

INTERNATIONAL HELLENIC UNIVERSITY SCHOOL OF ENGINEERING DEPARTMENT OF INFORMATION AND ELECTONIC ENGINEERING



# **STUDY GUIDE**

## DEPARTMENT OF INFORMATION AND ELECTRONIC ENGINEERING

THESSALONIKI, 2023

ii

## **STUDY GUIDE**

#### DEPARTMENT OF INFORMATION AND ELECTRONIC ENGINEERING

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#### FOREWORD

Dear students,

The Department of Information and Electronic Engineering of the International Hellenic University (IHU) started its operation at the School of Engineering of IHU in the spring of 2019 and has welcomed first-year students since September 2019. The Department is well staffed with teaching personnel and technical infrastructure and is among the largest departments of IHU.

The duration of the undergraduate studies in the Department has been set at ten (10) academic semesters, and in May 2020, the Department's Assembly approved the proposal for the inclusion of the Undergraduate Program in the awarding of an "Integrated Master", pending the positive response from the State to complete the process.

The purpose of the Undergraduate Program is primarily to provide modern and high-level knowledge, skills, and abilities in Computer Science and Electronic Engineering, as well as their interdisciplinary application fields. The program aims to produce graduates who combine sound theoretical knowledge with applied knowledge, enabling them to follow the constantly evolving landscape in their field of science and in their professional space. Besides providing a solid background of knowledge in the subject and cultivating a methodical way of thinking and problem-solving, the program aims for the multifaceted development and integration of the students' personalities, as well as the development of their professional awareness.

In addition to the five-year Undergraduate Program, the Department offers attractive postgraduate programs leading to the award of a postgraduate specialization degree in cutting-edge knowledge fields, either autonomously or through participation in interdepartmental postgraduate programs. Furthermore, the Department has effectively organized the third cycle of studies, leading to the PhD degree, and serves as the driving force for the development of scientific and research work.

The Study Guide you are reading provides all the necessary information about the Department, as well as undergraduate and postgraduate studies in it. It includes information about the courses, the research conducted, laboratories, specializations, student services, study regulations, and other relevant information concerning studies in the Department. The purpose of the Study Guide is to help students understand the content of their studies, choose the courses that interest them, and plan their path towards obtaining their degree.

As the President of the Department of Computer Engineering and Electronic Systems and on behalf of all the Department's staff, I assure you that this is a well-organized Department that creates an academic environment friendly to all its members. It is certain that it will provide you with all the necessary tools to excel in any field of Computer Science and Electronic Engineering.

The President of the Department,

Prof. Dimitrios Papakostas

## 1. THE INTERNATIONAL HELLENIC UNIVERSITY

#### **1.1** General Information

The International Hellenic University (IHU) based in Thessaloniki, was founded by article 1 of Law 3391/2005 (A' 240) and is organized and operates as a Higher Educational Institution (HEI) in the university sector, in accordance with paragraph 1 and indent a' of paragraph 2, article 1, Law 4485/2017 (A'114). With Law 4610/2019 (Government Gazette 70/A'/7-5-2019) seven (7) Schools were established therein with corresponding Departments in each of them.

The University has 9 Schools and 31 Departments. Most of the Departments are mainly concentrated in three university campuses. These university campuses are a) the Alexandrian Campus located in Sindos, Thessaloniki, b) the Campus of Serres, and c) the Campus of Kavala. Departments of IHU are also located in Thermi (Thessaloniki), Drama, Katerini, and Kilkis. The number of male and female students studying at IHU exceeds 50,000. This number makes the university one of the largest academic institutions in Greece in terms of student population.

The campus located in Thermi (Figure 1) serves as the university's headquarters and houses the University Center of International Programs of Studies (UCIPS), which is an academic unit of the university. The Department of Humanities, Social Sciences, and Economics, as well as the Department of Science and Technology, were established within the UCIPS, offering various postgraduate study programs in English, targeting both Greek citizens and citizens of Balkan countries, Southeast Mediterranean countries, European countries and other foreign countries.



Figure 1 - View of university buildings in Thermi, Thessaloniki

#### 1.2 Academic and organizational structure

According to the current legislation, each University is subdivided into Schools, which cover a set of related scientific disciplines, so that the necessary coordination for the quality of the education provided can be ensured. A School is subdivided into individual Departments which also constitute the basic academic units. The units in question cover the subject of a specific scientific field and award the corresponding degree/diploma. The 9 Schools of the International University of Greece and their 31 departments are presented in the table below.

The administration of each School are the Deanery and the Dean. The Deanery of each School consists of: a) the Dean of the School, b) the Presidents of the Departments, and c) representatives of Special Technical Laboratory Staff (ETEP), Special Teaching Laboratory Staff (EDIP), and students.

The Department is managed by: a) the Department's Assembly and b) the President of the Department. The Assembly of the Department is made up of the Educational Staff members of the Department, EDIP and ETEP representatives, undergraduate and postgraduate students.

SCHOOL	DEPARTMENT
SCHOOL OF ECONOMICS AND BUSINESS ADMINISTRATION (Sindos, Thessaloniki)	<ul> <li>Business Administration (Serres)</li> <li>Economic Sciences (Serres)</li> <li>Supply Chain Management (Katerini)</li> <li>Accounting and Finance (Kavala)</li> <li>Business Administration, Marketing and Tourism (Thessaloniki)</li> <li>Accounting and Information Systems (Thessaloniki)</li> <li>Management Science and Technology (Kavala)</li> </ul>
SCHOOL OF SOCIAL SCIENCES (Sindos, Thessaloniki)	<ul> <li>Library, Archive and Information Science (Thessaloniki)</li> <li>Early Childhood Education and Care (Thessaloniki)</li> </ul>
SCHOOL OF HEALTH SCIENCES (Sindos, Thessaloniki)	<ul> <li>Biomedical Sciences (Thessaloniki)</li> <li>Nutritional Sciences and Dietetics (Thessaloniki)</li> <li>Midwifery Science (Thessaloniki)</li> <li>Physiotherapy (Thessaloniki)</li> <li>Nursing (Thessaloniki)</li> <li>Nursing (Didymoteicho Branch)</li> </ul>
SCHOOL OF ENGINEERING (Serres)	<ul> <li>Industrial Engineering and Management (Thessaloniki)</li> <li>Environmental Engineering (Thessaloniki)</li> <li>Information and Electronic Engineering (Thessaloniki)</li> <li>Computer, Informatics and Telecommunications Engineering (Serres)</li> <li>Surveying and Geoinformatics Engineering (Serres)</li> <li>Mechanical Engineering (Serres)</li> <li>Civil Engineering (Serres)</li> </ul>
SCHOOL OF DESIGN SCIENCES (Serres)	<ul><li>Creative Design and Clothing (Kilkis)</li><li>Interior Architecture (Serres)</li></ul>
SCHOOL OF SCIENCES (Kavala)	<ul> <li>Computer Science (Kavala)</li> <li>Physics (Kavala)</li> <li>Chemistry (Kavala)</li> </ul>
SCHOOL OF GEOSCIENCES (Drama)	<ul> <li>Agricultural Biotechnology and Oenology (Drama)</li> <li>Agriculture (Thessaloniki)</li> <li>Forestry &amp; Natural Environment (Drama)</li> <li>Food Science and Technology (Thessaloniki)</li> </ul>
SCHOOL OF HUMANITIES SOCIAL SCIENCES AND ECONOMIC STUDIES (Thermi, Thessaloniki)	<ul> <li>Humanities Social Sciences and Economic Studies (Thessaloniki)</li> </ul>
SCHOOL OF SCIENCE AND TECHNOLOGY (Thermi, Thessaloniki)	<ul> <li>Science and Technology (Thessaloniki))</li> </ul>

#### **1.3** The Alexandrian campus of Sindos

The Department of Information and Electronic Engineering is located in the Alexandrian Campus of the International Hellenic University. The campus is located west of Thessaloniki, at a distance of 15 kilometers, near Sindos suburb, and it is the largest campus of the university. The location of the university campus is shown in Figure 2.



Figure 2. Geographical region of Alexandrian Campus of IHU

The Alexandrian Campus covers an area of 1,600 acres, a significant portion of which (approximately 1,000 acres) is occupied by the farm. The total surface area of the buildings is approximately 35,000 square meters. The campus is home to 14 university departments and offers facilities such as a well-organized library, a sports center, outdoor soccer and basketball fields, restaurants and cafeterias, medical center, church and ATMs. Additionally, the Alexandrian Campus provides student dormitories for housing. The campus is connected to the center of Thessaloniki through regular bus routes, specifically line number 52. The terminal station of this route is the Thessaloniki railway station. Figure 3 presents views of the buildings in the Alexandrian University Campus.

It is estimated that the number of students studying at the departments of the Alexandrian Campus exceeds 20,000. The services provided by the campus, the events held, and the large number of students present on a daily basis create an academic environment that promotes socialization and combines studies with the formation of well-rounded individuals.

In Figure 4, the location of the two buildings (Building H and Building  $\Pi$ ) of the Department of Information and Electronic Engineering within the campus area is indicated. To reach the two buildings from the entrance of the campus, one follows the arrows presented in Figure 4. Building H houses the department's secretariat, one of the two amphitheaters, classrooms, and electronic systems laboratories. Building  $\Pi$ houses the second amphitheater of the department, classrooms, a meeting room, computer laboratories, and the computer room with servers. Additionally, Building H has a cafeteria, and both buildings house staff offices.



Figure 3. Buildings in Alexandrian University Campus



Figure 4. The position of the Information and Electronic Engineering Department buildings (in yellow)

## 2. THE CITY OF THESSALONIKI

#### 2.1 Geographical and demographic information

Thessaloniki is the second-largest city in Greece and one of the largest cities in the Southeastern Mediterranean and Balkans. It is the capital of the Central Macedonia region and is located in northern Greece. It is estimated that Thessaloniki and its surrounding areas are home to over one million residents. South of Thessaloniki, at a short distance, lies Halkidiki, which is a popular tourist resort. To the southwest and northwest are the regions of Imathia and Pella, respectively, known for their archaeological sites of ancient Macedonia and ski resorts.

Thessaloniki has a long coastline and is renowned for its beauty, museums, and churches, as well as its local cuisine and cosmopolitan and multicultural atmosphere. It is also known for its vibrant nightlife, lively cultural scene with numerous theaters, music venues, and festivals that reflect the city's artistic and creative energy.

The city of Thessaloniki is home to three universities, many colleges, and numerous public and private secondary education schools. As a result, thousands of young people study in Thessaloniki. In recent years, many technology companies have been established in the city. Consequently, the city has created an environment suitable for both a student life and professional development and evolution in the field of technology.

#### 2.2 History

Thessaloniki has a rich history and cultural heritage as one of the most important cities in ancient Greece, the Byzantine Empire, and the Ottoman era. It was founded in the 4th century BC by Cassander of Macedonia. In its early years, the city served as a significant port and played a crucial role in the Kingdom of ancient Macedonia. A notable development was the elevation of the city during the Roman period as one of the main centers of the Roman Empire. Since the 4th century, Thessaloniki was as the center of administration for the Eastern Roman Empire (Byzantium). A characteristic feature is that Thessaloniki was referred to as the "Symvasilevousa" due to its historical significance, the role it played in the Byzantine Empire, and its significant governmental and cultural influence. From that period, Thessaloniki acquired a rich tradition in Orthodox Christian faith. Important historical monuments include the churches of Agia Sophia, Agios Dimitrios, and Acheiropoietos. These churches are significant early Christian landmarks and points of reference for the city's religious and cultural life.

The Ottoman Empire occupied Thessaloniki in 1430 and made it the capital of the region. During the Ottoman era, Thessaloniki became one of the largest centers of the Ottoman Empire and experienced intense cultural development. In this period, Thessaloniki was a multicultural city with a strong Islamic presence, as well as the presence of Jews, Greeks, Armenians, and other ethnicities. The various communities coexisted and contributed to the city's cultural diversity. Thessaloniki was liberated from the Ottoman Empire in 1912 during the Balkan Wars. The war was a series of conflicts between the Balkan states and the Ottoman Empire.

With the Asia Minor Catastrophe in 1922 and the signing of the Treaty of Lausanne in 1923, many Greek refugees settled in Thessaloniki. The refugees faced many difficulties as they tried to start new lives in unfamiliar territory. However, the refugees in Thessaloniki contributed to the city's development and cultural diversity.

During World War II, the Jewish community of Thessaloniki, which constituted a significant percentage of the city's population, suffered a tragic destruction with the extermination of the majority by the Nazis.

Visitors to Thessaloniki can explore its rich historical heritage by visiting the Archaeological Museum, which houses an impressive collection of objects from the ancient period, as well as the Museum of Byzantine Culture, which showcases the art and culture of the Byzantine Empire with a rich collection of icons, frescoes, manuscripts, and mosaics. Other important museums include the Folklore Museum and the Jewish Museum. The former presents the traditional life and culture of the Macedonia region, while the latter aims to preserve the memory of the Jewish presence in Thessaloniki through exhibits, books, and photographic material.

The symbol of Thessaloniki is considered to be the White Tower, which was built in the 15th century and served as a defense and observation tower, and later as a prison. Today, the White Tower is a popular tourist architectural landmark. It offers a stunning view of the sea and the city, and visitors can also explore the tower's history through exhibitions and informational materials and displays available there.

#### 2.3 Useful transportation information

Thessaloniki has an extensive bus network that covers the city and its suburbs (<u>http://m.oasth.gr/</u>). Route number 52 serves the transportation needs of students from the center of Thessaloniki to the Alexandrian campus of International Hellenic University in Sindos and vice versa.

In early 2024, the Thessaloniki Metro is expected to start operating, providing an urban transportation system of high quality. Taxis are also widely available in Thessaloniki and are a popular choice for getting around the city. It's worth noting that Thessaloniki promotes the use of bicycles with dedicated bike lanes and bike rental services at various locations in the city.

Thessaloniki has a modern airport called "Macedonia International Airport," which serves as a significant air transportation hub in the region. The airport is located approximately 15 kilometers south of the city center, has two terminals, and operates flights to various destinations in Greece and abroad. For more information, you can visit their website: <u>https://www.skg-airport.gr/</u>.

The Thessaloniki Railway Station connects Thessaloniki to many cities in Greece and international destinations. The Sindos train station, where the Alexandrian campus of IHU is located, contributes to the transportation of the student population. For more information, you can visit the website of the Hellenic Railways Organization: <u>https://ose.gr/</u>.

Buses operated by KTEL are a popular transportation for students studying in Thessaloniki. KTEL connects Thessaloniki with all the prefectures of Greece. The central bus station, known as "KTEL Macedonia" is modern and easily accessible. For more information, you can visit their website: <a href="https://www.ktelthes.gr/">https://www.ktelthes.gr/</a>.

## 3. THE DEPARTMENT OF INFORMATION AND ELECTRONIC ENGINEERING

#### 3.1 Introduction

#### 3.1.1 History

The Department of Information and Electronic Engineering (IEE), School of Engineering of the International Hellenic University of Greece was established in May 2019 by Law 4610 (Government Gazette 90/A'/07-05-2019) "Synergies of Universities and TEI, access to higher education, experimental schools, General Archives of the State and other provisions".

The department was formed by the merging of the Departments of Information Technology and Electronic Engineering of the Alexander Technological Educational Institute of Thessaloniki and welcomed its first-year students in September 2019. Although the department is considered new, it inherited the infrastructure and personnel of the two pre-existing departments (see Figure 5). However, its most significant inheritance is the long-standing successful presence of the two predecessor departments in the field of education and research, as well as the teaching, research, and administrative experience of the staff.

The history of the Department of Electronic Engineering dates back to 1936 when the Euclid Technical School was founded. In 1965, the school was renamed the Higher School of Electronics, and in 1981, the school was renamed as "Department of Electronics" and became part of the KATEE in Thessaloniki. With the establishment of the Technological Educational Institutes in 1983, the department became part of the Technological Educational Institutes in 2013, it was renamed the Department of Electronic Engineering. On the other hand, the Department of Information Technology of the Alexander Technological Educational Institute of Thessaloniki was established in 1987. At that time, it was called the "Department of Informatics" and was the first department of higher education in the field of computer science in Central and North Greece.



Figure 5. View of the buildings of the Department of Information and Electronic Engineering

#### 3.1.2 The IEE Department nowadays

As already mentioned, in 2019, the two departments merged as part of the creation of the new International Hellenic University and formed the Department of Information and Electronic Engineering, which offers complete studies and conducts research in computer science and electronic engineering. The graduates of the department can pursue careers in software development, as well as hardware design and electronic device systems. The aim of the department's studies is to provide graduates with knowledge and skills in a broad range of areas, including electrical circuits, analog and digital electronics, power circuits, embedded systems, systems and (web-based) application programming, operating systems, data management and analytics, machine learning and artificial intelligence, Internet of Things, automatic and intelligent control, information transmission, management and security, telecommunications, and networks.

The combination of the above knowledge and skills by students aims to make them competent and highly competitive graduates while laying the foundation for their further development as independent and self-sufficient professionals and/or researchers who can adapt to advancements and operate within the interdisciplinary approach through which hardware harmonizes and integrates with the software of modern and future electronic and computer systems and devices.

In addition to providing a knowledge background in the subject and cultivating a methodical and systematic way of thinking and problem-solving, the department aims at the multifaceted and comprehensive development of the students' personalities, as well as the development of their professional and social awareness. The department fosters a scientific research environment that increases the interest of students in scientific research and gradually introduces them to research activities, ensuring the readiness of future graduates who will be interested in pursuing postgraduate and/or PhD studies. Last but not least, the department emphasizes the connection and interaction with production units and service providers in the field and with relevant professional bodies, while also seeking their involvement in the improvement processes of the studies and lifelong learning.

The department admits students through national (panhellenic) examinations and special provisions that apply each time (transfers, etc.). Regarding the national examinations of General High Schools, the department admits students through the Scientific Fields of "Sciences" and "Economics and Informatics." Additionally, the department accepts students from the fields of Informatics and Electrical, Electronics, and Automation of Vocational High Schools participating in the corresponding national examinations.

Based on the legislation and developments in the field of informatics and electronics, the department has set the following objectives:

- Providing high-quality theoretical and applied knowledge.
- Providing the necessary scientific background for graduates to keep up with advancements in the rapidly evolving fields of Informatics and/or Electronic Systems.
- Continuously updating the curriculum content of the department in line with scientific and technological advancements in the fields of Informatics and Electronic Systems.
- Preparing and familiarizing students as much as possible with real research and work conditions, equipping them for the next stages of their professional/academic/research careers.
- Implementing research and development activities within the department and its research laboratories with active student participation.
- Ensuring continuous interaction between the department and other departments and research centers in Greece and abroad (outward orientation).

