<tr>
<td><strong>Teaching Methods</strong></td>
<td>In real time, face to face.</td>
</tr>
<tr>
<td><strong>Assessment Methods</strong></td>
<td>70% Final Theory Exams, 30% Semester Assignment.</td>
</tr>
<tr>
<td><strong>Language of Instruction/Exams</strong></td>
<td>Greek</td>
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<tr>
<td>RECOMMENDED BIBLIOGRAPHY</td>
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<tr>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>- Recommended Book Resources:</td>
<td></td>
</tr>
<tr>
<td>3. Τσούλος, Λ., Σκοπελίτη, Α., Στάμου, Λ. 2015. Χαρτογραφική σύνθεση και απόδοση σε ψηφιακό περιβάλλον. [ηλεκτρ. βιβλ.]</td>
<td></td>
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<tr>
<td>4. Φαρασλής Ι. Πανεπιστήμιο Θεσσαλίας, Πολυτεχνική Σχολή ΤΜΧΠΠΑ, 2012. Σημειώσεις: Γεωγραφικά Συστήματα Πληροφοριών και χαρτογράφηση φυσικών πόρων</td>
<td></td>
</tr>
<tr>
<td>- Recommended Article/Paper Resources:</td>
<td></td>
</tr>
<tr>
<td>5. International Journal of Geographical Information Science</td>
<td></td>
</tr>
<tr>
<td>6. <a href="https://www.tandfonline.com/toc/tgis20/current">https://www.tandfonline.com/toc/tgis20/current</a></td>
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CONSTRAINT PROGRAMMING
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<tr>
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<td>ECTS CREDITS</td>
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<td>COURSE WEBSITE (URL)</td>
<td><a href="https://eclass.uowm.gr/courses/ECE394/">https://eclass.uowm.gr/courses/ECE394/</a></td>
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<td>TEACHING WEEKLY HOURS</td>
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<tr>
<td>INSTRUCTORS</td>
<td>Stergiou K.</td>
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<tr>
<td>COURSE CONTENTS</td>
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<tr>
<td></td>
<td>Constraint Satisfaction Problems (CSPs)</td>
</tr>
<tr>
<td></td>
<td>binary and non-binary constraints,</td>
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<td>problem modeling,</td>
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<td>local and global consistency, arc consistency, basic arc consistency algorithms,</td>
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<td></td>
<td>solving CSPs by backtracking,</td>
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<td>forward checking algorithm,</td>
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<td>maintaining arc consistency algorithm,</td>
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<td>local search,</td>
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<td>key characteristics of constraint solvers,</td>
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<td></td>
<td>global constraints,</td>
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<td></td>
<td>programming constraint solvers,</td>
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<tr>
<td></td>
<td>optimization problems, case studies of real combinatorial problems.</td>
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</table>
**LEARNING OUTCOMES / GENERAL COMPETENCES**

The expected learning outcomes are the following:

1. Understanding basic concepts of constraint satisfaction problems and constraint programming.
2. Understanding methods of solving constraint satisfaction problems.
3. Gain experience in programming constraint solvers.
5. Development of problem-solving skills.

Upon successful completion of the course, students will:

1. understand the basics of constraint programming
2. know how to implement key algorithms for solving constraint satisfaction problems
3. have gained experience in programming constraint solvers
4. have gained experience in the use of constraint programming to solve real combinatorial problems

**PREREQUISITES**

- 

**TEACHING METHODS**

Face to face

**ASSESSMENT METHODS**

The evaluation is done through:

1. written examination at the end of the semester that includes short answer questions and resolution of exercises
2. scoring the report and the code of the projects carried out during the semester
3. oral presentation of the projects carried out during the semester

The evaluation criteria are as follows:

- correctness
- clarity
- accuracy
- efficiency

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
<table>
<thead>
<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
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<tbody>
<tr>
<td>- Recommended Article/Paper Resources:</td>
<td>Constraints, Artificial Intelligence, Journal of Artificial Intelligence Research, Annals of Mathematics and Artificial Intelligence</td>
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9TH SEMESTER – DIVISION OF COMPUTERS & ELECTRONICS
DESIGN AND OPERATION OF COMPUTER NETWORKS
**COURSE UNIT CODE**  
YH2

**COURSE UNIT TYPE**  
Specialization

**LEVEL OF STUDY**  
Undergraduate

**YEAR OF STUDIES**  
5th

**SEMESTER**  
9th

**ECTS CREDITS**  
5

**COURSE WEBSITE (URL)**  
[www.e-class.uowm.gr/courses/ICTE279/](http://www.e-class.uowm.gr/courses/ICTE279/)

**TEACHING WEEKLY HOURS**  
4

**INSTRUCTORS**  
Lazaridis V.

**COURSE CONTENTS**  

**LEARNING OUTCOMES / GENERAL COMPETENCES**  
Upon successful completion of this course, students will be able to:

- understand modern techniques, protocols, and applications across the area of computer networks.
- investigate, analyze, and document the core issues and requirements in building effective computer networks.
- adapt their knowledge to new and emerging technologies, such as MPLS, cloud computing, as well as modern Internet technologies such as IPv6, Internet of Things, etc., based on a solid understanding of the underpinning principles.

**PREREQUISITES**  
-

**TEACHING METHODS**  
Lectures, laboratory sessions

**ASSESSMENT METHODS**  
Written exam (70%)  
Laboratory exam (30%)

**LANGUAGE OF INSTRUCTION / EXAMS**  
Greek
RECOMMENDED BIBLIOGRAPHY

1. Andrew S. Tanenbaum, Δίκτυα Υπολογιστών, 4η έκδοση, Εκδόσεις Κλειδάριθμος.
2. William Stallings, Επικοινωνίες Υπολογιστών και Δεδομένων, 6η έκδοση, Εκδόσεις Τζιόλα.
3. Douglas Comer, Διαδίκτυα και Δίκτυα Υπολογιστών, 4η έκδοση, Εκδόσεις Κλειδάριθμος.
4. Douglas Comer, Διαδίκτυα με TCP/IP (Α Τόμος), 4η έκδοση, Εκδόσεις Κλειδάριθμος.
5. Jean Walrand, Δίκτυα Επικοινωνιών, Εκδόσεις Παπασωτηρίου.