#### 3.1.3 Department facilities at a glance

As mentioned in Section 1.2, the Department of Information and Electronic Engineering uses Building H entirely and the greater part of Building  $\Pi$ . These buildings meet the department's needs as they provide a variety of spaces suitable for both teaching and laboratory training, as well as research activities. Specifically, the department has two amphitheaters with a capacity of 100 people each, nine lecture halls with approximately 60 seats each, and 21 laboratory rooms. Out of the 21 laboratory rooms, six are computer labs with around 25 workstations each, while the remaining laboratory rooms are equipped with specialized electronic systems, antennas, etc., necessary for conducting lab exercises, experiments, and measurements.

Additionally, the department has a Computer Room with powerful servers that host several applications and services, many of which have been developed by members of the department's academic community and serve both students and staff. Students of the department have access to the servers and the services they provide through a user account provided to them upon their registration with the department.

Further details about the department's facilities and the services it offers to its academic community members are available in Section 8 of this study guide.

#### **3.2** The staff of the Department

The staff of the Department of Information and Electronic Engineering is divided into Teaching and Research Staff (DEP), Special Teaching Laboratory Staff (EDIP), Special Technical Laboratory Staff (ETEP) and Administrative Staff (AS) with corresponding responsibilities. The DEP and EDIP members are called faculty members.

The Department of Information and Electronic Engineering is staffed with 28 DEP members, 6 EDIP members, 2 ETEP members and 2 AS members. It is worth mentioning that in the near future, the department is going to gain two new faculty members who have been elected, and their appointment is pending. These numbers make the department one of the largest departments of the University in terms of staff.

The DEP faculty members belong to three academic ranks: Professors, Associate Professors and Assistant Professors. Teaching is also carried out by the EDIP members. The teaching activities are supported by the ETEP staff, whose responsibilities include the smooth operation of the department's computing infrastructure and laboratory equipment. Additionally, the educational process of the Department is also supported by temporary educational staff, which consists of adjunct associates and academic scholars. Tables of the Department staff are given below.

Table of Teaching and Research Staff (DEP) members					
Name	Rank	Subject	Office	Email	
Adamidis Panagiotis	Professor	Programming Methodologies	Building П, Office 106	adamidis@ihu.gr	
Antoniou Efstathios	Professor	Numerical and Symbolic Computational Methods for Mathematical Systems Theory	Building П, Office 107	antoniou@ihu.gr	
Vitsas Vasileios	Professor	Computer Technologies and Networks	Building П, Office 207	<u>vitsas@ihu.gr</u>	

Deligiannis Ignatios	Professor	Object-Oriented Software Engineering	Building П, Office 203	ignatios@ihu.gr
Dervos Dimitrios	Professor	Database Systems	Building П, Office 203	<u>dad@ihu.gr</u>
Diamantaras Konstantinos	Professor	Machine Learning, Signal Processing, and Parallel Processing Systems	Vehicles Building, Distance Learning Room	<u>kdiamant@ihu.gr</u>
Ilioudis Christos	Professor	Web Applications Technologies	Building П, Office 205	<u>iliou@ihu.gr</u>
loannidou Melpomeni	Professor	Telecommunications with emphasis on Communication Theory, Wireless Communications, Antennas	Building H, Office 1.8	<u>melina@ihu.gr</u>
Kazakopoulos Aristotle	Professor	Ionic Conductivity of Materials for Sensors	Building H, Office 1.2	<u>kaza@ihu.gr</u>
Kioskeridis Iordanis	Professor	Measurement Systems - Power Electronics Systems	Building H, Office 1.1	<u>ikiosker@ihu.gr</u>
Kostoglou Vasileios	Professor	Operational Research and Programming Languages	Building П, Office 212	vkostogl@ihu.gr
Marmorkos Ioannis	Professor	Digital-Optical-Satellite Communications ς	Building H, Office 1.6	<u>imarm@ihu.gr</u>
Bamnios Georgios	Professor	Analog and Digital Electronics and Audio Systems	Building H, Office 1.4	<u>bamnios@ihu.gr</u>
Papakostas Dimitrios	Professor	Analog and Digital Electronic Systems	Building H, Office 1.5	dpapakos@ihu.gr
Salampasis Michail	Professor	Development of Multimedia and Web Applications	Building П, Office 204	<u>msa@ihu.gr</u>
Stamatis Demosthenes	Professor	Software Engineering with emphasis on Expert Systems	Building П, Office 206	<u>demos@ihu.gr</u>
Tzekis Panagiotis	Professor	Applied Mathematics in Algorithms of Mathematical Systems Theory in Control Systems	Building H, Office 1.7	ptzekis@ihu.gr
Chatzimisios Periklis	Professor	Operating Systems and Computer Networks Technologies	Building П, Office 206	pchatzimisios@ihu. gr
Goulianas Konstantinos	Associate Professor	Scientific Applications Programming and Numerical Analysis - Neural Networks	Building П, Office 212	gouliana@ihu.gr

losifidis Athanasios	Associate Professor	Wireless Communications with emphasis on Mobile Telephony Systems	Building H, Office 1.9	aiosifidis@ihu.gr
Keramopoulos Euclid	Associate Professor	Development of Graphical User Interface for Web Databases	Building П, Office 107	euclid@ihu.gr
Sidiropoulos Antonis	Associate Professor	Development of Internet Applications, WeboMetrics and Scientometrics	Building П, Office 106	asidirop@ihu.gr
Giakoumis Angelos	Assistant Professor	Nonlinear Systems Study using Microcontrollers	Building H, Lab Г4	ang1960@ihu.gr
Kokkonis George	Assistant Professor	Tangible User Interfaces Design	Building H, Lab Г5	kokkonisgeo@gmail .com
Rigas Kotsakis	Assistant Professor	Image and Sound Processing with emphasis on broadcasting systems	Building H, MMSE Lab	<u>rkotsakis@ihu.gr</u>
Bratsas Charalampos	Assistant Professor	Intelligent Software Systems	Building H, Lab A5	<u>cbratsas@iee.ihu.gr</u>
Ougiaroglou Stefanos	Assistant Professor	Data Mining with Data Reduction Techniques	Building П, Office 203	<u>stoug@ihu.gr</u>
Papadopoulou Maria	Assistant Professor	Design of Circuits for Embedded Systems	Building Η, Lab Γ2	mspapa@ihu.gr
Hatzopoulos Argyrios	Assistant Professor	Characterization of industrial production transistors and calibration of electrical instrument measurements	Building H, Lab A2	<u>ahatz@ohu.gr</u>

Table of Laboratory Teaching Staff Members (EDIP)					
Name	Email				
Amanatidis Dimitrios	Communications and Computer Networks	Building П, Office 207	<u>dima@ihu.gr</u>		
Asdre Katerina	Theory of Complexity in Perfect Graph Algorithms	Building П, Office 205	asdre@ihu.gr		
Ampatzis Zafeirios	Electronic Technologies and Quality Control	Building Η, Lab Γ1	<u>zafiris@ihu.gr</u>		
Kalidopoulou Anna-Eleni		Building H, Ground floor	<u>kalidop@ihu.gr</u>		
Tsiakmakis Kyriakos	Motion Measurement Systems of Micro- Electromechanical Devices	Building H, Lab ∆4	<u>ktsiak@ihu.gr</u>		

## Table of Special Technical Laboratory Staff (ETEP)

Name	Subject	Office	Email
Karampas Ioannis	Support of Teaching and Research Activities & Smooth Operation of Infrastructure and Laboratory Equipment	Building П, Office 209	<u>karampas@ihu.gr</u>
Hatzipapas Nikolaos	Support of Teaching and Research Activities & Smooth Operation of Infrastructure and Laboratory Equipment	Building П, Office 209	<u>nik@ihu.gr</u>

Table of Administrative Staff		
Name	Position	Office
Tsitouridou Sophia	Head of Secretariat	Building H, Secretariat
Chaliambaka Chrysoyla	Secretary	Building H, Secretariat

#### 3.3 Secretariat duties and working hours

The Department Secretariat is responsible for student and administrative matters. Student services are provided on all working days, and during the hours of 12.00 to 14.00, at the offices of the Department Secretariat, located in Building H of the Alexandrian Campus of IHU. When students interact with the Department's Secretariat, they are required to have their student identification card with them. Student issues include:

- Registration Procedures,
- keeping the students' records, which include their grades, registration renewals every semester, and information about scholarships,
- granting Certificates and Degrees,
- granting certificates for legal use,
- issuing paper forms required for the students' Internship,
- creating/filling in student lists, according to their course enrolment declaration,
- registration cancellations of students who have two consecutive non-renewal of registration or three non-consecutive non-renewal of registration

Details regarding first-year student registrations, transfers and registration of those passing the qualifying exams in the Department, are provided in Section 5.3:

Registration renewals and course declarations are carried out through the electronic secretariat system at the beginning of each semester, and for a period of approximately fifteen (15) days. All students have their own personal code, obtained from the Department Secretariat, with which they declare the courses they will attend electronically.

After the lists of successful candidates in the National Examinations are sent by the Ministry of Education and Religious Affairs, a registration deadline for new entrants is set, common for all higher education institutions in Greece. This deadline should not be missed, otherwise latecomers lose the right to register. Registration of new entrants takes place in September.

#### 3.4 Research labs

In the Department of Information and Electronic Engineering, four Research Laboratories have been established and operate in accordance with Law 4485/2017 (Gov. Gazette 114/A'/04-08-2017) "Organization and Operation of Higher Education, Regulations for Research and other provisions". The internal regulations of each laboratory determine their activities, which include, among others, the promotion of science and support for research to cover the educational needs of the Department in specific subjects (individual Learning Units, LU). Briefly, the four Research Laboratories are the following:

- Information Management and Software Engineering Laboratory Website: https://imselab.iee.ihu.gr
- Intelligent Systems Laboratory Website: https://islab.iee.ihu.gr
- Applied Industrial Mathematics and Operations Research Laboratory Website: <u>https://inamorlab.iee.ihu.gr</u>
- Advanced Electronic Systems Laboratory Website: <u>https://aeslab.iee.ihu.gr</u>

The **Information Management and Software Engineering Laboratory** aims to promote and improve teaching and conduct research in the current trends in Database Technology and Software Engineering. The research areas of the laboratory members include data science, bibliometrics, scientometrics, data mining, information retrieval on the World Wide Web, data warehouses, recommendation systems, human-computer interaction and interactive systems, augmented reality, educational technology, information security, cyber security, internet security, software engineering, object-oriented technology, Agile methods, and software quality metrics.

The **Intelligent Systems Laboratory** is related to modern fields of computer science, including digital libraries, artificial intelligence, information retrieval, computational intelligence (neural networks, evolutionary algorithms, fuzzy logic, and fuzzy systems), semantic web, image and signal processing, knowledge management, pattern recognition, intelligent teaching and educational systems, and natural language processing.

The **Applied Industrial Mathematics and Operations Research Laboratory** aims to promote and develop applied and industrial mathematics, statistics, operations research, decision analysis, project management, as well as the development of algorithms and software applications in these areas. The laboratory supports the educational needs of the department in calculus, linear algebra, discrete mathematics, numerical analysis, probability and statistics, operations research, optimization methods, and project management.

The **Advanced Electronic Systems Laboratory** aims to promote science in advanced electronic systems as shaped by current scientific advancements and market requirements that include embedded systems and electronic systems for metering, energy, control and communications. In the above disciplines research activities are related to the measurement, analysis, design, development and optimization of mathematical, algorithmic, experimental, empirical or other methods at the hardware or software level as well as the development, management and control of relevant international and national standards and specifications.

#### 3.5 Committees

The following committees have been established to support the work of the President and the Assembly of the department:

- Internal Evaluation Group (IEG): D. Dervos, I. Marmorkos, E. Antoniou, A. Sidiropoulos, Student Representative
- Undergraduate Program Committee (UPC): D. Papakostas, D. Stamatis, G. Bamnios, K. Goulianas, A. Iosifidis
- Diploma Thesis Committee: I. Kioskridis, A. Euk. Keramopoulos
- Internship Committee: K. Goulianas, Ag. Giakoumis, R. Kotsakis
- PhD Studies Committee: Periklis Hatzimisios (Coordinator), M. Salampasis, A. Iosifidis
- Coordinating Committees for MSc Programs:

MSc in Web Intelligence: M. Salampasis (Director), E. Antoniou, A. E. Keramopoulos, V. Kostoglou, A. Sidiropoulos

MSc in Applied Electronic Systems: I. Marmorkos (Director), I. Kioskridis, G. Bamnios, P. Tzekis, A. Hatzopoulos

- Departmental Websites: E. Antoniou, A. Sidiropoulos, S. Ougiaroglou
- Departmental E-Services: P. Tzekis, A. Sidiropoulos, K. Tsiakmakis, S. Ougiaroglou
- Best Diploma Theses: I. Kioskridis, K. Diamantaras, M. Salampasis, A. E. Keramopoulos, A. Giakoumis
- Lab Network and Computer Infrastructure: K. Diamantaras, A. Sidiropoulos, K. Tsiakmakis, N. Hatzipapas
- Department Communication and Presentation: Ch. Ilioudis, S. Ougiaroglou, K. Tsiakmakis
- Supervision of Building Facilities: Departmental Secretary, Z. Abatzis, N. Hatzipapas, I. Karabas
- Maintenance of Computers and IT Equipment: N. Hatzipapas, I. Karampas
- Recognition of Student Courses: V. Kostoglou

Additionally, according to relevant legislation and the department's needs, other committees are established and operate to deal with specific issues, such as:

- Selection of Adjunct Associates
- Examination Committees
- Election Committees

#### 3.6 External Advisory Committee

The Department of Information and Electronic Engineering, from the beginning of its operation, having been oriented towards the achievement of the goal of continuous improvement of the quality of its educational and research activity, recognized the need for the establishment of an External Advisory Committee which will be composed of notable persons and executives of the sector. The mission of the External Advisory Committee is to ensure direct and meaningful communication of the academic community of the department with professionals of recognized reliability in the field of Information Technology and Electronics, to continuously provide advice and recommendations concerning both the content of the study program and the research department's directions. The members of the External

Advisory Committee of the Department are:

- Dr. Parastratidis Savvas, Amazon, Alexa Artificial Intelligence Senior Principal Engineer (<u>https://www.linkedin.com/in/savasp</u>)
- Giavri Zoe, Advantis Medical Imaging CEO & Head of Research (<u>https://www.linkedin.com/in/zoigiavri/</u>)
- Dr. Isaiadis Stavros, Goldman Sachs Global Head of Quantitative Execution Services Technology
- Pampoukidis Apyros, Vice-President of SEPE (Greek Informatics Business Association) / OTS (Open Technology Services) CEO (<u>https://www.ots.gr</u>)
- Lakasas Dimitriosς, Olympia Electronics S.A. CEO
- Panteliadis Fotios, KENOTOM co-founder and Leading Team (<u>https://www.kenotom.com/dipl-eng-fotios-panteliadis/</u>)
- Christodoulou Panagiotis, ELBIS (<u>http://www.elbis.gr/</u>)

#### 3.7 Student life

Student life in the Department includes many actions and activities that strengthen the academic community and culture and enable students to obtain additional knowledge of general or special interest on the subjects of the Study Program, to develop important complementary skills and to socialize.

#### 3.7.1 Student activities and groups

#### The "Umbrella" structure

In the Department of Information and Electronic Engineering, cooperation and mutual support among students are cultivated through voluntary actions. These actions aim at alleviating difficulties and making progress in studies. In previous years, this was exclusively initiated by students themselves. Specifically, groups of students organized classes in the rooms of the Department with the goal of helping weaker students understand the specific courses material. In recent years, this has been done in a more organized and coordinated manner with the active involvement of the Department in the "Umbrella" structure of the University.

The "Umbrella" structure aims to alleviate various factors that hinder education, daily care, and the consistent completion of studies for both students from vulnerable social groups (low-income classes, individuals with disabilities, single-parent families, students from immigrant families, students with serious health problems) and students who, for various reasons, struggle to complete their studies.

Thus, in the Department of Information and Electronic Engineering, under the supervision of two faculty members of the Department, a group of student volunteers and mentors is active in providing support to their fellow students to overcome possible difficulties during their studies. These mentors assist in matters related to the curriculum and its procedures, course choices, course content, and are responsible for organizing voluntary courses and activities aimed at academic progress.

If any student has any questions about studying in the Department and needs assistance, they can contact the mentors of the Department through their communication space on Discord (<u>https://discord.gg/MBrukZH</u>) or send an email to <u>imentorsindos@gmail.com</u>.

#### Student groups

Various student groups have been established and act at different times in the Department of Information and Electronic Engineering with members who have specific interests. These groups are supervised by

faculty members of the department. The groups currently active in the Department are:

- Digital and Analog Circuit Implementation group
- Autonomous Driving draive group (<u>https://draive.gr/</u>)
- IEEE Student Branch (<u>https://ieeeihuthess.org/</u>)
- Research and volunteer public safety and emergency team

Recently, following the actions of the students, the **Association of Information and Electronic Systems Engineering Students** was founded. The Association and the student groups, in addition to the innovative ideas they implement, participate in international competitions (e.g., ieeextreme), organize events and sessions for the promotion of their work and seminars with guest speakers who excel in the group's field of activity.



Figure 6. Activities of the Department student groups

#### The "Nautilus" Room

The "Nautilus" room is located in Building H of the Department. The management of this room has been recently entrusted to the Students Association by a decision of the Department's assembly, so to have the opportunity to carry out various activities related to their studies, as well as work on innovative initiatives or research projects. Additionally, the "Nautilus" room serves as the space where student groups operate. Furthermore, the "Nautilus" room is a meeting point and socialization space for the students of the Department.

#### 3.7.2 Events

Many events take place in the Department, which contribute to both informing students about their studies and cutting-edge technologies, as well as their socialization. Many of these events are organized by the student groups, while others are established events by the administration and staff of the Department. The events established by the Department's administration and staff are presented below.

#### Job fair days

The Department maintains connections with many computer science and electronic systems companies mainly located in Central Macedonia. At the beginning of each semester, the Department organizes an event where the collaborating companies present positions for employment and internships. These events have been very successful in the last academic years. In particular, the events held in the academic year 2022-23 attracted more than 35 companies, each of which presented more than one job and internship position. As a result, the offers far exceeded the demand of graduating students of the Department. An interesting point of the last academic year's events was the participation of companies offering job positions in European Union countries.

#### **Business Executives Speeches**

As mentioned earlier, the Department strives to connect with the job market by maintaining relationships

with numerous companies operating in the field of computer science and electronic systems. These connections are evident by the fact that during the semester periods, speeches on cutting-edge technologies are delivered in the auditorium of Building H by executives from companies collaborating with the Department. These speeches take place every one or two weeks on hours and attract the interest of both students who participate and companies that increasingly engage in the event.