WEB PROGRAMMING
<table>
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<td><strong>INSTRUCTORS</strong></td>
<td>Lazaridis V.</td>
</tr>
<tr>
<td><strong>LEARNING OUTCOMES / GENERAL COMPETENCES</strong></td>
<td>The course focuses on web technologies, with emphasis on web systems and applications programming. Initially, students review the technologies in the fields of computer networks, internet, world-wide-web, web-browsers, and webservers. Students are introduced to full stack development. They become familiar with the development of both static web pages, using HTML and CSS scripting, and dynamic web pages and web applications using server-side scripting with PHP, and MySQL databases, secure PHP scripting, client-side scripting with Javascript, and asynchronous data exchange AJAX, XML, and JSON. Students will be able to develop full stack web applications.</td>
</tr>
<tr>
<td><strong>PREREQUISITES</strong></td>
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</tr>
</tbody>
</table>
| **TEACHING METHODS** | • Face-to-face  
|                      | • Laboratory exercises  
|                      | • Possibility of remote courses |
| **ASSESSMENT METHODS** | • Language of evaluation: Greek/English  
|                       | • Formative assessment  
|                       | • Multiple choice tests  
|                       | • Short-answer questions  
|                       | • Laboratory work  
|                       | • Oral exam |

| **LANGUAGE OF INSTRUCTION/EXAMS** | Greek |

| **RECOMMENDED BIBLIOGRAPHY** | - Recommended Book Resources:  

**ADVANCED TOPICS OF DIGITAL DESIGN**
**COURSE UNIT CODE**  E23

**COURSE UNIT TYPE**  Specialization

**LEVEL OF STUDY**  Undergraduate

**YEAR OF STUDIES**  5th

**SEMESTER**  9th

**ECTS CREDITS**  5

**COURSE WEBSITE (URL)**  [https://eclass.uowm.gr/courses/ECE378](https://eclass.uowm.gr/courses/ECE378)

**TEACHING WEEKLY HOURS**  4

**INSTRUCTORS**  Asimopoulou N.

**COURSE CONTENTS**

- Hardware description languages. The VHDL language, levels of behavior and structure. Design of advanced combinatorial and sequential digital circuits using the VHDL language.
- Design of memories, processors. Logical and temporal simulation.
- Programming of embedded cores. VHDL material description language for SoC design.
- Laboratory exercises in VHDL, programming and
Upon successful completion of the course, students gain knowledge and understanding of the following topics:

- the importance of using hardware description languages (HDLs),
- increasing productivity with HDLs,
- the design workflow in reprogrammable logical structures,
- the proper use of the VHDL language in digital design,
- programming internal processor cores in an FPGA,
- modern applications of Hardware Description languages.

Upon successful completion of the laboratory department of the course, students gain knowledge and understanding of the following issues:

- advantages of VHDL language over schematic description,
- writing and debugging in VHDL language,
- correct use of all VHDL commands,
- logical simulation of digital circuits,
- synthesis in FPGAs and CPLDs,
- estimation of time delays in digital circuits,
- transferring the design to FPGAs and CPLDs,
- communicating with the reprogrammable devices.

**PREREQUISITES**

Digital Design

**TEACHING METHODS**

In class lectures and laboratory exercises
Possibility of distance learning

**ASSESSMENT METHODS**

Laboratory Exercises 50%
Final Examination 50%

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
**MICROTECHNOLOGY AND NANOTECHNOLOGY**

<table>
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<td>TEACHING WEEKLY HOURS</td>
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</table>

**INSTRUCTORS**

**COURSE CONTENTS**

- Introduction to Microtechnology and Nanotechnology.
- Historical background of micro- and nano-scale.
- Machinery, tools and implements used in nanoscience.
- Fabrication technology for Integrated Circuits and high-quality clean room processes.
- Advanced microtechnology and nanotechnology applications (Biology, Medicine, BioMEMS, Space, Environment, Communications, Electronics and Sensors, Energy and Materials).
- Examples of Nanoelectronics applications and recent research advances, such as organic electronics, graphene.
- Nanotechnology legislation (Nanotoxicity/Public Policy).
- Future nanotechnology prospects and applications.
**LEARNING OUTCOMES / GENERAL COMPETENCES**

Students acquire a set of thorough knowledge upon the fundamentals and the main applications of microtechnology and nanotechnology. Students become familiar with the terms, the concepts and the basic tools used in contemporary development and fabrication processes of relevant products and research efforts in the field of nanoscience / nanotechnology for engineering applications. The description of several findings could modify students’ understanding on the operating mode of micro-nanoscale and lead them to focus their own creative energy on facing important challenges in the field of engineering by comprehending and giving answers to existing questions. The students acquire a theoretical background that is useful for their future post-graduate studies.

**PREREQUISITES**

- 

**TEACHING METHODS**

- Face-to-face
- Possibility of synchronous distance learning

**ASSESSMENT METHODS**

- Presentation (20-25 slides) and written essay (2500 words) of three essays with different content.
- Final course grade (100%): Final written theory examination = 40% and Final essays grade (average grade) = 60%

**LANGUAGE OF INSTRUCTION/EXAMS**

- Greek and English

**RECOMMENDED BIBLIOGRAPHY**


**Fuzzy Systems**
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
<th>EYH4</th>
</tr>
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<tbody>
<tr>
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<td><a href="https://eclass.uowm.gr/courses/ECE388/">https://eclass.uowm.gr/courses/ECE388/</a></td>
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</tr>
<tr>
<td>INSTRUCTORS</td>
<td>Fragulis G.</td>
</tr>
</tbody>
</table>
### LEARNING OUTCOMES / GENERAL COMPETENCES

1. Comprehending the principles underlying the various processes involved in fuzzy systems: linguistic descriptions, fuzzy IF/THEN rules, rules of inference.
2. For a given problem the student should be able to formulate a suitable fuzzy rule base, select the implication operators, the fuzzification and the de-fuzzification strategies.
3. In regard to control tasks, the student should be able to develop the proper controller structure, formulate its fuzzy rule base and select suitable gain parameters for optimal system’s response.
4. In regard to fuzzy modeling for prediction tasks, design the appropriate fuzzy model and implement the parameters learning algorithm.
5. Comprehending the principles of fuzzy clustering and deal with applications to data classification.
6. Understanding the principle, structures and learning techniques involved in NNs.
7. Examining NNs of various structures, the relevant training techniques, and their applications to control, modeling and classification problems.
8. Integration of fuzzy systems and neural network models.