Figure 7. Job fair day at the auditorium of building H

#### Newcomers welcome event

This event takes place at the beginning of each academic year and involves introducing first-year students to the academic staff of the Department and informing them about the procedures and studies in the Department.

#### Presentations of Diploma thesis topics

Members of the academic staff of the Department have established a practice of presenting the topics of diploma theses that they are going to assign at the beginning of each semester. Students have the opportunity to learn about the topics of the diploma theses and express their interest in them.

#### **Events for Diploma thesis presentations**

At the end of each academic semester, an event is held where all students who have completed their diploma thesis present and are examined by a three-member committee. The presentations of the diploma theses are open to the public. The schedule of the presentations is announced to the academic community several days before the event takes place.

#### **Best Diploma Thesis Award Ceremony**

The Department has established a procedure for highlighting the best diploma theses of the Department. The students who have that have been distinguished through this procedure are honored at a special ceremony organized for this purpose where the members of the External Advisory Committee and collaborating companies representatives are invited.

## 4. THE UNDERGRADUATE STUDY PROGRAM

The first cycle of studies at the Department of Information and Electronic Engineering (IEE) of the School of Engineering at the International University of Greece consists of attending the Undergraduate Study Program (USP), which includes courses and a thesis corresponding to at least 300 ECTS<sup>1</sup> credit units. It typically lasts five academic years (ten semesters) and culminates in the award of a degree. In each academic year, the student selects educational activities corresponding to 60 ECTS units (Par.2b, Article 30, LAW 4009/2011).

The five-year Undergraduate Program of Studies of the Department was approved by the Ministry of Education and Religious Affairs in July 2019 (Ministerial Decision 104087/Z1, Government Gazette B'/2657/1-07-2019). It is a modern program which is fully harmonized with the corresponding UGPs of Greek Polytechnic Schools and Departments of Polytechnic Schools, as well as with corresponding UGPs of European and international university departments lasting ten (10) semesters.

#### 4.1 The purpose of the USP of the Department

The purpose of the USP is primarily to provide modern and high-level knowledge, skills and competences in the basic sciences of Computer Engineering and Electronic Systems Engineering, as well as their interdisciplinary fields of application. The program aims at graduates who combine sound theoretical knowledge with significant laboratory application, so that they can follow the ever-evolving landscape in their field of science as well as in their professional space. In addition to providing a solid background in the subject and cultivating a methodical way of thinking and problem-solving, the program aims at the multifaceted development and integration of the students' personality, as well as the development of their professional and social awareness. In addition, the USP cultivates students' interest in scientific research and gradually introduces them to research activities, in order to ensure the readiness of graduates who are interested in third-cycle academic studies.

The USP brings students into contact with the cutting edge of science and modern technological advancements in the field of Information and Electronic Engineering, including embedded systems, the Internet of Things (IoT) and the Tactile Internet, Artificial Intelligence, Augmented Reality, Big Data, Smart Grid, robotics, autonomous vehicles, Software Defined Networks, next-generation social and telecommunications networks, cloud, fog and edge computing, mobile and cloud computing, new medical electronic technologies, etc.

The Department places special emphasis on the modern interdisciplinary fields of scientific and technological developments that concern the integration of computer science with electronics. It is organized into the following Scientific Fields or Knowledge Areas (KAs):

- Programming and Algorithms (PA)
- Electronics (EL)
- Communications and Networks (CN)
- Embedded Computational Systems (ECS)

<sup>&</sup>lt;sup>1</sup> The ECTS credit units (European Credit Transfer and Accummulation System) constitute a measure of the workload required to achieve the overall objectives of the Academic Program as a whole and of each course separately by the student. In the context of the IEC UGS, each credit untie corresponds to a workload of 30 hours. Information about the ECTS system can be found at <a href="https://education.ec.europa.eu/el/education-levels/higher-education/inclusive-and-connected-higher-education/european-credit-transfer-and-accumulation-system">https://education.ec.europa.eu/el/education-levels/higher-education/inclusive-and-connected-higher-education/european-credit-transfer-and-accumulation-system</a>

- Data Management Artificial Intelligence (DMAI)
- General Knowledge and Skills (GKS)

The Knowledge Areas establish and define the scientific profile of the Department as a whole, i.e., the undergraduate program of studies, the postgraduate programs of studies, the doctoral studies, and the scientific research carried out.

#### 4.2 USP learning outcomes

The content of the studies covers the fields of Computer Science and Electronics and emphasizes interdisciplinary approach and assimilation of modern and rapidly developing new technologies. With the general and specific knowledge, skills and competences they acquire during their studies, the Information and Electronics Engineering graduates are able to:

- Analyze, design, develop and manage information systems, databases, business and web multimedia applications, reinforced, where appropriate, with artificial intelligence techniques.
- Analyze, design, develop and maintain small and large-scale software systems, intelligent and cognitive systems, user-computer interfaces and image analysis and composition software.
- Design, develop and maintain electronic components and systems, integrated circuits, embedded systems and hardware computing systems.
- Study, design and manage electronic communication systems, networks and services as well as Internet of Things systems.
- Conduct standardized tests and measurements, analyze and interpret experimental data and apply experimental results to improve production processes.
- Prepare and implement studies, research projects and applications in the fields of Computer Engineering and Electronic Systems Engineering, with respect to the principles of academic integrity, ethics and social responsibility.
- Carry out design and production studies, construct and supervise constructions, maintain telecommunication systems and devices, audiovisual and radio-television systems, protection and fire safety systems, measurement instruments, power electronic and automation control systems, computers, and medical devices.
- Conduct assessments and provide expert opinions on electronic arrangements, devices, systems, and installations, as well as evaluate offers of any type of electronic equipment and perform checks in corresponding industries, either alone or as members of committees.

On a more general context, graduates will be able to:

- Function effectively as members or as leaders of a scientific team.
- Apply effective written and oral communication skills in scientific and technological contexts, identifying and using appropriate bibliographic sources.
- Understand the need for and be able to engage in self-directed, continuous professional development.
- Demonstrate responsibility, ethics, and respect for diversity and the environment in the practice of their scientific profession.
- Evaluate the impact of technological achievements of science in a constantly evolving social and global framework, committed to quality and continuous improvement.

#### 4.3 Awarded title and level of qualifications

The USP of the Department corresponds to 300 credit units of the European Credit Transfer and Accumulation System (ECTS), and upon successful completion of it, the Department awards a degree in Information Engineering and Electronic Systems, which corresponds to Level 6 of the National and European Qualifications Framework<sup>2</sup>.

#### 4.4 Graduate career prospects

Graduates of the five-year Undergraduate Study Program of the Department of Information and Electronic Engineering, based on their specialized scientific and applied knowledge, have great professional career prospects and are employed in the private or public sector, either independently or in collaboration with other scientists, in areas related to:

- Analysis, design, development, and management of information systems, databases, business, and online multimedia applications, as well as added value applications, including security and privacy.
- Analysis, design, development, programming, and maintenance of small and large-scale software systems, intelligent systems, real-time systems, user-computer interfaces, and image analysis and synthesis software.
- Design, development, and maintenance of electronic devices and systems, integrated circuits, embedded systems, and computing systems at the hardware level.
- Study, development, and management of electronic communication systems, networks and services, and Internet of Things systems.
- Design and production studies, development and maintenance of telecommunication, audiovisual, radio-television, safety, and security systems and devices, measuring instruments, power electronics, automatic control, computer systems, and medical instrumentation.
- Conduct standardized tests and measurements, analyze, model, interpret experimental data, and apply experimental results to improve production processes.
- Carrying out, individually or as members of committees, assessments and expert opinions on electronic devices, devices, systems, installations, and all kinds of electronic and control equipment offers in corresponding crafts and industries.

The great potential for successful professional career of the graduates is documented by studies at national, European, and global levels, which predict that in the forthcoming years, there will be a significant shortage of specialized professionals in the abovementioned areas, as well as by the continuous and everincreasing interest of companies belonging to the IT and Electronics sectors for graduates of the Department.

For example, a survey recently conducted by Deloitte on behalf of the Association of IT and Communications Companies of Greece shows that by 2030 the Greek market will need 300,000 graduates in the sector who will contribute to the digital transformation of the country and an estimated supply/demand gap for specialist scientists with high-level technological education, which will reach approximately 7,000–7,500 per year for the period 2023–2030.

<sup>&</sup>lt;sup>2</sup> Further information on the National Qualifications Framework and the European Qualifications Framework can be found at <u>https://www.eoppep.gr/index.php/</u> and <u>https://nqf.gov.gr/</u>.

Besides, the increased interest of companies related to the scientific field of the Department is also confirmed by the large number of positions offered at the Internship and Interconnection with the Labor Market Days that are organized twice a year by our department. Indicatively, in the event held on February 11, 2023, 36 technology companies of various levels of specialization participated with representatives presenting the corporate profile and employment opportunities in their companies to students and graduates of the Department.

Regarding the graduates of the former Departments of Electronic Engineering and Information Technology Engineering, the following applies:

- The professional rights of the graduates of the four-year USP of the Department of Electronic Engineering are described in Gov. Gazette 158/A/14-6-1989.
- The professional rights of graduates of the four-year USP of the IT Engineering Department are described in Gov. Gazette 246/A/3-12-2008.

Regarding the graduates of the five-year USP of the Department:

- The degree ensures access to positions in the Public and the Broader Public Sector, as it is included in the Informatics branch of Gov. Gazette 232/A/17-12-2022 which concerns the determination of qualifications for appointment to Public Sector bodies.
- A positive response from the State is expected for the completion of the process of legalizing the participation of the graduates of the five-year USP of the Department in all announcements of the Supreme Personnel Selection Council for the branches of primary and secondary education teachers in Informatics and Electronics.
- The State is expected to complete is the judicial process for matching the Department and the professional rights of its graduates with a Polytechnic School Department as defined based on the current legal framework in Article 66 of Law 4610, Gov. Gazette 70/A/07-05-2019.

#### 4.5 Structure and courses of the USP

The Undergraduate Study Program consists of a set of courses appropriately distributed over semesters so that to satisfy their temporal sequence and interdependence. The **educational process** of each course may include lectures, laboratory exercises, and assignment, depending on the learning objectives of each course. Each course of the program corresponds to 6 ECTS credits, while each ECTS credit corresponds to a workload of 30 hours.

**Grades** in all courses are expressed on a numerical scale from zero to ten (0-10), with a passing grade of five (5). The final grade of each course is determined by evaluating students on specific activities, such as the final written examination, intermediate written examination, evaluation of laboratory exercises and technical reports, mandatory or optional assignments and exercises, etc. The evaluation criteria for each course and the exact method of calculating the final grade are provided in the detailed description of each course (APPENDIX A) and are accessible to students on the course's web page.

The first nine semesters of the program include the teaching of courses. The student is required to attend **32 compulsory (C) courses** that provide the necessary basic theoretical and practical knowledge.

In the 6th semester, the student begins to shape their personal path by choosing courses that belong to one of the following **specialization groups**:

• Electronics and Embedded Systems (combination of the knowledge areas of Electronics and Embedded – Computational Systems)

• Programming, Data, and Intelligent Technologies (combination of knowledge areas of Programming & Algorithms, and Data Management & Artificial Intelligence)

By choosing a specialization group, the student must attend the **five compulsory-elective (CE) courses** of the group and **eight additional elective (E) courses** from any group to complete the necessary 45 courses required for obtaining the degree.

The high percentage of compulsory courses ensures the completeness of the undergraduate program concerning the foundation and sufficiency of basic scientific knowledge and skills, as well as the coverage of core courses across the entire range of computer science and electronic science. With the compulsory and elective courses, the program achieves high-level depth and consolidation of knowledge in the wide range of the scientific fields of computer science and electronic science as well as specialized directions.

The last semester is dedicated to the compulsory Diploma Thesis, which may take place in collaboration with another academic or research institution or with the industry.

The design of the undergraduate program aims to satisfy the following basic characteristics:

- Focus the student's study on a limited number of compulsory courses (45), which correspond to integrated units/fields of the program.
- Acquire knowledge with a cognitive sequence.
- Master necessary basic knowledge before specialization.
- Develop basic and advanced skills in the scientific fields of the program.
- Personalized deepening and specialization in modern areas of Computer Science and Electronic Systems.
## 4.6 Presentation of the Undergraduate Study Program

## Table I. The Undergraduate Study Program at a glance

				Semester					ECTS	Sem	ECTS
1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>		10 <sup>th</sup>	
Mathematics I (C)	Mathematics II (C)	Probability Theory and Statistics (C)	Database Management Systems (C)	Wireless Communications (C)	Artificial Intelligence (C)	Computer Networks (C)	Information Security (C)	Compulsory – Elective Course (CE)	6		
Structured Programming (C)	Measurements and AC Circuits (C)	Mathematics III (C)	Telecommuni- cation Systems (C)	Microcontrollers (C)	Embedded Systems (C)	Power Electronics (C)	Machine Learning Principles and Methods (C)	Compulsory – Elective Course (CE)	6	Si	
Introduction to Computer Science (C)	Technical Writing, Presentation and English Terminology (C)	Signal Processing (C)	Introduction to Operating Systems (C)	Operating Systems Design (C)	Compulsory – Elective Course (CE)	Compulsory – Elective Course (CE)	Internet of Things (YC	Elective Course (E)	6	PLOMA THES (C)	30
Electronic Physics (C)	Digital Systems Design (C)	Data Structures and Analysis of Algorithms (C)	Electronic Circuits (C)	Electronic Devices (C)	Elective Course (E)	Compulsory – Elective Course (CE)	Elective Course (E)	Elective Course (E)	6	DI	
DC Circuits (C)	Object-Oriented Programming (C)	Web Languages and Technologies (C)	Computer Systems Organization and Architecture (C)	Human-Machine Interaction (C)	Elective Course (E)	Elective Course (E)	Elective Course (E)	Elective Course (E)	6		

Core Courses	Core Courses	Scientific Area Courses	Advanced Courses
(General Background)	(Special Background)	(IEE Specialty)	(Specialization)
( <b>°</b> )	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · /

Compulsory Courses (C)	Compulsory – Elective Courses (CE)	Elective Courses (E)	Required Courses (in total)
32	5	8	45

Electronics and Embedded Systems Specialia (ELES)	zation	Programming, Data Management and Artificial Int Specialization (PDAI)	telligance	Common Elective Courses for both Specializations (COMM)			
Course	Туре	Course	Туре	Course	Туре		
Synthesis of Electronic Circuits	CE	Numerical Methods	CE	Microwave Technology and Remote Sensing	E		
Control Systems	CE	Introduction to Data Analytics	CE	Optoelectronics and Optical Communications	E		
Sensors and Signal Conditioning	CE	Software Engineering	CE	Mass Media Communication Systems	E		
Applications of Embedded Systems	CE	Development of Web Systems and Applications	CE	Audio and Image Technologies	E		
Robotics	CE	<b>Operational Research</b>	CE	Wireless Networks	E		
Quantum Computing	E	Advanced Topics of Human-Computer Interaction (Mobile Programming)	E	Special Network Topics (CCNA) 1	E		
Microelectronic Circuit Design Methodologies	Е	Project Management	Е	Advanced Network Topics	E		
Programmable Logic Controllers	E	Database Technology	E	Mobile Communication Systems	E		
Design of Reconfigurable Digital Systems (FPGAs)	E	Advanced Computer Architecture and Parallel System Programming	E	Work Placement	E		
Applications of Control Systems	E	Data Organization and Data Mining	E	Network and Communication Security	E		
Power Converters	Е	Added-Value Internet Services	Е	Software Defined Networking	E		
Microelectronics	E	Information Retrieval – Search Engines	E	Special Network Topics (CCNA) 2	E		
Electrical Motor Drives and Smart Grid	Е	DBMS Systems and Services Administration	Е	Satellite Communications	Е		
Tangible User Interfaces	Е	Intelligent Systems	Е	Multimedia Technology	Е		
Biomedical Technology	Е	Advanced Topics in Artificial Intelligence	Е				
Computer Assisted Measurement Systems	Е	Advanced Machine Learning	Е				
Renewable Energy Sources and Smart Grid	Е	Development of Large Software Systems	Е				
		Distributed Systems	E				
		Semantic Web	E				
		Computer Graphics	E				

# Table II. Advanced Course (Specialization)

S	Codo	САТ	Туре	KA	ECT	ECT		TEACHING HOURS				
М	Code	CAI	туре	<b>N</b> A	S	VVL		The	Lab	Tot		
	1-101	GB	С	GKS	6	180	Mathematics I	4		4		
1	1-102	SB	С	PA	6	180	Structured Programming	4	2	6		
	1-103	GB	С	GKS	6	180	Introduction to Computer Science	4		4		
	1-104	SB	С	GKS	6	180	Electronic Physics	4		4		
	1-105	SB	С	EL	6	180	DC Circuits	4		4		

# Table III. Undergraduate Study Program per Semester

S	Cada	CAT	Tuna	KA	ECT	14/1		TEAC	HING H	OURS
М	Code	CAT	туре	RΑ	S	VVL		The	Lab	Tot
	1-201	GB	С	GKS	6	180	Mathematics II	4		4
2	1-202	SB	С	EL	6	180	Measurements and AC Circuits	4	2	6
	1-203	GB-SD	С	GKS	6	180	Technical Writing, Presentation and English Terminology	4	1	5
	1-204	SA-SD	С	ECS	6	180	Digital Systems Design	4	1	5
	1-205	SA-SD	С	PA	6	180	Object-Oriented Programming	4	1	5

S	Codo	CAT	Tune	KA	ECT	\A/I			TEACHING HOURS		
М	Code	CAT	туре	RA.	S	VVL		The	Lab	Tot	
	1-301	GB	С	GKS	6	180	Probability Theory and Statistics	4		4	
	1-302	GB	С	GKS	6	180	Mathematics III	4		4	
3	1-303	SB	С	CN	6	180	Signal Processing	4		4	
	1-305	SA	С	PA	6	180	Data Structures and Analysis of Algorithms	4		4	
	1-405	SA-SD	С	PA	6	180	Web Languages and Technologies	4	1	5	

S	Codo	CAT	Turne	K A	ECT	14/1		TEACHING HOURS		
М	Code	CAI	туре	RA .	S	VVL		The	Lab	Tot
	1-401	SA-SD	С	DMAI	6	180	Database Management Systems	4	1	5
4	1-402	SA	С	CN	6	180	Telecommunication Systems	4		4
	1-403	SA-SD	С	ECS	6	180	Introduction to Operating Systems	4	1	5
	1-404	SA	С	EL	6	180	Electronic Circuits	4		4
	1-304	SA-SD	С	ECS	6	180	Computer Systems Organization and Architecture	4	2	6