### PREREQUISITES
- 

### TEACHING METHODS
- Lectures using PowerPoint slides, Distance Learning using e-class platform.

### ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Written final examination (80%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Multiple-choice questions</td>
</tr>
<tr>
<td>- Short Answers</td>
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<tr>
<td>- Laboratory Work</td>
</tr>
</tbody>
</table>

Atomic / group project work (20%)

### LANGUAGE OF INSTRUCTION/EXAMS
Greek

### RECOMMENDED BIBLIOGRAPHY

1. Ευφυής έλεγχος, Κινγκ Ρ.
2. Εισαγωγή στην ασαφή λογική (Fuzzy Logic), Θεοδώρου Γιάννης Α.
3. ΑΣΑΦΗ ΣΥΝΟΛΑ, ΠΑΠΑΔΟΠΟΥΛΟΣ ΒΑΣΙΛΗΣ, ΜΠΟΤΖΩΡΗΣ ΓΕ-ΩΡΓΙΟΣ

### COMPILERS
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<thead>
<tr>
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<td><strong>SEMESTER</strong></td>
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<tr>
<td><strong>COURSE WEBSITE</strong></td>
<td><a href="https://eclass.uowm.gr/courses/ICTE345/">https://eclass.uowm.gr/courses/ICTE345/</a></td>
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<tr>
<td><strong>TEACHING WEEKLY HOURS</strong></td>
<td>4</td>
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<tr>
<td><strong>INSTRUCTORS</strong></td>
<td>Bibi S.</td>
</tr>
</tbody>
</table>
COURSE CONTENTS

Introduction to programming phases, Dictionary structure of programming languages, Lexical analysis, Regular expressions, Deterministic finite automata, Code generators, Syntax of programming languages, Syntax analysis: top-down and bottom-up analysis, Symbol table, Semantic analysis, Grammar of semantic properties and symbol table, Code generation-synthesis: intermediate code and machine code, Data display in memory.

Course modules:

- Section 1: Introduction to Compilers, Basic Compilation Phases, Types of Programming Languages, Compiler Technologies, Translators, Pre-Processors, Interpreters, Figure T
- Section 2: Lexical Analysis, Basic Definitions, Regular Expressions, Flex Tool
- Section 3: Lexical analysis, Deterministic Finite automata
- Section 4: Syntax analysis, Grammar, Top-down analysis, LL (1) parser, First-Follow sets, parsing table
- Section 5: Syntax Analysis, Bottom-up Analysis, LR parser, Closure sets, goto and action tables
- Section 6: Syntax Analysis, right, left sentence generation, BYACC tool
- Section 7: Semantic analysis, grammar of properties
- Section 8: Semantic analysis, translation scheme, symbol table.
- Section 9: Intermediate Representation, Graphic Representations, Decorated Trees, tuples, stacks
- Section 10: Intermediate representation, 3-address code
- Section 11: Code Optimization
- Section 12: Generating Machine Code
- Section 13: Display of data types and structures

LEARNING OUTCOMES / GENERAL COMPETENCES

Upon the successful completion of the course students are expected to:

Be able to compare the characteristics of programming languages through a critical approach

Understand conflicting programming language design options and how several choices affect the language acceptance

Understand the trends in the use of programming and be prepared for new programming methods, templates and tools

Familiarize with the whole programming language design cycle

Gain compiler implementation experience
<table>
<thead>
<tr>
<th><strong>PREREQUISITES</strong></th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEACHING METHODS</strong></td>
<td>Face to Face</td>
</tr>
</tbody>
</table>
| **ASSESSMENT METHODS** | The evaluation of students is carried out with:  
  • Written evaluation  
  • Progress exam  
  • Team work  
  The written evaluation is intended to examine the students' knowledge of the taught material and to capture the degree of its assimilation. Includes multiple choice questions, free questions but also short answers.  
  The written progress exam aims to establish the degree of familiarity of students with the subject of the course in the middle of the semester.  
  The team work is done in groups of 2 people and includes the development of a compiler section for a specific language, the grammar of which is given in. The first work concerns lexical and syntactic analysis while the next concerns semantic analysis.  
  The final evaluation of the students is as follows:  
  70% Written examination grade + 20% Progress grade + 10% Team Work |
| **LANGUAGE OF INSTRUCTION/EXAMS** | Greek |
RECOMMENDED BIBLIOGRAPHY

Books (in Greek)
1. Papaspyrou N., Skordalakis E., Compilers, S.ATHANASOPOULOS.
2. ML Scott, Programming Language Pragmatics, Morgan Kaufmann
4. AV Aho, MS Lam, R. Sethi, JD Ullman, Compilers: Principles, Techniques, and Tools, Addison Wesley

Journals:
6. Computer Languages, Systems and Structures, Elsevier

DATA MINING
<table>
<thead>
<tr>
<th>COURSE UNIT CODE</th>
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<tr>
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<td>INSTRUCTORS</td>
<td>Tsipouras M.</td>
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</tbody>
</table>

### COURSE CONTENTS
- Definition, Reasons for Data Mining, Data Mining Process, Databases & Data Warehouses, Data Pre-processing, Data Mining Techniques & Methods.
- Data, Values & data types, Data properties, Types of data sets – data quality.
- Data pre-processing, Data Summary, Data Purification and Transformation, Quantumization, Sampling, Dimension Reduction, Similarity – Data Distance.
- Similarity & Dissimilarity of Data, Types of similarity / dissimilarity, Distance.
- Similarity Operators, Correlation, Density.
- Data Warehouses, Data Mining Process, Databases, Shape, Content.
- Sorting, K – nearest neighbors’ algorithm, Properties, Education.
- Perceptron, Definition, Artificial Neuron, Linearly Detachable Problem, Properties, Training, Training Algorithm.
- Multilayer perceptron, Definition, Architecture, Properties, Global Convergence, Training, Backpropagation, Training Algorithm.
- Correlation Rules, Frequent Itemsets, Correlation Mining Rules, Frequent Itemsets Calculation, Apriori Algorithm, Complexity Factors.
**LEARNING OUTCOMES / GENERAL COMPETENCES**

The course is the main introductory course in the concepts of Data Mining. The course aims to introduce students to the basic Data Mining Techniques (data, problems, applications). It also refers to introductory concepts of Data Pre-processing, Sorting, Clustering and Correlation Rules, so that the student has a comprehensive understanding of the procedures and methodologies used in Data Mining. In this sense the course is the basis on which specific methodologies and data mining techniques are developed and can be used at postgraduate level. Finally, the aim of the course is for students to understand the importance of data mining in multiple applications as well as its contribution to different scientific fields.

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

- describe the basic principles of D. M. – recognize different approaches to data mining (Unsupervised Learning, Supervised Learning).
- identify and select data preprocessing techniques.
- distinguish concepts of sorting, categorization, and clustering of data.
- discover knowledge through large data warehouses.
- design and develop grouping and sorting algorithms.
- compose correlation rules.
- reconstruct multidimensional data mining problems using dimensional techniques.
- evaluate and compare D. M. algorithms and judge accordingly their suitability for specific problems.

**PREREQUISITES**

- 

**TEACHING METHODS**

- Face to face
- Distance learning

**ASSESSMENT METHODS**

| Assignment (40% of the total mark) and exams (60% of the total mark) |

**LANGUAGE OF INSTRUCTION/EXAMS**

- Greek

**recommended bibliography**

BIOINFORMATICS
<table>
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<td><strong>INSTRUCTORS</strong></td>
<td>Aggelidis P.</td>
</tr>
<tr>
<td><strong>LEARNING OUTCOMES / GENERAL COMPETENCES</strong></td>
<td>The goal of Bioinformatics is the application of computer technology in the management and analysis of biological data. In particular, the aim of the course is for students to deal with the calculation, storage, analysis, graphic representation, simulation / modeling of biological information.</td>
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<tr>
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<td>Lectures Labs Remote</td>
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<td>60% final exam 20% lab test 20% homework</td>
</tr>
<tr>
<td><strong>LANGUAGE OF INSTRUCTION/EXAMS</strong></td>
<td>Greek</td>
</tr>
</tbody>
</table>
**RECOMMENDED BIBLIOGRAPHY**

- Recommended Book Resources:
  1. PANTELIS ANGELIDIS, Medical Informatics volume A, "wisdom", 2011.

**DIGITAL IMAGE PROCESSING**
This course provides an introduction to the applied digital image processing technology through a practical approach. The aim of the course is to cover topics that include:

- The mathematical foundations of image analysis.
- The theory and applications of transformations in two dimensions.
- The design and applications of digital filters.
- The theory and applications of image restoration and encoding.

More advanced applications such as decomposition, waves (wavelets), etc will be covered. Special emphasis will be given to the processing of Digital Medical Image. Through MATLAB basic programming instruction, the student will be given the opportunity to encounter real problems in the field of medical image and see advanced filtering and object detection techniques in medical image. Upon completion of the course, the student will have acquired the necessary knowledge and skills to be able to understand basic principles related to the representation and manipulation of medical digital images, to understand the methods of image processing in both space and frequency domain and finally to understand basic algorithms for restoring medical images.

**PREREQUISITES**

- 

**TEACHING METHODS**

- In-person (and potentially online through a synchronous distance learning platform)

**ASSESSMENT METHODS**

- I. Final theory examination (50%)
- II. Final lab examination (50%)
- III. Project (bonus)

**LANGUAGE OF INSTRUCTION/EXAMS**

- Greek
- Suggested Bibliography:
1. Παπαμάρκος Νικόλαος, Ψηφιακή Επεξεργασία και Ανάλυση Εικόνας, ΝΙΚΟΛΑΟΣ ΠΑΠΑΜΑΡΚΟΥ, 2010.
2. ΙΩΑΝΝΗΣ ΠΗΤΑΣ, ΨΗΦΙΑΚΗ ΕΠΕΞΕΡΓΑΣΙΑ ΕΙΚΟΝΑΣ, ΙΩΑΝΝΗΣ ΠΗΤΑΣ, 2010.

- Related scientific articles:
### Course Details

<table>
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<th><strong>Course Unit Code</strong></th>
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<tr>
<td><strong>Instructors</strong></td>
<td>Ploskas N.</td>
</tr>
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</table>

### Course Contents

- Problems, Algorithms and Computational Complexity.
- Turing Machines.
- Recursive and Recursively Enumerable Languages.
- Special Types and Combinations of Turing Machines.
- Non-deterministic Turing Machines.
- Global Turing machines.
- Church Thesis.
- Undecidability.
- The Halting Problem.
- Rice Theorem.
- Complexity Classes.
- Classes L, NL, P, NP, PSPACE and EXPTIME.
- NP Completeness.
- Cook-Levin Theorem.
<table>
<thead>
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<th>LEARNING OUTCOMES / GENERAL COMPETENCES</th>
<th>Upon successful completion of this course, students will:</th>
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<tbody>
<tr>
<td>• understand and design Turing machines</td>
<td></td>
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<tr>
<td>• understand halting problems</td>
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<td>• understand complexity classes and the classification of problems in these classes</td>
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<tr>
<td>• understand the concept of completeness and be able to solve problems</td>
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<tr>
<td>• understand NP-completeness</td>
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<tr>
<td>• implement algorithms to solve computationally difficult problems</td>
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<tr>
<td>• compose algorithmic ideas for implementing applications</td>
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<table>
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<table>
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<tr>
<th>TEACHING METHODS</th>
<th>• Face-to-Face</th>
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| ASSESSMENT METHODS | The language of evaluation is Greek. The assessment method consists of three assignments (30%) and a final written examination (70%). The final examination includes multiple choice questions, short answer questions, and problem-solving questions. The three assignments require the implementation of algorithms in the C programming language. The above evaluation criteria are posted on the course website. |