S	Codo	CAT	Turne	K A	ECT	14/1		TEAC	HING H	OURS
М	Code	CAT	туре	RΑ	S	VVL		The	Lab	Tot
	1-501	SA-SD	С	CN	6	180	Wireless Communications	4	2	6
5	1-502	SA	С	ECS	6	180	Microcontrollers	4		4
	1-503	SA	С	ECS	6	180	Operating Systems Design	4		4
	1-504	SA-SD	С	EL	6	180	Electronic Devices	4	2	6
	1-505	SA	С	PA	6	180	Human-Machine Interaction	4		4

S	Codo	CAT	Turna	IZ A	ECT	14/1		TEAC	HING H	OURS				
М	Code	CAT	туре	RΑ	S	VVL	COURSE IIILE	The	Lab	Tot				
	1-601	SA	С	DMAI	6	180	Artificial Intelligence	4		4				
	1-602	SA-SD	С	ECS	6	180	Embedded Systems	4	2	6				
	Electroni	cs and Em	bedded S	Systems S	Specializ	zation (I	ELES)							
	1-611	SP-SD	CE	EL	6	180	Synthesis of Electronic Circuits	4	2	6				
	1-612	SP	Е	ECS	6	180	Quantum Computing	4		4				
	1-613	SP	E	EL	6	180	Microelectronic Circuit Design Methodologies	4		4				
c	Programming, Data Management and Artificial Intelligance Specialization (PDAI)													
O	1-641	SP	CE	PA	6	180	Numerical Methods	4		4				
	1-642	SP	Е	PA	6	180	Advanced Topics of Human-Computer Interaction (Mobile Programming)	4		4				
	1-643	GB	Е	GKS	6	180	Project Management	4		4				
	Common	Elective C	Courses f	or both S	pecializa	ations (	СОММ)							
	1-671	SP	Е	CN	6	180	Microwave Technology and Remote Sensing	4		4				
	1-672	SP-SD	E	CN	6	180	Optoelectronics and Optical Communications	2	2	4				
	1-673	SP-SD	Е	CN	6	180	Mass Media Communication Systems	2	2	4				

S	Cada	CAT	Tune	KA	ECT	\A/I		TEAC	HING H	OURS			
М	Code	CAT	туре	RΑ	S	VVL	COURSE IIILE	The	Lab	Tot			
	1-701	SA-SD	С	CN	6	180	Computer Networks	4	2	6			
	1-702	SA	С	EL	6	180	Power Electronics	4		4			
	Electroni	cs and Em	bedded S	Systems S	Specializ	zation (I	ELES)		-				
	1-711	SA	CE	ECS	6	180	Control Systems	4		4			
	1-712	SP-SD	CE	EL	6	180	Sensors and Signal Conditioning	4	2	6			
	1-713	SP-SD	Е	ECS	6	180	Programmable Logic Controllers	2	2	4			
7	1-714	SP-SD	Е	ECS	6	180	Design of Reconfigurable Digital Systems (FPGAs)	2	2	4			
	Programming, Data Management and Artificial Intelligance Specialization (PDAI)												
	1-741	SP	CE	DMAI	6	180	Introduction to Data Analytics	4		4			
	1-742	SP	CE	PA	6	180	Software Engineering	4		4			
	1-743	SP	Е	DMAI	6	180	Database Technology	4		4			
	1-744	SP	E	PA	6	180	Advanced Computer Architecture and Parallel System Programming	4		4			
	Common	Elective C	Courses f	or both S	pecializa	ations (	COMM)						
	1-771	SP-SD	Е	CN	6	180	Audio and Image Technologies	2	2	4			

S	Codo	САТ	T Type	Type	Type	Type	Type	Туре	Туре	Туре	Туре	Туре	Type	Туре	Туре	K A	ECT	14/1		TEAC	HING H	OURS
М	Code	CAT	туре	ħΑ	KA S WE COURS		The	Lab	Tot													
8	1-801	SA	С	DMAI	6	180	Information Security	4		4												
	1-802	SA	С	DMAI	6	180	Machine Learning Principles and Methods	4		4												

1-803	SA	С	CN	6	180	Internet of Things			4
Electroni	ics and Em	bedded S	Systems S	Speciali	zation (I	ELES)			
1-811	SP-SD	Е	ECS	6	180	Applications of Control Systems	2	2	4
1-812	SP-SD	Е	EL	6	180	Power Converters	2	2	4
1-837	SP	Е	EL	6	180	Microelectronics	2	2	4
1-839	SP-SD	Е	EL	6	180	Electrical Motor Drives and Smart Grid	2	2	4
rogram	ming, Data	Manage	ment and	Artificia	al Intellig	gance Specialization (PDAI)		•	
1-841	SP	Е	DMAI	6	180	Data Organization and Data Mining	4		4
1-842	SP	Е	PA	6	180	Added-Value Internet Services	4		4
common	Elective C	Courses f	or both S	pecializ	ations (	COMM)	·		
1-871	SP	Е	CN	6	180	Wireless Networks	4		4
1-872	SP-SD	Е	CN	6	180	Special Network Topics (CCNA) 1	2	4	6
1-873	SP	Е	CN	6	180	Advanced Network Topics	4		4
1-874	SP	E	CN	6	180	Mobile Communication Systems	4		4
1-898	SP	Е	GKS	6	180	Free Selection B	4		4
1-948	SP	Е	PA	6	180	Development of Large Software Systems	4		4

S	Code	САТ	Type	КЛ	ECT	wi	COURSE TITLE		HING H	OURS
М	Code	UA1	Type	114	S	VVL		The	Lab	Tot
	Electroni	cs and Em	bedded S	Systems S	Speciali	zation (I	ELES)			
	1-911	SP-SD	CE	ECS	6	180	Applications of Embedded Systems	2	2	4
	1-912	SP	CE	ECS	6	180	Robotics	4		4
	1-913	SP	Е	EL	6	180	Renewable Energy Sources and Smart Grid	4		4
	1-914	SP	E	ECS	6	180	Tangible User Interfaces	4		4
	1-915	SP	E	EL	6	180	Biomedical Technology	4		4
	1-916	SP-SD	E	EL	6	180	Computer Assisted Measurement Systems	2	2	4
	Program	ming, Data	Manager	ment and	Artificia	al Intellig	gance Specialization (PDAI)			
	1-941	SP	CE	PA	6	180	Development of Web Systems and Applications	4		4
9	1-942	SP	CE	GKS	6	180	Operational Research	4		4
	1-943	SP	E	DMAI	6	180	Information Retrieval – Search Engines	4		4
	1-944	SP	Е	DMAI	6	180	DBMS Systems and Services Administration	4		4
	1-945	SP	E	DMAI	6	180	Intelligent Systems	4		4
	1-946	SP	E	DMAI	6	180	Advanced Topics in Artificial Intelligence	4		4
	1-947	SP	E	DMAI	6	180	Advanced Machine Learning	4		4
	1-949	SP	Е	PA	6	180	Distributed Systems	4		4
	1-950	SP	Е	PA	6	180	Semantic Web	4		4
	1-969	SP	E	PA	6	180	Computer Graphics	4		4
	Common	Elective C	Courses f	or both S	pecializa	ations (	COMM)			
	1-970	SD	E		12	360	Work Placement			

1-971	SP	Е	CN	6	180	180 Network and Communication Security			4
1-972	SP	Е	CN	6	180	180 Software Defined Networking			4
1-973	SP -SD	Е	CN	6	180	30 Special Network Topics (CCNA) 2		4	6
1-974	SP	Е	CN	6	180	Satellite Communications	4		4
1-975	SP	Е	CN	6	180	Multimedia Technology	4		4
1-998	SP	Е	GKS	6	180	Free Selection A	4		4

S	Codo	CAT	Turne		ECT	14/1		TEAC	HING H	OURS
М	Code	CAI	туре	ħΑ	S	VVL	COURSE IIILE	The	Lab	Tot
10	1-999	SA-SD	С		30	900	Diploma Thesis			

Legend

SM: Semester

CAT (Category)

SD: Skills Development

GB: General Background (Core)

GB-SD: General Background - Skills Development

SB: Special Background (Core)

SA: Scientific Area (IEE Specialty)

SA-SD: Scientific Area – Skills Development

SP: Specialization (Advanced)

SP-SD: Specialization – Skills Development C: Compulsory

Туре

**CE: Compulsory Elective** 

E: Elective

#### KA: Knowledge Area

GKS: General Knowledge and Skills DMAI: Data Management - Artificial Intelligence CN: Communications and Networks ECS: Embedded – Computational Systems EL: Electronics PA: Programming and Algorithms

#### 4.7 Diploma thesis

To acquire the IEE Department undergraduate degree, it is mandatory to prepare and submit a Diploma Thesis under the supervision of a faculty member (either full-time or part-time). The Diploma Thesis is an extensive work in a specific scientific area, with research, study, developmental, or applied character, and corresponds to **30 ECTS credits**. Right to undertake and prepare a Diploma Thesis have students who have reached **210 ECTS** credits at least. The evaluation Diploma Theses takes place three times a year, after the February and September exam periods and before the June exam period, by an appropriate appointed committee of three faculty members.

The Thesis is an extensive document that includes: (a) summary, (b) theoretical framework of the topic and the relative achievements of science and technology, (c) detailed presentation of the methodology followed, (d) results certifying the correctness of the approach used and demonstrating the topic usefulness, (e) conclusions and (f) bibliography – references and optionally appendices with scripts, device specifications, etc.

The objective of the Diploma Thesis is to introduce the undergraduate student to the research process while on the other hand enable the Department develop research activities by investing in its own human

resources. Each student can choose the topic in which they wish to complete the Diploma Thesis., in collaboration with the Department faculty members.

The minimum duration for completing the Diploma Thesis is one (1) academic semester, and the maximum duration is two (2) years from the date of assignment. After two years, the Diploma Thesis is automatically canceled, and the student is required to undertake a new topic. The Diploma Thesis is completed with the writing of the thesis and its public defense before a three-member examining committee, which assesses the work and decides on its final grade, during a special two-day workshop that is held three times per year after the end of the corresponding examination periods.

The process of the preparation, submission and examination of the Diploma Thesis are described in detail in the corresponding Diploma Thesis Regulation.

#### 4.8 Work placement (internship)

The students of the IEE Department of IHU have the right to internship in computer engineering and electronic systems during their studies.

According to the Undergraduate Study Program of the Department, the internship is **optional**, corresponds to **12 ECTS credits** and is recorded in the Diploma Supplement and the Transcript of Records. Students in their ninth semester and above, who have completed 210 ECTS credits are allowed to conduct an internship. This can be carried out in the public or private sector. Additionally, students have the opportunity to conduct their work placement in academic institutes or enterprises of the European Union as part of European or other programs.

Specific periods of work placement execution have been defined by the Department, which are the Winter period, starting October 1st, and the Spring period, starting from April 1st. These dates may change after approval by the Internship Committee.

The topics of work placement are coordinated by the Internship Committee, consisting of three members of the Department's academic and research personnel. The Committee conducts a systematic search for positions, which are announced to the students before the beginning of each work placement period. Positions proposed by the students may be accepted after approval by the Committee. Furthermore, at the beginning of each semester, the department hosts **a career day event where companies collaborating with the department present positions** for students who wish to undertake an internship. During these events, companies present many positions for direct employment as well. In recent academic years, more than 35 companies have participated. Most of them are based in Central Macedonia, while some are based in the rest of Greece and abroad. The job and internship positions presented by the companies exceed the demand from graduating students of the department.

Students are required to follow the announcements concerning the internship which are posted on the Department's website. Prior to the start of each internship period, interested students are informed about the process and the available positions through an informative workshop, in which interested parties (enterprises and research institutes) participate. The Department places students in internship positions through the operational program "Competitiveness, Entrepreneurship and Innovation", which is one of the Operational Programs of the Corporate Agreement for the Development Framework (ESPA 2014-2020), which funds actions for education at all levels of the education system, the connection of education with the labor market, lifelong learning, and research. The resources of the operational program come from the European Social Fund (ESF).

During the Internship, students are supervised by the Internship Academic Supervisor, who is appointed by the Department. On their part, students complete their activities in the Internship Record Book, which they submit at the end of the Internship. The Internship Record Book is checked and signed by the Academic Supervisor, the Internship Committee, and the Department Head, who approve or reject the conducted internship.

#### 4.9 International dimension of the USP and partnerships

During the design of the Undergraduate Study Program of the Department of Information and Electronic Engineering, programs of other Higher Education Institutes were taken into account. Particular emphasis was placed on the compliance of the proposed USP with the international ACM/IEEE Computing Curricula. The USP is structured on the basis of the European Credit Transfer and Accumulation System (ECTS), in accordance with what is determined internationally for the specific level of study (level 6 of the European Qualifications Framework). It is noted that one credit unit corresponds to a workload of 30 hours and each semester corresponds to 30 credit units, in accordance with the European practice in corresponding USPs. The USP also includes courses related to the development of abilities and skills (communication, consulting) that make students competitive at national and international level.

As part of its international collaborations, the Department actively participates in the Erasmus+ program of the European Community for the mobility of students and faculty members to other European Institutes. Students can move either to attend undergraduate or postgraduate courses, do an internship, or for an after-placement position at the end of their studies. Faculty members of the Department can move to other European higher institutions either for teaching or for training. The Department maintains partnerships for student exchanges for studies, within the framework of the Erasmus+ program, with 62 universities in the European area.

Every academic year, a certain number of students of the Department move, while the Department also receives visiting students from European universities. The ECTS system adopted by the Department facilitates the movement of students. The Department offers incoming Erasmus students the opportunity to attend undergraduate and postgraduate courses. If a sufficient number of guest students expresses interest in attending a class, then it is offered to them in the form of lectures in English. The usual treatment of visiting students in courses where their participation is small is as follows: The teaching professor meets with them every week where he assigns them educational material for individual study, exercises to be solved, tasks/projects to be worked out, discusses and analyzes together any questions they may have and generally monitors their progress in the course. The evaluation of the courses is done either by a written exam or by assignments/projects delivered by the students. In any case, care is taken to ensure that the education offered to Erasmus+ hosted students is at the same high and demanding level as the rest of the Department's students. Communication of the incoming Erasmus+ students with all the staff of the Department takes place in the English language, and the students' impressions upon their return to their home universities are very positive.

The participation of faculty members from abroad in the Department curriculum is possible within the framework of the Erasmus+ program and has been, in addition, officially institutionalized in Article 75 of the new Internal Regulation of the IHU (Gov. Gazette 4889/6-11-2020, issue B'). According to the Internal Regulation of Operation, renowned Greek or foreign scientists and researchers can apply for the title of Visiting Professor, contributing to the lecturing and research activities of the Department. Thus, every academic year, the Department welcomes faculty members from universities abroad to teach in the Department while faculty members of the Department move abroad to teach at a university.

## 5. UNDERGRADUATE STUDIES ORGANIZATION

#### 5.1 Duration and schedule

The studies are conducted with the system of semester courses. The USP includes nine academic semesters with courses, while the tenth semester involves the realization of a Diploma Thesis. The maximum duration of study in the first cycle of studies of the IEE Department is ten (10) academic semesters for the award of the degree, increased by six (6) academic semesters. After the completion of the maximum period of study, the Board of Directors of the Department, subject to the provisions of the following paragraphs, issues an act of deletion (article 76, par. 1, Law 4957/2022).

Students who have not exceeded the maximum duration of studies may, after submitting a request to the Department's Secretariat, interrupt their studies for a period of up to two (2) years. The right to interrupt studies can be exercised once or in parts for a period of at least one (1) academic semester, but the total duration of the interruption cannot exceed two (2) years if granted in parts. The student status is suspended during this period and participation in any educational process is not allowed (Article 76, par. 4, Law 4957/2022).

Teaching of the courses is carried out according to the **timetable**, which is drawn up before the start of the semester by the corresponding responsible professor of the Department under the responsibility of the Department's Chair and is announced to the students on the website of the department <u>http://www.iee.ihu.gr</u>. The timetable includes the distribution of teaching hours of the courses (lectures, laboratories) within the five working days of the week, the lecturers, as well as the classrooms.

The **compulsory courses** of the USP are taught in all academic years. The **elective courses** are taught if a sufficient number of students register. This number can be set by decision of the Department Assembly following a proposal by the responsible professor. In the event that an elective course is not taught due to the small number of students who have applied for it, students who have chosen it can replace it with another elective course. Likewise, a maximum number of students who can register for and attend specific optional or elective courses or exercises may be specified.

Attendance of the course labs is mandatory. The number of allowed absences is set at a percentage of 20% of the conducted labs. The number of allowed absences may be changed by decision of the Department Assembly, upon proposal by the responsible instructor, and is stated in the Department's Study Guide and/or the course's website. The procedures for selection/registration to the labs and the rules for attending the labs are posted on the course's website, under the responsibility of the instructor.

During lectures, laboratory exercises, and throughout the preparation of their thesis, students are obliged to keep the premises clean and adhere to both the general safety rules, as described in the relevant regulations, and the safety rules established separately by each laboratory.

The detailed regulations concerning the procedures of the Undergraduate Program of the Department are posted on the website <u>https://www.iee.ihu.gr/english-κανονισμοί/.</u>

#### 5.2 Academic calendar

The academic year starts on September 1st of each year and ends on August 31st of the following year. The educational process of each academic year is structured into two semesters, the winter and the spring. Each semester includes 13 teaching weeks and includes an examination period after its completion. In September, before the start of the winter semester courses, there is an additional examination period for all courses of the winter and spring semesters. For courses or laboratories that are examined during the normal duration of the academic year through progress exams or assignments, there is no obligation for a re-examination in September. The exact dates of the start and end of courses and examination dates are determined by the Administrative Committee of the IHU. The academic calendar for the academic year 2022-2023 is as follows:

- Winter semester courses: 26/9/2022 6/1/2023
- Winter lab exams: 9/1/2023 13/1/2023
- Winter examination period: 23/1/2023 10/2/2023
- Spring semester courses: 20/2/2023 2/6/2023
- Spring lab exams: 6/6/2023 9/6/2023
- Spring examination period: 12/6/2023 30/6/2023
- Fall examination period: 1/9/2023 22/9/2023

Classes are not held on the following holidays, celebrations and anniversaries:

- From December 24 to January 7 (Christmas holidays)
- January 30 (The Three Patron Saints of Education Day)
- March 25 (National Anniversary The Annunciation / National Anniversary of the 1821 Revolution against the Turkish Rule)
- Clean Monday
- From Holy Monday to Sunday of St. Thomas (Easter holidays)
- May 1st (Labor Day)
- Holy Spirit Day
- From August 1 to August 31
- October 26 (St. Demetrius day the Patron Saint of the city of Thessaloniki)
- October 28 (National Anniversary)
- November 17 (National Anniversary Students' uprising in the National Technical University of Athens against the junta in 1973)

#### 5.3 Student admission and registration

Students become those who enroll in the Department of Information and Electronic Engineering of IHU after passing the entrance exams in higher education, by transfer, or by admission (as graduates of other Departments or Schools) according to the relevant provisions.