<table>
<thead>
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<th>Greek</th>
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<table>
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<tr>
<th>RECOMMENDED BIBLIOGRAPHY</th>
<th>- Recommended Book Resources:</th>
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<tbody>
<tr>
<td>1. Harry Lewis, Christos Papadimitriou, Στοιχεία θεωρίας υπολογισμού, Εκδόσεις Κριτική, Έκδοση: 1η/2005</td>
<td></td>
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<tr>
<td>- Related Scientific Journals:</td>
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<tr>
<td>Algorithmica</td>
<td></td>
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<tr>
<td>Journal of Algorithms</td>
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<td>ACM Transactions on Algorithms</td>
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COMMON ELECTIVE COURSE (ALL SEMESTERS)
SPECIAL ASSIGNMENT
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<td>7th, 8th, 9th</td>
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<tr>
<td>INSTRUCTORS</td>
<td>Faculty members and part-time teachers (responsible: Th. Zygiridis)</td>
</tr>
<tr>
<td>COURSE CONTENTS</td>
<td>Research-related assignment, based on a combination of knowledge acquired from previous semesters.</td>
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<tr>
<td>LEARNING OUTCOMES / GENERAL COMPETENCES</td>
<td>Upon successful completion of this course, students will:</td>
</tr>
<tr>
<td></td>
<td>- become more familiar with the research process,</td>
</tr>
<tr>
<td></td>
<td>- acquire experience in searching and analyzing the relevant literature,</td>
</tr>
<tr>
<td></td>
<td>- become familiar with combining knowledge from different subjects,</td>
</tr>
<tr>
<td></td>
<td>- familiarize with applying theoretical knowledge,</td>
</tr>
<tr>
<td></td>
<td>- proceed with the critical analysis of research results,</td>
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<tr>
<td></td>
<td>- gain experience in working and obtaining results under specific deadlines,</td>
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<td></td>
<td>- gain experience in writing structured technical reports,</td>
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<tr>
<td></td>
<td>- be familiar with the type of work that will be required for the diploma thesis.</td>
</tr>
</tbody>
</table>

| PREREQUISITES | - |
| TEACHING METHODS | - No lectures are conducted |
## Assessment Methods
Summative evaluation of the final thesis, written in Greek. The evaluation is based on the degree of achievement of the objectives set initially, and the quality of the deliverable report. If deemed necessary by the supervisor, an oral and/or a public presentation is conducted.

## Language of Instruction/Exams
Greek

## Recommended Bibliography
Bibliography depends on the content of the selected research project.

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### 7th Semester – Free Elective Courses
RESEARCH, TECHNOLOGY AND INNOVATION POLICY
COURSE UNIT CODE: E7
COURSE UNIT TYPE: Free elective
LEVEL OF STUDY: Undergraduate
YEAR OF STUDIES: 4th
SEMESTER: 7th
ECTS CREDITS: 5
COURSE WEBSITE (URL): https://ece.uowm.gr/courses.php?view_course=76
TEACHING WEEKLY HOURS: 4
INSTRUCTORS: Samara E.

COURSE CONTENTS:
The content of the course includes:
• Innovation and competitiveness
• Innovation as a management process
• Innovation Systems
• Technological entrepreneurship
• Entrepreneurship and innovation practices
• Research, Technology and Innovation Policies in America, Europe and Greece
• Measuring indicators of innovation
• Development of the Business Canvas
• Financial Tools
• Writing and Developing a Business Plan
This course aims to contribute to meeting the training needs of modern innovation and entrepreneurship techniques and places particular emphasis on the detailed presentation of successful business practices. The material of this course is divided into two parts as follows: The first deals with the process of innovation and its relationship with knowledge, learning and creativity, while the second part with entrepreneurship and its interdependencies with innovation and various systems, innovation policies, with particular emphasis on drawing up and developing a business plan.

At the end of the course the student will be able to:

- List the types of innovation.
- Describe the concepts of attitude, momentum and innovation performance.
- Name the difference between innovation and invention.
- Describe the types and characteristics of innovation.
- Apply the standards of the innovation process.
- Recognize innovation systems.
- Recognize the types of entrepreneurship.
- To select appropriate financial tools for entrepreneurship.
- Compare innovation policies.
- Write a business plan.

**LEARNING OUTCOMES / GENERAL COMPETENCES**

**PREREQUISITES**

- 

**TEACHING METHODS**

Lectures (13 wks x 4 hrs theory) and two obligatory homework projects.

**ASSESSMENT METHODS**

100% evaluation of homework business plan.

More specifically, students are graded by delivering the business plan in a word format and by delivering a PowerPoint pitching presentation of their business plan. The presentation process is open and involves evaluators from the business, academic and financial worlds.

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek

**RECOMMENDED BIBLIOGRAPHY**

2. Επιχειρηματικότητα και Κοινωνική Οικονομία, Έκδοση: 1η/2017, Συγγραφείς: Σαρρή Κατερίνα, Τριχοπούλου Άννα,
QUALITY CONTROL
**COURSE UNIT CODE**  | E6  
---|---  
**COURSE UNIT TYPE**  | Free elective  
**LEVEL OF STUDY**  | undergraduate  
**YEAR OF STUDIES**  | 4<sup>th</sup>  
**SEMESTER**  | 7<sup>th</sup>  
**ECTS CREDITS**  | 5  
**COURSE WEBSITE (URL)**  | [https://ece.uowm.gr/courses.php?view_course=64](https://ece.uowm.gr/courses.php?view_course=64)  
**TEACHING WEEKLY HOURS**  | 4  
**INSTRUCTORS**  | Not Available  
**LEARNING OUTCOMES / GENERAL COMPETENCES**  | The course presents systematically the modern methods of quality assurance placing special emphasis on the techniques of Statistical Quality Control (SQC). After the completion of the course the students should be able to handle and solve problems related to control and assurance of quality of products and processes by means of scientifically rigorous quantitative methods.  
**PREREQUISITES**  | -  
**TEACHING METHODS**  | Lectures  
**ASSESSMENT METHODS**  | Final written exam (compulsory), Intermediate written exam (optional)  
**LANGUAGE OF INSTRUCTION/EXAMS**  | Greek  
ENGLISH III (ACADEMIC WRITING)
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<td>INSTRUCTORS</td>
<td>Tavoultzidou S.</td>
</tr>
</tbody>
</table>

**COURSE CONTENTS**

- Paraphrasing techniques to avoid plagiarism
- Cause & Effect
- Comparing & Contrasting
- Drawing conclusions
- Paragraph Organisation (Definition, Generalization/Specialization, Clarification, Use / Utilization of Examples, Classification, Description)
- Text Composition (content cohesion and coherence, common mistakes)
- Describing Graphs and Trends
- Writing Introductions and Conclusions
- Discussing Results
- Describing Processes and Methods
- Referring to Sources
- Being Critical and Evaluating
Upon successful completion of the course students will be able to:

- identify Academic discourse characteristics and style, as well as the main academic genres, i.e., scientific article, thesis, etc.
- apply writing skills and strategies employed for writing and editing a text, i.e., paragraph structure, content, consistency, cohesion, coherence, syntactic structures, specialist lexis, punctuation
- apply academic skills to write academic discourse (scientific texts, reports, descriptions, research papers, theses, etc.)
- use the relevant literature

The main concern of the course is to enhance students’ writing skills, critical thinking, linguistic and intercultural awareness required to meet:

- their needs as Electrical and Computer Engineering students at undergraduate level
- their needs regarding postgraduate studies, European Programmes (Erasmus+, etc.)
- their career pursuits as electrical and computer engineers, or academic researchers in a national, international, or interdisciplinary environment

<table>
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<th>PREREQUISITES</th>
<th>Required Level of English: B2 in accordance with the Joint European Framework for Modern Languages</th>
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<tr>
<td>TEACHING METHODS</td>
<td>• Face-to face</td>
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<td>• Synchronous distance learning (zoom), if required</td>
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<td>ASSESSMENT METHODS</td>
<td>• End-semester exams test (60%)</td>
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<td>• Mid-semester test (20%)</td>
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<td>• Project (20%) – Oral presentation/written project</td>
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<td>RECOMMENDED BIBLIOGRAPHY</td>
<td>1. Integrating Technical &amp; Academic Writing into your English Course - Theory and Practice - Κωδ. Βιβλίου Εύδοξο: 86199178 Έκδοση: 1η/2019, Συγγραφείς: E. Panourgia</td>
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<td></td>
<td>2. University Writing Course Student's Book with answers, Κωδ. Βιβλίου στον Εύδοξο: 10686, Έκδοση: 1η έκδ./2007, Morley John, Doyle Petropolis Ian</td>
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<td>3. Ακαδημαϊκή γραφή, Κωδ. Βιβλίου στον Εύδοξο: 68391268, Έκδοση: 3η/2017, Ευδωρίδου Έλσα -Καρακασίδης Θόδωρος</td>
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PROJECT MANAGEMENT
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<tr>
<td><strong>COURSE CONTENTS</strong></td>
<td>Project: notion, features and project types. Main factors and variables that affect the operation, implementation and success of a project. Environment and groups that affect the implementation of a project. Project’s lifecycle. Association of cost, quality, added value and lifecycle. Selection criteria and project’s evaluation techniques. Project planning, management and operation. Work, Product, Cost and Organization Breakdown Structure. Project resources. Actions, milestones and time-scheduling. Reticular analysis: AOA and AON, CPM and PERT. Time, cost, and project compression. Budget composition and observation. Fundamental project implementation observation indices: CPI (Cost Performance Index) and SPI (Schedule performance Index).</td>
</tr>
</tbody>
</table>
Upon successful completion of the course, students will be able to:

- Recognize what a project is, distinctive features of a project and its’ importance for companies and organizations
- Understand the importance of the complexity and variability of the implementation environment of a project and the profit groups for the successful beginning, implementation and delivery of it
- Recognize the relation between cost, time and quality of a project
- Recognize the crucial factors and variables that affect the successful completion of a project
- Use the techniques and methodologies for the evaluation, selection and rejection of a project
- Comprehend the importance of the project’s lifecycle and the way this contributes to the successful observation and implementation
- Be acquainted with the tools and methodologies for the project’s organization, time-scheduling, observation and management
- Learn and use the methods for composing, observing and studying a project budget and the financial dimensions, in general
- Define the CPI and SPI indices, interpret them and make decisions on the project implementation
OPERATIONS RESEARCH
### COURSE UNIT CODE
E36

### COURSE UNIT TYPE
Specific background

### LEVEL OF STUDY
undergraduate

### YEAR OF STUDIES
4th

### SEMESTER
8th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
[https://eclass.uowm.gr/courses/ICTE318/](https://eclass.uowm.gr/courses/ICTE318/)

### TEACHING WEEKLY HOURS
4

### INSTRUCTORS
Kyriakidis T.

### COURSE CONTENTS
- Introduction
- Operations Research applications
- Mathematical modeling of Linear Programming (LP) problems
  - Graphical solution for LP problems
  - Simplex method
  - Interpretation, sensitivity analysis, special cases
  - LP problem solving using computer software (lindo, lingo, EXCEL solver).
- Dual problem
- Integer programming
- Branch and Bound algorithm.
- Transportation problems
- Network problems
- Project scheduling
- Decision support theory
- Inventory management
The course introduces students to the basics of Quantitative Analysis. Special emphasis is given to optimization techniques for the planning, design and synthesis of production processes and systems. The course also includes the examination of case studies that lead to a better understanding of the theory and prepare the students in modeling process optimization problems. Upon completion of the course students will be able to use decision-making tools for systems such as inventory management techniques, equipment maintenance, quality control, demand forecasting and production planning, as well as their interactions with external factors and will be able to:

- understand the basic mathematical programming (Linear and Nonlinear) concepts and methods,
- model real-world operational problems by the development of appropriate mathematical programming models,
- solve mathematical programming models by employing the appropriate operations research methodologies and algorithms,
- handle data and solve mathematical programming models using computer software,
- perform sensitivity analyses on the results of operations research problems,
- interpret the results of an operations research problem's solution.