The registration of newly admitted students takes place at the Department's Secretariat within the time limits defined each time by the Ministerial Decisions. Students registered in the Department receive from the Secretariat credentials (username/password) that allow them to access the electronic services of the University and the Department.

**Those who passed the National Examinations** and completed their registration through the electronic application of the Hellenic Ministry of Education and Religious Affairs must verify their identity at the Secretariats of their Departments, by submitting the following supporting documents:

- 1. Registration application for (printed from the website of the Ministry of Education),
- 2. Photocopy of identity card (ID),

3. One (1) photograph (ID type),

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

- After the identification process at the Department Secretariat, students receive the credentials of the electronic institutional account they will have as members of the university community. By activating their account at <a href="https://uregister.the.ihu.gr">https://uregister.the.ihu.gr</a> they gain access to the following electronic services:
- Submit an application for the issuance of an academic identity card, which also functions as a
   "student pass", through the Electronic Service for Obtaining an Academic Identity Card
   (https://submit-academicid.minedu.gov.gr/).
- Submit an application for free meals, using the credentials of their institutional account, through the online platform of the Alexandria Campus of IHU (<u>http://feeding.teithe.gr/</u>).
- Register to courses and monitor their progress with the online secretariat and student log system of IHU (<u>https://uniportal.ihu.gr</u>).
- Access the Integrated Management Service of Textbooks "Eudoxus" (<u>https://eudoxus.gr/</u>) to declare textbooks of their choice for the courses they are registered to.
- Access and manage their electronic mailbox, through the Electronic Mail (e-mail) of the Alexandria Campus of IHU. (<u>https://noc.the.ihu.gr/webmail-ateith/</u>).
- Access the course pages of the Study Program through the Moodle platform (<u>https://moodle.teithe.gr/</u> and <u>https://exams-iee.the.ihu.gr/</u>).
- Access the Department's online services through the service catalog (<u>http://apps.iee.ihu.gr/</u>). These services include the department and faculty members announcements (e.g., assignment submission dates, grade announcements, lecture topics, etc.) but also about other topics (e.g., scholarships, work placement, etc.)
- Access the Department's electronic thesis management system (<u>http://thesis.iee.ihu.gr/</u>).

The website of the Department (<u>http://www.iee.ihu.gr/</u>) is a tool for updating and providing information on the activities of the Department and on important student matters, such as application dates, exam schedule, course timetable, lecture topics, etc. Students must regularly visit the Department's website and be updated on issues that concern them.

The **admission of Higher Education graduates** follows the current legislation. The percentage of admissions of University graduates, Technological Educational Institutes (TEI), A.S.PAI.TE, or equivalent Institutes and Universities in Greece or abroad (recognized by DOATAP – the Hellenic National Academic Recognition and Information Center, <u>http://www.doatap.gr/</u>) as well as holders of degrees of two-years and over-two-years higher education institutes of the Ministry of Education and Religious Affairs and other Ministries, is set at 12% of the Department's annual number of admissions.

The Education and Training Vocational Diplomas, which are considered relevant to those of the first cycle Study Program of the Department, are:

- Computer technician
- Computer and electronic office machine technician
- Measurement instruments technician
- Medical instruments technician
- Radio-TV and audio equipment technician

and the maximum number of Vocational Training Institutes graduates that can be classified is set at 5% the Department's annual number of admissions.

The courses for the Department's qualifying exams are published on the Department's website.

#### 5.4 Arrangements for the recognition of previous studies

After their success in the admission examinations, the admitted graduates apply to the Department Assembly for the recognition of courses included in their detailed transcript of records from their graduating institute. In particular, the student submits a written application to the Department's Secretariat along with a detailed transcript of records certified by the Secretariat of their graduation department, accompanied by the detailed syllabus of the courses taught and the laboratories in which they were practiced. The application and the supporting documents are forwarded to the responsible faculty member, who makes a recommendation to the Department's Assembly for the recognition or non-recognition of courses of the applicant student. The total number of recognized courses cannot exceed 30% of the ECTS credits of the Undergraduate Program of IEE Department.

## 5.5 Part-time studies – Interruption of studies

Part-time enrollment is granted to:

- students who are proven to work for at least twenty (20) hours a week,
- students with disabilities,
- athletes who, during their studies, belong to sports clubs registered with the General Secretariat
  of Sports and a) for the years they receive distinction between the 1<sup>st</sup> and 8<sup>th</sup> place in national
  championships of individual sports with the participation of at least twelve (12) athletes and eight
  (8) clubs, or compete in teams of the two higher categories in team sports, or participate as
  members of national teams in paneuropean championships, world championships, or other
  international events under the Hellenic Olympic Committee or b) participate at least once, during
  their studies, in Olympic, Paralympic, and Deaflympic Games.

The above categories may be registered as part-time students after their application is approved by the dean's office.

For part-time students, each semester is counted as half an academic semester, and they cannot enroll and be examined in more than half of the courses offered in the semester covered by their program of studies.

Students may, following their application to the Dean's office, interrupt their studies for a period not exceeding two (2) years. Student status is suspended during the interruption of studies.

#### 5.6 Declaration of courses – Enrollment renewal

At the beginning of each semester, the student must submit an electronic declaration that includes the courses of the study program that they intend to attend or be examined in during the specific semester. The deadlines for submitting declarations are announced by the Department Secretariat through a relevant announcement on the Department's website at the beginning of the semester and are strictly adhered to. After the deadline for submitting course declarations, no new declarations are accepted, nor are changes to a declaration that was submitted on time, except during the period for submitting corrective declarations that may follow. Declarations are submitted on <u>https://uniportal.ihu.gr</u>.

With this declaration, the student acquires the right:

- to receive the textbooks provided for the courses declared,
- to participate in the exams of the courses declared.

Students are obliged to declare first the compulsory courses of the previous semesters that they have not successfully completed and then the courses of their nominal semester, until they reach **42 ECTS credits**, which is the maximum number of credits they can declare every semester.

Students who have been graded with a grade of five (5.0) or higher in a course do not have the right to enroll and be examined in the same course again.

They must attend another course or declare another course to fulfill their credit requirements.

Participation in the September resit does not require submission of a new statement for the courses that students have already selected at the beginning of the two semesters and have not been examined in them or have failed their examinations.

#### 5.7 Academic ID – Student pass

Since 24/09/2012, undergraduate, graduate, and doctoral students of all universities in the country can electronically submit their application for issuing an academic ID card on the website of the Ministry <a href="https://academicid.minedu.gov.gr/">https://academicid.minedu.gov.gr/</a>.

#### 5.8 Learning resources

Undergraduate students have the right to choose and receive free of charge one (1) textbook for each compulsory or elective course of their study program. Before the end of each academic year, the Department Assembly, upon recommendation of the teaching staff, approves the distributed textbooks for each course of the study program for the next academic year. Any printed or electronic book, including free access electronic books, as well as printed or electronic academic notes, are considered as resources. The list of textbooks includes at least two proposed textbooks per compulsory or elective course, which are included in the Central Database of the Electronic Service for Integrated Management of Textbooks "Eudoxus" (https://eudoxus.gr). Otherwise, a special justification is required from the Department Assembly.

The matters related to the free provision of textbooks to students are regulated by a joint decision of the Ministers of Finance and Education and Religion Affairs, published in the Government Gazette.

Each student, after submitting the electronic statement of courses that they will attend (every semester), makes the corresponding declaration of textbooks through the "Eudoxus" service. The deadline for the declaration of preferable textbooks for each academic semester is announced on the Department's website. Failure to submit this declaration disqualify students from free textbooks but not from the exams.

The total number of textbooks each student is entitled to obtain freely is equal to the minimum number of compulsory and elective courses required to obtain the Degree. If the student declares more elective courses or replaces one elective with another after an unsuccessful examination, they are not entitled to obtain a textbook for the additional courses they choose.

The students can declare and receive textbooks for courses from previous semesters, as long as they have not been successfully examined in the specific course and have not already received a textbook for this course in the past. If the students have already received a textbook for a specific course in the past, they are not entitled to receive a new one for the same course even if the textbook of the course has changed. In case a textbook has already been sent by a courier service, it is considered to be obtained by the students, even if they, through their own fault, do not receive it (e.g., if the period of time during which the textbook remains at the destination station of the distributor/courier has elapsed).

#### 5.9 Exams

Courses taught in one academic semester are examined in two examination periods. The first examination period begins immediately after the end of the semester (winter or spring). The second examination period is set in September, before the start of the next winter semester. Exams are conducted exclusively in Greek according to a schedule approved by the Department Assembly. The exam schedule is posted on the Department's website at least two (2) weeks before the examination period. In special cases and after a special Ministerial decision, it is possible to conduct the exams remotely. Conducting examinations remotely introduces further requirements and restrictions so to ensure the integrity of the examination process. Although each course has its own specifics and requirements for its remote examination, there are some general guidelines for all courses.

The examination method is determined by the responsible professor of the course (written, oral, through assignments) according to the course outline in the Study Guide, and is announced on the course's electronic page and/or on the Department's website. Prerequisites for the students' participation in the examinations are:

- the electronic declaration of the course,
- the fulfillment of obligations (e.g., attendance, reports, exams) in laboratory exercises (where applicable),
- the completion of compulsory assignments, or the achievement of a passing grade in assignments or progress exams, if this has been specified and announced before the declaration of the courses.

The examinations are conducted in accordance with the provisions of the Examination Regulations (https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-εξετασεων ΤΜΠΗΣ.pdf).

The assessment and grading in each course is the exclusive responsibility of the course instructor or the responsible professor. The exam grade for each course is expressed on a ten-point scale from 0 to 10 (with a precision of one decimal point), in which five (5.0) represents the passing grade and ten (10.0) represents an excellent performance.

Students may request a certificate of participation in the exams. The certificate form is filled out by the student, signed by the professor during the exam, and after the exam is signed and stamped by the Department Secretariat. Students can request a certificate of participation after the exam as well as when the exams are conducted remotely.

If a student fails more than three (3) times in a course with grades higher than one (1) and different from each other, they may, upon their request and decision of the Dean, be examined by a three-member committee of professors of the School of Engineering who have identical or relevant knowledge field and are appointed by the Dean. The examiner/teacher responsible for the course is excluded from the committee. The application is submitted to the Dean's Office and is communicated to the Chair of the relevant Department.

#### **5.10** The academic advisor (tutor)

The Department of Information and Electronic Engineering implements the institution of the Academic Advisor. Every year the Department appoints a faculty or teaching member as the academic advisor of

each first-year student guiding on study-related matters. The allocation of students to academic advisors is done randomly. Then, through a special application (<u>https://advisor.iee.ihu.gr/</u>), students are informed about the academic advisors and their contact details, and the advisors are informed about the contact details of the students who were assigned to them.

The academic advisors inform the students about their roles and invite them to an introductory meeting. Students are encouraged to communicate regularly with their academic advisor and discuss any issues in their academic life that concern them, e.g., problems with courses, labs, issues related to study regulations, course selection, or even personal difficulties (family problems, health problems) which may affect their studies. Academic advisors help students complete their studies rationally and efficiently and help solve problems that may arise during their studies. Students can discuss any topic with their academic advisor. The academic advisor will try, as much as possible, to give or suggest solutions to any problems.

The regulation for the academic advisor is posted on the department's website and provides further information about the institution (<u>https://www.iee.ihu.gr/regulations/</u>).

#### 5.11 Assessment of educational process

The Department of Information and Electronic Engineering puts particular emphasis on the evaluation of the educational process conducted in the Department. In this context, the Department implements assessment procedures following the regulations set by the Hellenic Authority for Higher Education (HAHE) and the Quality Assurance Unit (QAU) of the university. These procedures aim to identify areas for improvement and enhance teaching and educational activities. The Department encourages students to participate in the evaluation process by undertaking promotional activities such as announcements and events. The Internal Evaluation Group (IEG) is a special committee responsible for the assessment procedures conducted within the department and consists of faculty members and a student representative. It's worth noting that the IEG maintains a website (https://omea.iee.ihu.gr/) where the actions and results of the evaluation processes implemented by the department are presented.

Every academic semester, the IEG encourage as many students as possible to evaluate the courses they attend and their instructors, through the completion of the QAU questionnaire (<u>https://modip.ihu.edu.gr/</u>). The IEG conducts internal evaluations every academic year by collecting and organizing data, including the evaluation data from students and their grading data. The outcome of this process is the annual internal evaluation report. The Department, under the responsibility of the IEG, organizes at least one event per academic year to inform the academic community about the results of the internal evaluation.

For data collection and processing, the IEG has developed software applications such as: a) IEEPubs (<u>https://omea.iee.ihu.gr/ieepubs/</u>), which collects, organizes, and distributes the published scientific work of the department's academic community members; b) IEECitations, which automatically retrieves and organizes references to the published work of department members; c) IEEGrades, which processes primary grading data. The processing of grading data is of a statistical/analytical nature generating graphs that visualize grade distributions for courses in each examination period, as well as the difficulty level of each course; d) IEEAlumni (<u>https://alumni.iee.ihu.gr</u>) that records the graduates' career progress and allows them to communicate with each other.

#### 5.12 Student objections and complaints

According to the Regulation on Student Complaints and Objections approved by the Department's Assembly, students can express their complaints and submit objections to the appropriate authorities.

Potential complaints and objections may relate to academic and student disagreements, inappropriate behavior by a member of academic or administrative staff, or insufficient guidance of students by a member of academic or administrative staff in various fields of application.

The Regulation for the Management of Student Complaints and Objections is available at the link <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Regulations-of-operation-of-complaints-and-objections-of-students.pdf.</u>

## 5.13 The student's advocate

The student's advocate, established under Article 55 of Law 4009/2011, aims to mediate between students and faculty members or administrative personnel of the university, ensuring legitimacy within the framework of academic freedom, addressing cases of mismanagement, and safeguarding the smooth functioning of the institution. The Student Ombudsman does not have jurisdiction over matters that concern examinations and student grades.

According to Article 52 of the Internal Regulations, autonomous offices operate under the name "Student's Advocate" in the Thessaloniki, Serres, and Kavala campuses. Each office has designated advocates for the student members of the IHU in the respective University campus.

The responsibilities of the advocates include:

- Examining students' requests and seeking solutions to problems they encounter with academic or administrative services.
- Facilitating students' contacts with the university's governing bodies and administrative services.
- Examining students' reports and complaints regarding compliance with ethical provisions and university legislation.
- Informing students about their rights and obligations as members of the University Community.

Every student has the right to submit a Request Submission Form that is available on the University's website (<u>https://www.ihu.gr/synigoros-foititi</u>), documenting any problem that concerns them, provided that it does not pertain to examination matters and grades.

#### 5.14 Student disciplinary offences

Student disciplinary offenses include the violation of the provisions of the legislation for Higher Education Institutions, the violation of decisions by the university bodies, and the violation of behavioral rules that members of the academic community should demonstrate to maintain democratic functioning and preserve the prestige of the University and its procedures.

A disciplinary offense can be committed intentionally by the student, but it can also be committed through negligence, provided it is specifically defined. The offense can also be committed by assisting a third party or facilitating them to commit a disciplinary offense.

Disciplinary offenses include:

(a) Violation of the integrity of examinations.

(b) Plagiarism or omission of direct or indirect contributions of other individuals to the respective subject of scientific study or research.

(c) Destruction of property owned by the University, whether movable or immovable, used by the University or the academic community members.

(d) Obstruction of the smooth functioning of the University, including its educational, research, or administrative functions, the functioning of its individual and collective bodies and services, as well as the use of its facilities and equipment.

(e) Use of sheltered or open spaces, facilities, infrastructure, and equipment of the University without the permission of the competent authorities.

(f) Use of sheltered or open spaces, facilities, infrastructure, and equipment of the University for purposes not consistent with its mission, as well as facilitating others in the commission of such acts.

(g) Deliberate or indeliberate polluting of covered or open spaces of the University, including noise pollution.

(h) Use of prohibited substances, as defined in Law 4139/2013 (Article 74), within the University, and any contribution to their trafficking.

(i) Committing any offense or crime related to student status.

In the event of committing a disciplinary offense, depending on its severity, the following penalties can be imposed on the student:

Written reprimand.

- Prohibition from participating in exams of one or more courses for one or more examination periods.
- A temporary or permanent prohibition from using the equipment or facilities of the Institution.
- Temporary suspension of student status for a period ranging from one (1) to twenty-four (24) months.
- Permanent expulsion.

Temporary suspension of student status results in the suspension of the validity of the student ID card and the corresponding deprivation of the rights associated with that status, such as participation in exams, receipt of academic transcripts, and receipt of financial or other support from the University. A penalty of suspension of student status for more than six (6) months also entails the deprivation of the right to use the spaces and facilities of the University, as well as the right to reside in the student residences of the University for the corresponding period.

The penalty of permanent expulsion can be imposed exclusively for disciplinary offenses of cases (c), (d), (h), and (i).

Disciplinary bodies include the rector, the competent vice-rector, the department chairperson, their deputies, and the Student Disciplinary Council.

The department chairperson is responsible for imposing disciplinary penalties of a written reprimand and exclusion from participating in the examinations of one (1) or more courses in one (1) examination period. The same penalties are also imposed by the rector or the vice-rector or their duly appointed substitute if they become aware of or have serious indications of the commission of a disciplinary offense and no disciplinary prosecution has been initiated by the department chairperson or the dean of the school.

If the seriousness of the offense justifies the imposition of a more severe penalty, the bodies mentioned in the previous paragraph refer the case to the Student Disciplinary Council, which has the authority to impose any other disciplinary penalty.

More information regarding student disciplinary offenses is included in the internal regulations of the IHU as well as in Law 4777/Gov. Gaz. 25 A'/17-2-2021.

#### 5.15 Graduation – Degree grade

To obtain the Degree, students must have completed:

- The 32 compulsory (C) courses of the USP.
- The five (5) compulsory-elective (CE) courses of the Specialization Group they have chosen.
- Eight (8) other courses of the USP.
- Their Diploma Thesis.

The Degree grade is calculated by

$$B = 0.02 \sum_{n=1}^{N} g_n + 0.1 g_d$$

where N = 45 is the total number of courses that the student must complete,  $g_n$  is the independent grade of each course of the USP, and  $g_d$  is the grade of the Diploma Thesis.

## 5.16 Graduation certificate – Transcript of Records – Diploma Supplement

After completing their obligations at the Information and Electronic Engineering Department, students participate, upon their application, in the **graduation ceremony** where they are sworn in and proclaimed as graduates of the Department.

Graduates receive the Graduation Certificate, a detailed Transcript of their performance in courses and the diploma thesis, and a Diploma Supplement that accompanies the Graduation Certificate, providing detailed information about the nature, level, background, content, and status of the completed studies.

## 6. POSTGRADUATE STUDY PROGRAMS

In the Department of Information and Electronic Engineering, there are currently two self-organized postgraduate study programs and one interdisciplinary postgraduate study program in collaboration with the Department of Early Childhood Education and Care. These programs are:

- MSc in Web Intelligence
- MSc in Applied Electronic Systems
- Interdepartmental MSc in Digital and Soft Skills in Educational Sciences

#### 6.1 Postgraduate studies in Web Intelligence

The Department of Information and Electronic Engineering of the International Hellenic University organizes the Postgraduate Study Program in Web Intelligence (MSc in Web Intelligence).

The duration of the program is three academic semesters, with the possibility of part-time attendance with a minimum completion time of five semesters. The fees for the entire duration of the program are 400 euros. The number of admitted students to the program is thirty (30) postgraduate students per year.

The courses in the program are delivered on Wednesdays, Fridays, and Saturdays. On Wednesdays and Fridays, classes start at 16:00, while on Saturdays, classes start at 10:00. It should be noted that up to 35% of the lectures are conducted through distance learning methods.

The MSc program in Web Intelligence started its operation in the academic year 2012-13 at the Department of Information Technology of the Alexander Technological Educational Institute of Thessaloniki. Since the academic year 2019-20, the postgraduate program is implemented by the Department of Information and Electronic Engineering. Therefore, the MSc program in Web Intelligence has completed ten years of existence and continues to be an innovative study program in Greece.

Website of the MSc program: <u>https://msc.iee.ihu.gr/</u>.

#### 6.1.1 Purpose and objectives

The Postgraduate Study Program in Web Intelligence aims to provide post graduate-level education and conduct research in web intelligence by combining advanced information technologies on the web and the internet with intelligent systems and computational intelligence. The graduates of the MSc program are expected to acquire a strong scientific background, experience, and technical knowledge for the development of Intelligent Web Applications.

More Specifically, the objectives of the MSc program are:

- To provide high-level education to scientists who will be able to successfully contribute to critical areas related to computer science and offer integrated solutions.
- To promote and develop research in all fields related to Web Intelligence.

The goal of the program is to create highly trained scientists by providing specialized knowledge in Web Intelligence, which they can utilize in the analysis of intelligent systems, the evaluation and application of intelligent technologies, and the production and development of new technologies.

The graduates of the MSc program are expected to acquire the necessary skills for successful careers as high-ranking executives both in the private sector (software design and production companies, IT departments of large corporations, etc.) and the public sector (public organizations, educational institutions, research centers, etc.)

#### 6.1.2 Postgraduate degree awarded

The Master's Program awards a Master's degree in "Web Intelligence" which is at level 7 of the National and European Qualifications Framework. The grading system for the degree is descriptive, as follows: Distinction (8.5-10), Very Good (6.5-8.49), Good (5-6.49). The numerical grade is calculated as the weighted average of the grades in the ten courses of the Master's Program and the Master's Thesis. In order to be awarded the master's degree, successful completion of ten courses, equivalent to 60 ECTS, is required, as well as successful completion, presentation, and examination of the master's thesis, which corresponds to 30 ECTS. Therefore, a total of 90 ECTS credits are required to obtain the master's degree.

#### 6.1.3 Organization and management

The responsible bodies for the organization and operation of the MSc in "Web Intelligence" are the following:

- The Senate of the International Hellenic University
- The Committee of Postgraduate Studies of IHU
- The Assembly of the Department of Informatics and Electronic Systems Engineering
- The Coordinating Committee (C.C.) of the MSc, composed of members of the academic staff of the Department of Informatics and Electronic Systems Engineering, who are involved in postgraduate projects or supervising doctoral theses and are appointed by the department assembly.

The C.C. is responsible for monitoring and coordinating the program's operation and consists of the following members:

- Michalis Salampasis, Professor, Director (msa@ihu.gr)
- Stathis Antoniou, Professor (<u>antoniou@ihu.gr</u>)
- Euklidis Keramopoulos, Associate Professor (euclid@ihu.gr)
- Vasileios Kostoglou, Professor (vkostogl@ihu.gr)
- Antonis Sidiropoulos, Associate Professor (<u>asidirop@ihu.gr</u>)

The Director for the Postgraduate Study Program, who presides over the C.C., is appointed by the Department Assembly for a two-year term, renewable, and carries out his duties. The Director belongs to the same or related field of study as the MSc, and performs the duties specified by the Institution's Postgraduate Studies Regulation and its internal regulations. The Director of Postgraduate Studies proposes to the General Assembly any matter concerning the effective implementation of the program.

The administrative support for the program is provided by Ms. Konstantina Giovannoudi, Administrative Officer of I.H.U. (<u>sec-msc@iee.ihu.gr</u>).

#### 6.1.4 Study program

For the successful completion of the Master's Program, it is required to successfully attend ten courses, five in the winter semester and five in the spring semester, as well as successfully complete and present the Master's thesis, which takes place in the third and final semester. The courses offered in the program are presented in the table below.

Code	Title	ECTS	Weekly hours	Semester
M101	Research Methodologies	6	3	A

M102	Software Engineering for Web Applications	6	3	А
M103	Internet Information Systems Security	6	3	А
M104	Mobile and Pervasive Computing Systems	6	3	А
M105	Machine Learning	6	3	А
M201	Data Warehouse and Data Mining	6	3	В
M202	Intelligent Technologies - Agents	6	3	В
M203	Social Networking	6	3	В
M204	Information Retrieval on the Web	6	3	В
M205	Semantic Web	6	3	В
M301	MSc Thesis	30		Γ

#### 6.1.5 MSc Thesis

During the 3rd semester, all postgraduate students are required to prepare, submit, and present their diploma MSc thesis, which can be a research or application development project. The results of the thesis, which should include elements of originality, are presented in the form of a dissertation. The thesis is an important part of the study program. It aims to demonstrate the student's ability to integrate and apply the knowledge acquired during their studies in the MSc program. The Master's Thesis can fall into one or more of the following categories:

- Systematic and in-depth literature review on a specific topic: It should provide a comprehensive literature review, covering a gap in the existing research literature and generating new knowledge in the field of Web Intelligence.
- Original high-level study: It should compose a valuable original study, utilizing research or original material, or proposing new methodologies and techniques in the area of Web Intelligence.
- Addressing an original application problem: It should design and develop an innovative service for a specific technological and operational environment in the field of Web Intelligence.

Regardless of the category, the thesis should demonstrate originality, synthesis, and the integration of knowledge acquired during the studies. It should also reflect the student's personal contribution and ability. The originality may refer to: (a) covering a literature gap (e.g., producing a new theory or new data), (b) an effective modification of a theoretical analysis, (c) a successful solution to an original problem, (d) modification or supplementation of the methods used to solve a problem, or (e) drawing new conclusions.

To conduct the thesis, at least one semester is required, and it should be written in Greek or English. At the beginning of the 3rd semester, each postgraduate student must select the topic of the thesis and the supervisor. The topics of the theses are announced by the professors, and students choose based on their interests, knowledge, and experience. Students can also propose a thesis topic, which should specify the

subject to be analyzed, the company or organization with which potential cooperation will take place, the methodology, and the bibliography to be used. The acceptance of the proposal is based on criteria such as relevance to the postgraduate program, contribution to expected benefits, and elements of originality in the approach. For more information, you can visit: <u>https://msc.iee.ihu.gr/semester-3/</u>.

#### 6.1.6 Admission

Graduates of the following departments are accepted: Computer Science, Computer Engineering, Electronic Engineering, Automation Engineering, Electrical Engineering, Mathematics, Physics of Greek Universities, as well as departments of recognized foreign Universities whose degree has been recognized by DOATAP.

The evaluation and selection of postgraduate students are carried out by the Coordinating Committee. The selection process involves an algorithm that assigns scores to the qualifications of candidates with the aim of selecting candidates who meet the necessary conditions that maximize the probability of successful completion of the MSc program. The selection process is based on the following criteria:

- 1. Relevance of the candidate's undergraduate studies to the scientific area of the MSc program (up to 30 points).
- 2. Overall grade of the bachelor's degree (up to 10 points).
- 3. Grade in relevant prerequisite courses related to the MSc program (up to 10 points).
- 4. Relevance and performance in a Bachelor's or Diploma Thesis (up to 5+5 points).
- 5. Any relevant research activity (up to 10 points).
- 6. Another degree or postgraduate qualification (5 points).
- 7. Any relevant professional experience (up to 5 points).
- 8. Interview (up to 20 points).

More Information concerning the admission are available at the MSc program website (<u>https://msc.iee.ihu.gr/admission-process/</u>).

#### 6.1.7 Duration of studies

The minimum duration of studies is defined as three (3) academic semesters, including one semester for the completion of the MSc Thesis. The maximum period of enrollment cannot exceed a total of 6 academic semesters for full-time study.

The MSc program offers the option of part-time study. Inclusion of a student in a part-time program can be done upon their request and during their enrollment in the program. It is also possible to switch from full-time to part-time study or vice versa during the program. Students who opt for part-time study should choose to attend courses that are offered during the full-time study process.

Part-time studies have a minimum duration of 5 semesters. Each semester, students must compulsorily choose the enrollment in at least 2 courses among those taught in the current semester. The maximum number of courses per semester is determined by the total number of courses taught in the current semester, i.e., 5 courses. Each academic year, students must select the enrollment in a total of at least 5 courses (50% of the courses).

#### 6.1.8 Staff

Faculty members of the teaching and research staff (DEP) and laboratory lecturers (EDIP) from the Department of Information and Electronic Engineering teach in the MSc program according to their

specialization. In addition, courses are taught by faculty members from other departments, visiting professors, and specialized scientists who hold a PhD degree. The instructors for the academic year 2022-23 are listed in the tables below.

Members of Department of Information and Electronic Engineering							
Name	Rank	Email					
Panagiotis Adamidis	Professor	adamidis@ihu.gr					
Efstathios Antoniou	Professor	antoniou@ihu.gr					
Aikaterini Asdre	EDIP	asdre@ihu.gr					
Konstantinos Goulianas	Associate Professor	gouliana@ihu.gr					
Dimitrios Dervos	Professor	dad@ihu.gr					
Konstantinos Diamantaras	Professor	<u>kdiamant@ihu.gr</u>					
Christos Ilioudis	Professor	<u>iliou@ihu.gr</u>					
Euclid Keramopoulos	Associate Professor	euclid@ihu.gr					
Vasileios Kostoglou	Professor	<u>vkostogl@ihu.gr</u>					
Charalampos Bratsas	Assistant Professor	<u>cbratsas@iee.ihu.gr</u>					
Stefanos Ougiaroglou	Assistant Professor	<u>stoug@ihu.gr</u>					
Dimitrios Papakostas	Professor	dpapakos@ihu.gr					
Michalis Salampasis (MSc Program Head)	Professor	<u>msa@ihu.gr</u>					
Antonis Sidiropoulos	Associate Professor	asidirop@ihu.gr					
Dimosthenis Stamatis	Professor	<u>demos@ihu.gr</u>					
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#### 6.2 Postgraduate studies in Applied Electronic Systems

The Department of Information and Electronic Engineering of the International Hellenic University has been organizing a Master's Program (MSc) in Applied Electronics Systems since the academic year 2017-18. The MSc program focuses on the design and programming of advanced electronic systems and reflects the contemporary developments in the field of embedded systems, as well as measurement, energy, control, and communication systems. Its objective is to educate engineers and graduates in relevant disciplines and equip them with advanced knowledge in the subject of electronic systems for professional careers in the fields of research and development, industry, or academia. The program's orientation is technological and is ensured by providing a suitable theoretical background in combination with the provision of high-level technological education. Upon completion of the MSc program, graduates will have a strong scientific background in the evolving field of electronics.

The courses are conducted in the classrooms and laboratories of the Department of Information and Electronic Engineering at the Alexandrian Campus in Sindos during the afternoon hours. The duration of the MSc program includes three full academic semesters. The first two semesters involve courses, while the third academic semester is dedicated to the completion of a MSc thesis. Employed students have the option of part-time enrollment, which lasts twice as long as full-time enrollment, meaning three academic years. The fees per student amount to four hundred (400) euros, covering the entire duration of the program, and are paid in full upon registration. Up to 30% of students are accepted who are exempted from fees based on financial criteria according to article 35 of Law 4485/2017.

The MSc program was established and operated as an MSc program of the (then) Department of Electronic Engineering of the Technological Educational Institute of Thessaloniki (TEI) in the academic year 2017-18 (Gov. Gazette 2392/14-7-2017). With Gov. Gazette 3472/13-9-2019, its re-establishment as an MSc program in "Applied Electronics Systems" of the Department of Information and Electronic Engineering of the International Hellenic University was approved, as well as its operation until the academic year 2022-23. With Gov. Gazette 4318/2-10-2020, its operation was extended until the academic year 2024-25. The operation of the MSc program is determined by the Study Regulation, as well as Law 4485/2017 (Gov. Gazette 114/4-8-2017) concerning Higher Education in the country.

Website of the MSc program: <u>https://aes.iee.ihu.gr</u>.

#### 6.2.1 Purpose and objectives

The purpose of the MSc program is to educate graduates in electronic engineering and related disciplines, enhancing their scientific knowledge and research skills in cutting-edge technologies of applied electronics. The program aims to produce graduates who are capable, responsive to the country's developmental priorities and societal needs, and can effectively engage in both academic and industrial/corporate environments internationally. Graduates are expected to contribute to advancements in the broader field of electronic systems and develop innovative solutions and applications.

The objectives of the MSc program are as follows:

- To educate graduates in electronic engineering and related disciplines, equipping them with advanced knowledge in the field of electronic systems for professional careers in research and development in industry or academia.
- To provide the advanced technological knowledge required for the application of Electronics in various fields, including but not limited to embedded systems, measurement systems, energy systems, control systems, and communications.
- To foster a collaborative atmosphere among the staff, students, and relevant companies, offering an environment where students can develop their knowledge and skills.
- To enhance and expand collaboration opportunities for the department, both at the academic level, with related departments and interdisciplinary collaborations, and at the level of applied research and production with industries, companies, and businesses operating in the field of applied electronic systems.

The graduates of the MSc program are expected to:

- Possess an in-depth understanding and knowledge of applied electronic systems and be capable of using their knowledge for the original development and application of complex methodologies to solve problems within a broader interdisciplinary field.
- Combine knowledge of applied electronic systems and critically evaluate complex issues, including considerations of social and ethical responsibilities associated with the application and outcomes of technological applications.
- Be able to assume positions in enterprises, organizations, or production units in the public and private sectors in Greece and abroad that are involved in areas related to electronic technologies, fulfilling their need for highly skilled personnel.
- Have the ability to develop entrepreneurial activities as self-employed individuals in the technological field of study, involving the study, design, and implementation of advanced electronic systems.
- Be able to promote basic and applied research in related subjects and possess the necessary knowledge and skills to pursue PhD.

## 6.2.2 Postgraduate degree awarded

The MSc program leads to a postgraduate diploma at level 7 of the National and European Qualifications Framework and is equivalent to 90 ECTS credits. It is recognized by all authorities (Ministry, ASEP, etc.) in Greece and abroad.

The MSc program awards a Master's degree in "Applied Electronic Systems". To be awarded the MSc degree, successful completion of 8 courses is required, corresponding to 60 ECTS credits, as well as the successful examination of the master's thesis (30 ECTS credits). The MSc grade is determined by the weighted average of the grades of the courses and the master's thesis, with the corresponding ECTS credits serving as weighting factors.

#### 6.2.3 Organization and management

The responsible bodies for the organization and operation of the MSc program are:

- The Senate of International Hellenic University.
- The Postgraduate Studies Committee of International Hellenic University.

- The Assembly of the Department of Information and Electronic Engineering, which is responsible for the development and recommendation of proposals for the MSc program to the Senate of International Hellenic University through the Postgraduate Studies Committee. It is also responsible for the formation of the coordinating committee, the awarding of postgraduate degrees, the assignment of teaching duties to the instructors of the MSc program, the verification of successful completion of studies, the provision of scholarships, extension or suspension of studies, student deletions, and more.
- The Coordinating Committee (CC) of the MSc program, composed of five (5) faculty members of the Department elected by the Assembly of the Department for a two-year term. The CC collaborates with the Director and is responsible for monitoring and operating the MSc program. The CC makes recommendations to the Assembly regarding any matter concerning the operation of the MSc program.
- The Director of the MSc program, who is a member of the CC and is appointed together with the Deputy Director by a decision of the Assembly of the respective Department for a two-year term. The Director of the MSc program presides over the CC and makes recommendations to the relevant bodies of the Institution regarding any matter concerning its effective operation.
- The responsible for the MSc Thesis, who is a member of the CC and makes recommendations to it on any matter related to MSc Thesis.
- For the administrative support of the MSc program, there is a Secretariat responsible for various matters related to its operation, such as student registration, maintenance of grading files, evaluation of instructors, issuance of degrees, certificates, attestations, and more.

#### Coordinating Committee of the MSc in Applied Electronic Systems:

- Ioannis Marmorkos, Professor (Director) imarm@ihu.gr
- Panagiotis Tzekis, Associate Professor (Deputy Director) ptzekis@ihu.gr
- Iordanis Kioskeridis, Professor (Supervisor of Dissertations) ikiosker@ihu.gr
- Georgios Bamnios, Professor bamnios@ihu.gr
- Argiris Chatzopoulos, Associate Professor ahatz@ihu.gr

#### Secretariat of the MSc in Applied Electronic Systems:

• Konstantina Giovannoudi, I.H.U. Administrative Staff - <u>aesinfo@the.ihu.gr</u>

#### 6.2.4 Study program

The postgraduate program consists of three academic semesters of study. Each semester includes 13 teaching weeks. During the first two semesters, students are required to successfully complete courses equivalent to 30 ECTS credits per semester (typically, 4 courses per semester, each corresponding to 7.5 ECTS credits). The third semester is dedicated to the preparation of the master's thesis, which is mandatory and corresponds to 30 ECTS credits of the ECTS system. Therefore, the program offers 90 ECTS.

The courses of the postgraduate program may include theoretical lectures, practical exercises, laboratory work, seminars, and/or other activities, all of which are considered as an integrated educational unit. The number and content of the offered courses are regularly updated by the Assembly of the respective Department, aiming to ensure that the postgraduate program reflects the advancements in the specific field of knowledge, as well as the broader field of Electronics and the demands of the job market. The following table presents the courses of the program.