**PREREQUISITES**

Statistics

**TEACHING METHODS**

- Lectures and lab exercises.
- Asynchronous distance learning through the eclass platform.

**ASSESSMENT METHODS**

Intermediate written exam (optional)

Final written exam (compulsory): Problem solving

**LANGUAGE OF INSTRUCTION/EXAMS**

Greek
**RECOMMENDED BIBLIOGRAPHY**

- **Recommended Book Resources:**
  1. Επιχειρησιακή Έρευνα, Παντελής, Υψηλάντης
  2. Εισαγωγή στην Επιχειρησιακή Έρευνα, Κολέτσος Ιωάννης, Στογιάννης Δημήτρης
  3. Εισαγωγή στην Επιχειρησιακή Έρευνα, 10η Έκδοση, Taha A. Hamdy
  4. ΠΟΣΟΤΙΚΗ ΑΝΑΛΥΣΗ ΓΙΑ ΤΗ ΛΗΨΗ ΔΙΟΙΚΗΤΙΚΩΝ ΑΠΟΦΑΣΕΩΝ ΤΟΜΟΣ Α’, ΟΙΚΟΝΟΜΟΥ ΓΕΩΡΓΙΟΣ, ΓΕΩΡΓΙΟΥ ΑΝΔΡΕΑΣ
  5. Διοικητική επιστήμη, Anderson David R., Sweeney Dennis J., Williams Thomas A., Martin Kipp
  6. Επιχειρησιακή Έρευνα και Βελτιστοποίηση για Μηχανικούς, Καρλαύτης Μ., Λαγαρός Ν.
  7. Schaum’s ΕΠΙΧΕΙΡΗΣΙΑΚΗ ΕΡΕΥΝΑ, RICHARD BRONSON, GOVINDASAMI NAADIMUTHU

- **Recommended Article/Paper Resources:**
  1. European Journal of Operational Research,
  2. Computers & Operations Research,
  3. Omega,
  4. Computers and Chemical Engineering
<table>
<thead>
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<td>Tsalikakis A.</td>
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<td>COURSE CONTENTS</td>
<td>The concept of Business and Organization, the reasons for creation and their importance. Operating environment and resources (physical, financial and human) of businesses. Basic principles and functions of management: Planning, Organization, Management and Control. Targeting: Identification, evaluation, prioritization and criteria for success of objectives. Relationship between planning and control. Planning and decision making. Procedure, stages, risk and uncertainty of decision making. Decision-making environment, types of decisions and factors that influence the process.</td>
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The course introduces students to the concept of business, organization and their operating principles. Emphasizes the importance of the environment (internal and external) in which they operate and make decisions. Through lectures and targeted case studies they will understand basic concepts and tools useful for their life and studies.

Upon completion of the course students will be able to:

• know what planning and organization are as well as their importance in their personal and professional life.

• Understand the importance of the operating environment of organizations, of its complexity and variability, and how this affects the operation of businesses and decision making.

• know and apply the basic functions of the administration

• know the importance of the goals, how they are prioritized and evaluated as well as the factors that influence their successful implementation.

• understand the importance of decision making and the risk involved

• Implement the decision-making process and understand the factors that affect it

**PREREQUISITES**
- **TEACHING METHODS**
  Face to face

**ASSESSMENT METHODS**
Final exam (100%)

**LANGUAGE OF INSTRUCTION/EXAMS**
Greek

**RECOMMENDED BIBLIOGRAPHY**
1. ΟΡΓΑΝΩΣΗ ΚΑΙ ΔΙΟΙΚΗΣΗ ΕΠΙΧΕΙΡΗΣΕΩΝ, ΜΑΝΤΖΑΡΗΣ ΙΩΑΝΝΗΣ
2. ΜΑΝΑΤΖΜΕΝΤ, Μπουραντάς Δημήτρης
3. ΜΑΝΑΤΖΜΕΝΤ ΑΡΧΕΣ ΔΙΟΙΚΗΣΗΣ ΕΠΙΧΕΙΡΗΣΕΩΝ, ΧΥΤΗΡΗΣ Σ. Λ.
4. Αποφάσεις - Λήψη Αποφάσεων, Δημητρόπουλος Ευστάθιος
9TH SEMESTER – FREE ELECTIVE COURSES
NON-DESTRUCTIVE TESTING
### COURSE UNIT CODE
EH6

### COURSE UNIT TYPE
Free elective

### LEVEL OF STUDY
undergraduate

### YEAR OF STUDIES
5th

### SEMESTER
9th

### ECTS CREDITS
5

### COURSE WEBSITE (URL)
https://ece.uowm.gr/courses.php?view_course=190

### TEACHING WEEKLY HOURS
4

### INSTRUCTORS
Not Available

### COURSE CONTENTS
Non-destructive testing of materials and structures. Radiographic method, ultrasound method, electromagnetic methods (dielectric, magnetic leak), magnetic particle and liquid penetration methods, visual inspection, thermography method and other methods. International standards and specifications

### LEARNING OUTCOMES / GENERAL COMPETENCES
Upon successful completion of the course, the student will:
- has understood the phenomenon of each recognized Non-Destructive Control method,
- can perform simple laboratory tests with at least 4 methods (Magnetic, Penetrating, Diurnal, Ultrasonic),
- can interpret industrial radiographs,
- can evaluate the application and expected errors in the test sample,
- can choose the appropriate method of Non-Destructive Control,
- can interpret specifications,
- can write simple non-destructive reporting reports,
- develops problem solving capability and through the evaluation