Course title	C/E*	ECTS	Weekly hours	Semester
Technological Entrepreneurship and Research	С	7.5	3	А
Sensors and Measurement Systems	С	7.5	3	А
Renewable Energy Systems and Electromobility	С	7.5	3	А
Internet of Things (IoT) Applications	С	7.5	3	А
Embedded Systems Design	С	7.5	3	В
Algorithms and Programming for Mobile Devices	С	7.5	3	В
Industrial Controllers and Supervisory Control and Data Acquisition (PLC and SCADA)	С	7.5	3	В
4th and 5th Generation Mobile Communications	E	7.5	3	В
Optical Networks	E	7.5	3	В
Course offered by another related MSc program and approved as suitable by the Coordinating Committee	E	7.5		В
MSc Thesis	С	30		Г

\* C: Compulsory, E: Elective

#### 6.2.5 MSc Thesis

is required to complete a master's thesis. They choose the topic and supervisor, who is a faculty member of the MSc program. The master's thesis corresponds to 30 ECTS credits, and a prerequisite for undertaking it is the successful completion of at least 6 courses of the MSc program. The purpose of the thesis is to provide the graduate student with the opportunity to apply the knowledge acquired in their field of interest and help them develop skills and synthetic abilities. The master's thesis can involve designing and constructing electronic devices/systems, developing original software, using specialized software for application simulation, developing mathematical or physical models, and/or conducting measurements. The thesis topics have a study, research, developmental, and applied nature. Sources of thesis topics include current scientific advancements in the field of Electronics, research activities of the Department, and technological advancements in production and industry. Special emphasis is placed on conducting theses in collaboration with recognized companies in the job market.

The master's thesis is evaluated by a three-member examination committee consisting of the supervisor and two other members. The graduate student submits a copy of the thesis in electronic format and defends it in a public presentation-examination in front of the committee. The evaluation of the thesis is based on specific criteria such as:

- Methodology and processing/analysis of research data
- Clarity in formulating the objectives, assumptions, and conclusions of the study

- Achievement of the objectives
- Scientific contribution
- Sufficient bibliographic documentation of the topic
- Quality and validity of the bibliographic sources
- Quality of the written text
- Quality of the presentation during the defense

The writing of the thesis must adhere to academic ethics and legislation by referencing the sources relied upon through proper citation and referencing. Special emphasis is placed on avoiding plagiarism, which, if detected, can lead to the student's expulsion from the MSc program, in accordance with the regulations of the postgraduate studies.

#### 6.2.6 Admission

The maximum number of admitted students per year is set at forty (40). The number of admissions for each year is determined by the Selection Committee and may be less than forty. Typically, it ranges from 25 to 30 students.

#### Required qualifications for admission to the MSc program

The minimum required qualifications for admission to the MSc program are a degree from a Greek or recognized foreign university, relevant to the field of study, and sufficient knowledge of the English language (B2 level). For international students, proficiency in the Greek language is also required.

In addition to the above minimum requirements, the selection of M.Sc. candidates takes into account scientific publications or distinctions, as well as other academic degrees beyond the undergraduate level.

#### Categories of graduates who are accepted

Accepted candidates for the M.Sc. program include graduates from Greek universities or recognized foreign institutions (degree recognition by DOATAP) in fields related to electronics, telecommunications, automation, and informatics (e.g., graduates in Electronics, Electrical Engineering, Polytechnic Schools, Computer Science, Computer Engineering, Automation, and Applied Sciences). Applications from graduates of other disciplines are evaluated on a case-by-case basis by the Selection Committee, depending on the knowledge and experience of the candidate.

#### **Required documents and application:**

The necessary documents that candidates must submit through the special platform are:

- Application form (completed online).
- Copy of the degree certificate or certificate of completion of studies from the Department's Registrar's Office, indicating the degree grade.
- For candidates coming from foreign universities, a certificate of equivalence of the degree from DOATAP is also required.
- Copy of the detailed academic transcript.
- Detailed Curriculum Vitae.
- Documentation of sufficient knowledge of the English language and, for international students, Greek language proficiency.
- Proficiency in the English language is certified by one of the following:

- Language proficiency certificate in English at least at the B2 level issued by the Ministry of Education or other institutions recognized by ASEP.
- Legally recognized university degree (undergraduate or postgraduate) from an English-language program of study, recognized by DOATAP.
- If none of the above certificates are available, the Selection Committee may decide to conduct additional internal examinations. The content and timing of these examinations are determined by the Selection Committee.
- For international students, proficiency in the Greek language is certified by a language proficiency certificate in Greek issued by the Ministry of Education or other institutions recognized by ASEP.
- Scientific publications and/or distinctions (if any).
- Copies of other academic degrees, such as a postgraduate diploma or a doctoral degree (if any).

#### Evaluation, scoring, and selection of candidates:

The evaluation and selection process of candidates is carried out by the Selection Committee using a specialized algorithm that scores the qualifications of the candidates.

The evaluation process is based on the following criteria:

- Undergraduate degree grade (converted to scores by multiplying the grade by 2).
- Possession of a relevant postgraduate diploma (5 scores).
- Possession of a relevant PhD degree (10 scores).
- Relevant research activity (converted to points by multiplying the number of publications in reputable international scientific journals by 2 and adding the number of papers presented at scientific conferences).
- Relevance of undergraduate/master's thesis (up to 4 points).
- More information is available at <u>https://aes.iee.ihu.gr/?page\_id=30</u>.

#### 6.2.7 Duration of studies

#### Full-time enrollment

The duration of full-time enrollment in the postgraduate program includes 3 full academic semesters. The first two semesters involve attending classes/lectures/laboratories/seminars, while the third academic semester is dedicated to the completion of the master's thesis.

The maximum duration of full-time enrollment cannot exceed the regular duration of study plus three (3) additional academic semesters (3 academic years in total). If the maximum duration of full-time enrollment, i.e., three (3) academic years, is exceeded, the postgraduate student will be automatically expelled from the postgraduate program.

#### Part-time enrollment

Part-time enrollment is available for working students and has a duration twice as long as full-time enrollment, which means three (3) academic years. The maximum duration of part-time enrollment cannot exceed the aforementioned three (3) academic years plus one (1) additional academic year (4 academic years in total). If the maximum duration of part-time enrollment (4 academic years in total) is exceeded, the part-time postgraduate student will be automatically expelled from the postgraduate program.

Students who initially started their postgraduate studies as full-time students cannot switch to part-time enrollment afterwards. The number of part-time students in each study cycle is determined by the Department and cannot exceed the number of full-time students.

#### Suspension of enrollment:

Every full-time or part-time postgraduate student has the right to request a one-time suspension of their enrollment in the postgraduate program. The suspension period can be either one academic semester or one academic year. The application for enrollment suspension must be justified, submitted to the C.C., and referred to the Department Assembly for approval based on the C.C.'s recommendation. The duration of the enrollment suspension is not counted towards the duration of study.

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#### 6.3 Postgraduate studies in Digital and Soft Skills in Educational Sciences

The interdepartmental Postgraduate Program (MSc) titled "Digital and Soft Skills in Educational Sciences" of the International Hellenic University is a collaboration between the Departments of: a) Early Childhood Education and Care of the School of Social Sciences, and b) Department of Information and Electronic Engineering of the School of Engineering, at the International Hellenic University.

The duration of the studies is 3 semesters, providing 90 ECTS credits, and it is at level 7 of the National Qualifications Framework. The monitoring system is entirely distance-based, meaning that all courses are conducted through the method of synchronous distance learning, via Zoom, without the need for physical presence, allowing participants to attend from anywhere. Therefore, the program is flexible in terms of attendance and tailored to the specific needs of adults.

To obtain the MSc degree, a maximum of nine courses (or seven if a student chooses to complete a MSc dissertation) are required, while offering opportunities for elective courses to accommodate alternative learning paths based on participants' specific interests. The dissertation is not mandatory, as students have the option to choose between completing a dissertation or finishing the program solely by attending courses.

The teaching approach of the courses emphasizes active student engagement (seminar structure), combining research, theory, and practice. Continuous feedback through the evaluation of all instructors is considered crucial for the continuous improvement throughout the operation of the MSc program on "Digital and Soft Skills in Educational Sciences." The elective courses have been selected and developed to allow postgraduate students to gain specific specialization in particular fields of the MSc program.

Furthermore, the two directions offered by the program, as well as the courses provided in each one of them, have been designed to allow postgraduate students to choose the scientific area and professional field that interests them the most.

Moreover, it should be noted that in order to meet the multiple needs of postgraduate students in the MSc program (working professionals, residents of other areas, etc.), the program's courses have been designed to be implemented in a limited number of days, during afternoons, and primarily on weekends. Additionally, modern synchronous and asynchronous teaching methods will be utilized, in accordance with the relevant regulations. This is another factor ensuring the sustainability of the MSc program by guaranteeing the unhindered attendance of participants in the program's courses.

The interdisciplinary collaboration in the organization of the postgraduate program offers a broader and more credible scientific approach to the newly established subject it addresses. Moreover, the needs of the population addressed by the MSc program on "Digital and Soft Skills in Educational Sciences" now fall within the framework of pedagogical digital competence, a complex field that requires a "dialogue" between different scientific disciplines.

The MSc program awards a MSc degree in "Digital and Soft Skills in Educational Sciences". The tuition fees amount to a total of 2,100 euros. It is noted that the program provides certification in "Pedagogical and Didactic Competence" (Gov. Gazette 736/25.02.2021, vol. B) as well as competence in "Computer Use" based on the provisions of Supreme Council for Civil Personnel Selection (ASEP). It is worth mentioning

that the MSc operates according to Gov. Gazette 2777/26.04.2023, vol. B, while the Study Regulations have been published in Gov. Gazette 2820/27-4-2023, vol. B.

The website of the program: <u>https://digital-skills.the.ihu.gr/</u>.

#### 6.3.1 Purpose and objectives

The MSc program "Digital and Soft Skills in Educational Sciences" is aimed at participants involved in the learning process. The range of topics covered includes both the cultivation of skills and abilities of the participants in the learning process and their preparation to transmit essential social demands through education, focusing on both digital and soft skills.

The MSc program aims to enhance the professional profile of educators and pedagogues and bring about dynamic reforms in the learning process. It seeks to shape the intention and develop the ability of participants in the learning process to utilize new technologies, intertwined with the parallel cultivation of soft skills, in a dialogical relationship.

The objective of the MSc program is the production and dissemination of knowledge in the field of education, with specialization in two main areas: (a) the utilization of digital and soft skills in early childhood and (b) the utilization of digital and soft skills in education and lifelong learning.

The MSc program aims to equip postgraduate students with the necessary knowledge, experiences, and skills that will enable them to pursue professional careers in sectors of the job market where digital and soft skills are deemed necessary. More specifically, the program aims:

- Staff schools, kindergartens, daycare centers, and creative activity centers, as well as other relevant entities in the public and private sectors, with professionals specialized in digital and soft skills.
- Prepare a specially trained scientific workforce that will staff future educational units in the country (at all levels and grades) and promote research and teaching in education sciences through innovative approaches and actions ensured by a comprehensive and high-level curriculum.
- Provide postgraduate students with the opportunity to critically connect theory, research, and practical application in order to achieve a notable professional and/or academic career, both domestically and internationally.
- Contribute to the reduction of brain drain to other countries and strengthen the existing personnel at all levels of education by bringing in new specialized professionals and scientists in areas at the forefront of modern society.

#### 6.3.2 Study program

The courses and research activities for the awarding of the Master's Degree in "Digital and Soft Skills in Education Sciences" are described as follows:

(a) Each course is taught in Greek for 39 hours, which corresponds to 13 three-hour sessions. The courses are in the form of seminars and are divided into two categories: core courses and elective courses.

(b) Each offered course is credited with ECTS units, taking into account the total workload required for successful completion. The total workload per semester is assessed with an upper limit of thirty (30) ECTS credits. Specifically:

- Courses are credited with 10 ECTS.
- The master's thesis is credited with 20 ECTS (research and writing).

• To obtain a Specialized Master's Degree, the completion of ninety (90) ECTS credits is required.

(c) Students are required to successfully attend and pass at least seven (7) postgraduate courses, which correspond to 70 credits if they undertake to successfully complete a master's thesis, which corresponds to twenty (20) credits. The master's thesis is a compulsory empirical research project, with a minimum duration of one semester and a maximum of two semesters. If students choose not to pursue a master's thesis, they are required to pass at least nine (9) postgraduate courses, corresponding to ninety (90) credits. Each course is graded on a scale of 0-10, with a pass mark of 5. Specifically:

- Students of each specialization must successfully attend the four (4) core courses (4 x 10 ECTS = 40 ECTS), which are taught during the first two semesters of study.
- Students who choose to pursue a master's thesis must successfully attend three (3) elective courses, while those who choose not to pursue a MSc thesis are required to successfully attend five (5) elective courses.
- Students who choose to pursue a master's thesis can replace it with the successful completion of two elective courses, as long as they have not exceeded the maximum total completion time of the program.
- To ensure that postgraduate students have acquired a comprehensive knowledge of the fields covered by the Master's Degree program, they must successfully complete the attendance of at least 30 ECTS credits from the group of courses on digital skills and at least 30 ECTS credits from the group of courses on soft and combinatory skills (excluding the ECTS credits of the master's thesis).
- Students who choose to pursue a MSc thesis must declare it to the Secretariat of the Master's Program by submitting a signed statement by the end of the first semester, as determined by the decision of the Program's Academic Committee for each academic year. Otherwise, they will not have the right to choose this option.

First Semester Courses (3 Core Courses)		
Title	ECTS	
Advanced Level Research Methodology in Educational Sciences	10	
Critical Extensions of Digital Pedagogy	10	
Utilization of Soft Skills in Educational Sciences	10	

Second Semester Courses (1 Core Course and 2 Elective Courses)		
Title	ECTS	
Information Technology Systems and Skills in Education	10	
Elective Course 1 (from the respective specialization)*	10	
Elective Course 2 (from the respective specialization)*	10	

Third Semester Courses with Dissertation (Dissertation and 1 Elective Course)		
Title	ECTS	
MSc Dissertation	20	
Elective Course 3 (from the respective specialization)*	10	

Third Semester Courses without Dissertation (3 Elective Courses)		
Τίτλος	ECTS	
Elective Course 3 (from the respective specialization)*	10	
Elective Course 4 (from the respective specialization)*	10	
Elective Course 5 (from the respective specialization)*	10	

\*In order for an elective course to be offered, it must be chosen by at least fifteen (15) postgraduate students.

(d) After the end of the second semester, those students who wish to do so proceed to complete a master's dissertation under the supervision of one of the instructors of the MSc program, as determined by the Coordinating Committee

#### Course catalogue

General Pedagogical Courses	Specialization
Teaching Methodology	Teaching Methodology
Common Course for all Specializations	Common Course for all Specializations
Contemporary Educational Trends	Contemporary Educational Trends
Specialization in Education and Lifelong Learning	Specialization in Education and Lifelong Learning
The Science of Education in Early Childhood	The Science of Education in Early Childhood
Courses on Combinatorial Skills	Specialization
Critical Extensions of Digital Pedagogy	Common Course for all Specializations
Advanced Research Methodology in Educational Sciences	Common Course for all Specializationsç
Advanced Research Designs and Data Analysis Methods in Education	Common Course for all Specializations

Advanced Research Designs and Data Analysis Methods in Education	Specialization in Education and Lifelong Learning	
Differentiated Pedagogy and New Technologies	Specialization in Early Childhood Education	
Digital Skills Courses	Specialization	
Information Systems and Computer Skills in Education	Common Course for all Specializations	
Integration of New Technologies in the Learning Process	Common Course for all Specializations	
Creation of Interactive Educational Materials	Common Course for all Specializations	
Internet of Things in STEM Education	Specialization in Education and Lifelong Learning	
E-Learning Platforms and Communication	Specialization in Education and Lifelong Learning	
Data and Information	Specialization in Education and Lifelong Learning	
Use and Creation of Educational Software Applications	Specialization in Early Childhood Education	
Soft Skills Courses	Specialization	
Utilization of Soft Skills in Education	Common Course for all Specializations	
Innovation and Creative Learning in Education	Specialization in Education and Lifelong Learning	
Interpersonal Skills and Communication in Early Childhood Education	Specialization in Early Childhood Education	
Interpersonal Skills and Communication in Education	Specialization in Education and Lifelong Learning	
Creativity and Innovation in Early Childhood Education	Specialization in Early Childhood Education	

#### Master's Thesis

The master's thesis is evaluated by a three-member committee consisting of the supervisor and two other members appointed by the Coordination Committee.

After successful defense of the thesis, the candidate is required to submit a printed copy of the work, as well as a digital copy, to the Department's Secretariat.

#### 6.3.3 Admission

Greek and international University and Technological Education Institutes graduates with good knowledge of English are admitted at the MSc program. The application, selection, and admission procedures are described at <a href="https://digital-skills.the.ihu.gr/?page\_id=705">https://digital-skills.the.ihu.gr/?page\_id=705</a>.

## 7. DOCTORAL STUDIES PROGRAM

The Department of Information and Electronics Engineering offers doctoral studies since February 2020 based on the Doctoral Studies Regulation (DSR) approved by Government Gazette B'/211/03.02.2020 and operates following the provisions of Law 4485/2017, Law 3391/2005 as amended and in force, as well as the relevant provisions and decisions of IHU Senate.

The doctoral studies aim to promote knowledge and high-level scientific research and to create scientists capable of contributing to the progress of science, education, and research. The PhD degree is an academic title that certifies the completion of original scientific research and the substantial contribution of the holder to the advancement of science and knowledge in the respective scientific field. Graduates of the Doctoral Studies Program (DSP) are intended to enrich the research, business, and educational potential of Greece and abroad.

The Department Assembly of the Department has all the responsibilities for the smooth operation of the DSP, namely, it determines the subject field of each doctoral thesis, approves the applications of the candidates, appoints the supervisor(s) of the doctoral thesis, the members of the Advisory Committee, the members of the examining committee, and awards the PhD degree according to the provisions of the DSR. At least one faculty member of the Department participates in each three-member Advisory Committee.

For the coordination of the Doctoral Studies, the Department has established the Doctoral Studies Coordinating Committee (DSCC), composed of the following members:

- Periklis Chatzimisios, Professor, Director of DSCC
- Michael Salampasis, Professor, DSCC member
- Athanasios Iosifidis, Assistant Professor, DSCC member

The number of active doctoral candidates in the Department for the academic year 2022-2023 is 31.

## 7.1 Criteria and procedure for admission – selection of PhD students

Right to Apply for a Doctoral Dissertation in the Department is granted to those who meet the following requirements:

- Hold a Bachelor's degree from a Greek University (University or Technological Educational Institute) or an equivalent institution abroad.
- Hold a Master's degree from a Greek University (University or Technological Educational Institute) or an equivalent institution abroad, or hold an integrated Master's degree according to Article 46 of law 4485/2017.
- Have a good command of the English language at least at level B2.