### PREREQUISITES
-

### TEACHING METHODS
Lectures, Lab exercises

### ASSESSMENT METHODS
Final exam 100%

### LANGUAGE OF INSTRUCTION/EXAMS
Greek
1. Βιβλίο στον Εύδοξο [320267]: ΜΗ ΚΑΤΑΣΤΡΟΦΙΚΟΙ ΕΛΕΓΧΟΙ, ΘΕΟΔΩΡΟΣ ΜΑΤΙΚΑΣ, ΔΗΜΗΤΡΙΟΣ ΑΓΓΕΛΗΣ
COMPUTERS AND EDUCATION
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<td>Lazaridis V.</td>
</tr>
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<td>TEACHING WEEKLY HOURS</td>
<td>4</td>
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</tbody>
</table>

**COURSE CONTENTS**

Development of student activities that will utilize: a. modern technological tools (educational software, software tools of general and special use, multimedia/hypermedia tools) b. Internet and WWW services, tools and applications c. mobile technologies and their relevant applications. Evaluation of pedagogical/teaching methods. They shall have the ability to evaluate User Interface of educational applications, as well as the learner-learning results (teaching effectiveness).

**LEARNING OUTCOMES / GENERAL COMPETENCES**

Upon completion of course, students will be able to:

- Define Educational Technology and describe the past and the present of the area as well as the factors that affect it.
- State arguments that advocate for the use of technology in education.
- Define the general categories of technological resources (hardware and software) that can be utilized in Education.
- Know the teaching practices and strategies.
- Integrate technology that reflects the instructional and constructive approaches to teaching and learning.
- Design strategies of technology integration in education, realize them and design action research which will evaluate the effect of those strategies.

**PREREQUISITES**

- 

**TEACHING METHODS**

- Face to face
- Contemporary distance learning available
<table>
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<tr>
<th>ASSESSMENT METHODS</th>
<th>Assessment method: Multiple-choice tests</th>
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<tr>
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<td>Greek</td>
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| RECOMMENDED BIBLIOGRAPHY  | 1. Γρηγοριάδου, Μ., κ.α. (2009). Διδακτικές Προσεγγίσεις και Εργαλεία για τη διδασκαλία της Πληροφορικής. Εκδ. Κλειδάριθμος  

**OPTIONAL COURSES**
RESEARCH METHODOLOGIES AND SCIENTIFIC WRITING
<table>
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<td><strong>INSTRUCTORS</strong></td>
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</table>
COURSE CONTENTS

The syllabus of the course includes the following lessons:

• 1st Lesson: «Introduction to scientific research»
  Characteristics of scientific research, types of research, discrimination of research types, stages of scientific research

• 2nd Lesson: «Key parts of research reports: Research hypotheses»
  Selection of the research topic, the title of the research, introduction, identification and importance of the problem, the purpose of the research

• 3rd Lesson: «Key parts of research reports: Structure»
  Literature review, design of experiments, results, conclusions, suggestions for further research, references, appendixes

• 4th Lesson: «Research ethics»
  Ethics in science, methodologies of scientific research, purpose of scientific research

• 5th Lesson: «Overview of research process»
  Stages of research, conceptual phase, design phase, empirical phase, analytical phase

• 6th Lesson: «Research tools»
  Simulations, experiments, experimental design, questionnaires, interviews

• 7th Lesson: «Data acquisition methods: Interviews and questionnaires»
  Data collection techniques, observation, interviews, questionnaires, questionnaire design, sampling, analysis of results

• 8th Lesson: «Data acquisition methods: Literature review»
  Search in databases, publishing companies, conference proceedings, scientific journals, technical reports

• 9th Lesson: «Scientific writing»
  Structure of scientific research, rules of scientific writing, thesis structure and organization

• 10th Lesson: «Structure of research thesis: Introduction»
  Cover, preface, summary, table of contents, abbreviations/nomenclature, introduction, main topic, discussion, references

• 11th Lesson: «Structure of research thesis: Writing»
  Writing of equations, figures, references, plagiarism

• 12th Lesson: «Presentation of research thesis: Structure»
  Types of presentation, structure of the presentation, relation between the manuscript of the research thesis and the research presentation

• 13th Lesson: «Presentation of research thesis: Time management»

• Time management, presentation of conclusions.
### LEARNING OUTCOMES / GENERAL COMPETENCES

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

- Recognize the nature of a scientific problem and suggest potential solutions
- Understand the basic principles of scientific research
- Collect the required data and references
- Write a research thesis by following the main rules concerning the structure of the thesis, the presentation and discussion of the results and the drawing of conclusions
- Present scientific results based on pre-defined specifications

### PREREQUISITES

- 

### TEACHING METHODS

- Face to face
- Distance learning

### ASSESSMENT METHODS

- personal assignments/projects (80% of the final grade)
- Oral examination – presentation of students’ projects in the classroom, questions and discussion (20% of the final grade)

### LANGUAGE OF INSTRUCTION/EXAMS

Greek

### RECOMMENDED BIBLIOGRAPHY

1. Α. Σαχίνη-Καρδάση, "Μεθοδολογία έρευνας", Εκδ. Βήτα, 2007
2. Π.Γ. Κυριαζόπουλος, "Μεθοδολογία έρευνας εκπόνησης διπλωματικών εργασιών", Εκδόσεις Σύγχρονη Εκδοτική, 2011
4. Π. Λατινόπουλος, "Τα πρώτα βήματα στην έρευνα: ένας χρηστικός οδηγός για νέους ερευνητές", Εκδ. Κριτική, 2010
5. Ζ. Αγιουτάντης, "Ενας πρακτικός οδηγός για τη συγγραφή τεχνικών κειμένων", Εκδόσεις Ίων, Αθήνα, Ελλάδα, 2003