As an exception, PhD students who do not hold a Master's degree are accepted when they have demonstrated research activity in a relevant subject, proved specifically by at least one (1) publication in a relevant subject to the PhD topic in a peer-reviewed international scientific journal or an international scientific conference. Candidates in this category must successfully attend and pass at least two (2) undergraduate or postgraduate courses offered by the Department of Information and Electronic Systems Engineering, which are recommended by the Advisory Committee and approved by the Department's Assembly.

PhD candidates should not have a first-degree kinship relationship with a member of the three-member Advisory Committee or the DSCC.
The IEE Department adopts, based on Article 38, paragraph 2, and Article 42, paragraphs 1, 2, and 3 of Law 4485/2017, the following two methods for selecting doctoral candidates:

- **Synchronous selection of doctoral candidates** (Article 38, paragraph 2, Law 4485): The candidate submits an application to the Department's Secretariat in October and May. The application includes the proposed temporary title of their PhD, as well as the proposed supervisor, who belongs to those eligible to supervise PhD studies, according to the provisions of the DSR.
- Asynchronous selection of doctoral candidates (Article 42, Law 4485): Members of the Department's Faculty, who are eligible to supervise doctoral dissertations according to the DSR, announce positions for doctoral candidates, which are published in the daily press and post on the Department's website. Interested candidates who meet the above requirements are invited to submit their applications within the specified deadline.

More information and details about the application process are available in the DSR, which can be found on the Department's website.

# 7.2 Carrying out doctoral studies

The IEE Department may collaborate with other departments of Higher Education, research centers, and institutes in Greece or abroad for the conduct of dissertations under joint supervision, as provided for in the Doctoral Studies Regulation (DSR) and current legislation.

The minimum duration for obtaining a Doctoral Degree is at three (3) full calendar years from the date of appointment of the three-member Advisory Committee. The maximum duration for the completion of the doctoral dissertation is set at six (6) full calendar years from the date of appointment of the three-member Advisory Committee. The period abovementioned can be extended for two (2) additional years upon the request of the candidate and with a documented decision by the Department's Assembly.

For exceptional cases where PhD candidates are admitted without holding a Master's Degree, the minimum time limit for obtaining the PhD degree is set at least four (4) full calendar years from the date of appointment of the three-member Advisory Committee. The Department's Assembly may decide to suspend the enrollment of the doctoral candidate based on the provisions of the DSR.

PhD students retain full rights and benefits provided for students in the second cycle of studies for five (5) years from the date of appointment of the three-member Advisory Committee. Additionally, PhD holders maintain access, borrowing, and use of electronic services rights offered by university libraries for up to five (5) years after the award of the PhD degree.

PhD students are required to submit an annual progress report to the three-member Advisory Committee and give an oral presentation. Based on the evaluation of the progress report, the three-member Advisory Committee may unanimously and with documented reasons recommend the rejection of the PhD student. The relevant decision is communicated to the candidate and the Department's Assembly, which can proceed with the deregistration of the PhD student, based on proper justification. The PhD students may also be deregistered upon their request.

The PhD students participate in educational and research activities of the Department under the supervision of the supervising professor. Additionally, they may assist in teaching relevant courses (laboratories, tutorials, assignments) upon a decision by the Department's Assembly. Throughout their studies and until the defense of their dissertation, the candidate is obligated to offer their services in examinations surveillance of the department, according to the examination schedule prepared by the department.

The supervising professor, with the concurring opinion of the Advisory Committee, may request the mandatory attendance of undergraduate or postgraduate courses of the Department or other Schools of IHU, subject to the approval of the Dean's Office, if deemed necessary.

# 7.3 PhD thesis evaluation and PhD degree awarding

After completing the PhD thesis, the candidate submits an application to the three-member Advisory Committee through the Department's Secretariat, to support the thesis in public and be evaluated. The PhD thesis requires in-depth research by the candidate. The candidate is required to have at least two (2) publications as the main author/researcher in reputable peer-reviewed scientific journals with an impact factor in at least one of the internationally accepted indexing systems, e.g., Web of Science, Scopus, Scimago Q1-Q3.

The language of the PhD thesis may be either Greek or English. If the thesis is written in English, it must include a comprehensive summary in Greek, describing the methodology and main results of the work.

The three-member Advisory Committee decides on the approval or justified rejection of the application. If approved, it prepares a detailed report (whose content is determined in the DSR) and submits it to the Department's Assembly, accompanied by a declaration from the candidate stating that their doctoral thesis does not contain any elements of plagiarism. The relevant form is provided by the Secretariat. If the three-member Advisory Committee does not approve the application of the candidate, they provide detailed scientific observations and suggestions for improvement and a timeline for implementation.

After receiving a positive Report from the Advisory Committee, the Department's Assembly appoints a seven-member Examination Committee to evaluate the PhD thesis. This includes the members of the Advisory Committee and four additional members who meet the criteria specified in the DSR.

The doctoral dissertation is supported by the candidate in public, in front of the Examination Committee. The candidate presents their work and answers the questions of the members of the Examination Committee as well as questions that may be asked by the audience (with the consent of the Examination Committee). After completing the above procedure, the Examination Committee convenes and evaluates the dissertation in terms of quality, completeness, original thinking, and its contribution to science. Based on these criteria, it formulates its final judgment. A majority vote approves the PhD thesis. The approved thesis may receive one of the following grades: "Excellent", "Very Good", or "Good". Upon completion of the evaluation process, the Examination Committee prepares and signs the Minutes of Approval of the PhD thesis, which is forwarded to the Department Assembly for the candidate to be awarded the doctoral title and receive the PhD degree.

The Department Assembly proclaims and acknowledges the candidate as a "Doctor" in a public session in the presence of the candidate. A copy of the PhD degree is issued to the Doctor, signed by the Rector, the President of the Department, and bears the seal of IHU.

After its completion, the PhD thesis and its summary are deposited in the IHU library and uploaded to the digital repository of IHU. A copy of the PhD thesis is submitted to the National Documentation Centre for publication in the National Archive of doctoral dissertations.

For more information, please refer to the regulations of doctoral studies and the Department's website <u>https://www.iee.ihu.gr/wp-content/uploads/2020/02/KANONI2MO2\_PhD\_0EK\_211\_03-02-2020.pdf</u>

# 8. FACILITIES AND SERVICES OF THE DEPARTMENT

# 8.1 Department facilities

The Department of Information and Electronic Engineering uses two buildings. These buildings are Building "H" and Building " $\Pi$ ". Part of the smaller building opposite Building  $\Pi$  is also available to the department.

# 8.1.1 Laboratories and equipment

The Department has 21 laboratory spaces used for teaching courses and also available for students to perform exercises, complete their theses, and other tasks. The laboratory equipment is highly satisfactory in terms of quality, suitability, and adequacy.

Out of the 21 laboratory spaces, 6 are computer labs and are located in Building  $\Pi$ . The remaining laboratory spaces are located in Building H and are equipped with specialized electronic equipment. These rooms also operate with specific safety specifications, such as industrial floors, isolation transformers, and high-voltage protection systems. Each of these 15 specific rooms has 10 workstations accommodating 2 to 3 individuals. Each workstation is equipped with all the necessary instruments and measurement systems required for completing the educational laboratory sessions.

These 14 rooms are located in Building "H" and are named as follows:

- A1: Power Electronics
- A2: Electronics
- A3: Mass Media Technology
- A4: Antennas, Microwaves & Radar
- A5: Programming & Computer Networks
- C1: Optoelectronics & Optical Communications
- C2: Electric Circuits
- C3: Telecommunications
- C4: Microcomputers
- C5: Computer-Aided Design (CAD)
- C6: Television Studio & Radio Studio
- D1: Digital Circuits
- D2: Electronics
- D3: Automated Control Systems
- D4: Electronic Measurements





The laboratory equipment for computer-related subjects is located in Building  $\Pi$  and the smaller building across from Building  $\Pi$ . It is supported by a local network with a multitude of servers and provides over 190 workstations distributed among six computer labs, a research room, and staff offices. The six computer laboratories and their respective capacities are as follows:

- Operating Systems Laboratory (Room 201) with 24 workstations
- Information Systems and Management Laboratory (Room 202) with 24 workstations
- Information Management and Software Engineering Laboratory (Room 208) with 24 workstations
- Programming and Multimedia Laboratory (Room 211) with 24 workstations

- Computer Systems, Security, and Networks Laboratory (Room 210) with 28 workstations
- Intelligent Systems and Web Applications Laboratory (Room 301) with 25 workstations

Additionally, next to Room 301, there is the Research Room (Room 302), which includes the office space for doctoral candidates and researchers. This room, along with the staff offices in Building  $\Pi$ , has approximately 40 workstations. The workstations in all the mentioned rooms are part of a unified network with structured cabling based on multi-mode optical fibers (gigabit) and supported by high-level networking equipment (Cisco switches). The management and monitoring of the equipment are mostly done through software developed by the Department or using open-source software.



Rooms 201, 202, 208, 210, and 211 are located on the 1st floor of Building  $\Pi$ . Rooms 301 and 302 are in the smaller building across from Building  $\Pi$ . These specific laboratory spaces have a shared software installation of both Windows and Linux operating systems. Therefore, any of these rooms can be used for any computer laboratory class or for conducting laboratory examinations. It is worth noting that Room 208 is equipped with specialized equipment that enables hybrid teaching, where trainees can attend the class either remotely or in person.

As mentioned above, the department maintains a large number of servers that provide services to the students of the department. Most of these servers are hosted on two powerful central computers located in the computer room of Building  $\Pi$ . Each of these computers has two multi-core processors, 64GB of RAM, and hard drives in a RAID array. Virtual machines (servers) are created on these powerful computers using virtualization server software (XenServer – Open Source Server Virtualization), which makes them easily portable and upgradable. In addition, virtual machines are used for course-related needs (e.g., database and web servers) as well as for research purposes (conducting experiments).

Both Building H and Building  $\Pi$  have wireless Internet access via WiFi. Additionally, the department has a Domain Name Server (DNS), an LDAP server for user authentication for accessing the department's services, and DHCP for automatic IP address assignment to workstations.

# 8.1.2 Teaching classrooms



Figure 8. The department's amphitheaters and a typical classroom.

The Department of Information and Electronic Engineering has nine (9) classrooms and two (2) lecture halls. Each classroom can accommodate up to 60 people and is equipped with presentation equipment and projection screens connected to a local computer with internet access. Each of the two lecture halls has a capacity of 100 people and is equipped with presentation equipment and projection screens. One of the classrooms, B3, is equipped with special equipment for hybrid teaching, allowing students to attend classes remotely. The Department has three (3) classrooms (101, 102, and 109) and one (1) lecture hall in Building P. All the remaining classrooms (B1-B6) and the other lecture hall are located in Building H.

#### 8.2 E-services of the Department

#### 8.2.1 E-learning

The Department of Information and Electronic Engineering utilizes the e-learning systems provided by the university to improve the quality of education. More specifically, most of the department's faculty members and adjunct associates use the university's asynchronous e-learning platform (moodle) (<u>https://exams-iee.the.ihu.gr/</u>). Through this platform, faculty members and adjunct associates upload educational materials and make them available to students attending their courses. Additionally, through the platform, instructors can create online tests and assess the progress of learners. It is noted that some faculty members do not use the asynchronous e-learning platform, but maintain their own websites with educational material.

Moreover, the department also has 18 Zoom rooms for synchronous distance learning. These rooms are used for synchronous distance learning in the postgraduate programs, some courses of which are conducted remotely. The rooms are also used for tutorial-style education in the undergraduate program, as well as for meetings of the department's academic community (committees, meetings for dissertations, etc.). The Zoom rooms are accessible only to authorized users through the application https://rooms.iee.ihu.gr.

All students of the department have an academic email account and webmail service upon their registration. They can use these to communicate with the faculty members and ask questions related to the course material. Therefore, the email service, which is accessible to all students of the university, complements the other e-learning tools.

It is worth noting that the department has developed applications for student assessment, exams and assignment submission (e.g., <u>https://submit.iee.ihu.gr</u>). These applications are widely used by many faculty members and adjunct associates of the department.

#### 8.2.2 IT services offered to the academic community

The IT services provided by the Department of Information and Electronic Engineering are highly advanced. In fact, the department has not only installed and uses software to provide services, but also a wide range of specialized software has been developed to meet specific departmental needs. The development and management of these services are carried out by DEP, EDIP and ETEP members as well as students as part of their bachelor's theses, course assignments, or research projects. All these services are accessible to students upon enrollment in the department and obtaining an access account. This account is solely for accessing the services maintained by the department. All services are hosted on powerful computers located in the department's computer room and have the capability to create virtual servers (virtual machines) on them. The services are accessible to the academic community of the department through a user-friendly control panel called "apps" (https://apps.iee.ihu.gr - Figure 9). These services and websites are part of the department's infrastructure, aiming to provide information, facilitate communication, and enhance the overall experience for students and staff.

Here is a brief description of the most important services developed by the department and hosted in its infrastructure, available to students and/or staff:

- Department's Website: <u>https://www.iee.ihu.gr</u> serves as the central hub for information about the department and acts as a starting point for accessing individual services and websites.
- Website of the MSc in "Web Intelligence": <u>https://msc.iee.ihu.gr</u> provides information specifically about this postgraduate program.

- Website of the MSc in "Applied Electronic Systems": <u>https://aes.iee.ihu.gr</u> offers information dedicated to this particular postgraduate program.
- Website of the Internal Evaluation Group (IEG): <u>https://omea.iee.ihu.gr</u> serves as the online platform for the student union.



#### Figure 9. Student view of Apps control panel

- LDAP Service: The department maintains an LDAP (directory service) that authenticates all users, including students, staff, and adjunct associates. Additionally, it supports authentication based on the secure open protocol OAuth2.0. Various components and software have been developed to facilitate its operation, such as integration with the electronic system used by the department's administration.
- Personal Websites: The department provides two dedicated web servers for hosting personal websites of students and staff. Each student can upload their personal website to the users.iee.ihu.gr web server, while the people.iee.ihu.gr web server hosts websites of the department's personnel. Moreover, for department staff, there is an additional webpage available at <a href="https://www.iee.ihu.gr/staff\_category/faculty-member/">https://www.iee.ihu.gr/staff\_category/faculty-member/</a> where a brief presentation of each staff member is provided. Members of the department can update their own profile on the LDAP directory, which automatically updates the relevant information on the department's website and all connected services.
- A system for announcements (<u>https://aboard.iee.ihu.gr</u>) has been developed that provides continuous information to students regarding educational processes within their department, as well as academic, professional and research matters relevant to students and alumni. Each student can access the announcements posted by the department staff either by visiting a user-friendly and adaptable online platform or by receiving email notifications. User authentication is done using the central LDAP/auth2 system. Teachers/staff members can post announcements, which are categorized for easy organization. When an announcement is posted, interested individuals receive notifications via email to their specified account and/or through a mobile application developed by the department. Some of the announcements (public announcements) are automatically posted on the department's central website.
- The Thesis Management System (<u>https://thesis.iee.ihu.gr</u>) allows the faculty members to post available bachelor's and master's theses. Students can browse through the available topics and,

after contacting the faculty member, the latter assigns a thesis to a student through the system. Once the thesis has been completed, the student uploads the thesis to the system. The faculty member then approves or rejects it. The assigned examination committee for each thesis has access to the thesis and all its details. After the presentation, the committee enters the grade into the system. At the end of each examination period, the system generates a report with all the successfully examined theses and their grades.

- IEEAlumni (<u>https://alumni.iee.ihu.gr</u>) is a service for searching and managing graduates. It is designed for alumni of the department, allowing them to inform about their post-graduation evolution and communicate with each other.
- The Job and Internship Placement Service (<u>https://jobs.iee.ihu.gr/</u>) allows companies and organizations affiliated with the department to announce job positions and/or internship opportunities.
- VPN: The department operates a VPN server (Virtual Private Network) to serve its members, including students. This allows all members to access content provided through HEALlink from their homes. Additionally, it provides access to department services that are not accessible from the internet for security reasons.
- DNS: The department operates a DNS server, which improves internet usage speed by eliminating the need for each computer to communicate with an external DNS server. It also facilitates the development of departmental network services. Additionally, the department's DNS is used as a secondary DNS server for the entire Alexandria University campus.
- Student Wireless Network (WiFi): There is full coverage of the department's premises for wireless internet access.
- Email Lists (lists.iee.ihu.gr): The department provides email lists through a dedicated server, serving the communication needs of staff, students, and alumni. This enables easy and direct communication and updates for department members.
- SSH Service: The department provides students with access to a central Linux server through a secure SSH connection. Students can use this server for their coursework, as a storage space, or to create personal websites.
- Firewall: The network of Building P and all departmental electronic services are protected by a Firewall, which safeguards all connected computers from malicious access. Additionally, through specific configurations on the internal nodes (Cisco routers), the building is protected from internal malicious activities.
- DHCP service is provided. This means that when a staff member connects a computer to the building's network, no further configuration is needed. All network settings are automatically assigned.
- Cisco Networking Academy: In collaboration with Cisco, department students can get certified after completing the appropriate courses.
- MySQL, PostgreSQL, and Oracle Database Servers for all students and staff of the department.
- Free Microsoft and Oracle software for educational use.
- XenServer Open Source Server Virtualization: The department has two central computers where virtual machines are created. All departmental electronic services run on virtual machines, which allows for easy portability and upgrading. Additionally, virtual machines are used for educational purposes, such as database servers for courses, as well as for research experiments.

- Websites: In addition to the main departmental website and the websites of postgraduate programs, a variety of websites are maintained by departmental staff and/or students.
- Online services supporting the educational process and teaching (e.g., online examination environments, online assignment submission at <a href="https://submit.iee.ihu.gr">https://submit.iee.ihu.gr</a>, etc.).
- Online services for course and laboratory enrollment.
- Academic Advisor service (<u>https://advisor.iee.ihu.gr</u>), which provides information to students about their academic advisor and allows advisors to access information about assigned students.
- Special Categories of Students service (<u>https://www.iee.ihu.gr/specialcategories</u>), through which faculty members confirm if a student belongs to a special category and is entitled to special examination arrangements (e.g., oral examination due to dyslexia).
- Exam Schedule Services: When the schedule for the upcoming exam period is announced, students have the ability to create their personal exam calendars by selecting the courses they are interested in. They can then integrate this schedule into other services (such as Google Calendar). In the rare cases when changes are necessary in the schedule, students' personal calendars are automatically updated. The same service is available for faculty members.
- Electronic Room Booking System: The schedule of all department rooms is organized electronically
  and accessible online to authorized users. This allows an instructor to book a room for any urgent
  educational need in a digital and automated manner, without the risk of conflicts. Furthermore,
  the Electronic Room Booking System has been expanded to include Zoom virtual rooms. Each
  faculty member can reserve a virtual room without the need for a coordinator. Additionally, a web
  application (<u>https://rooms.iee.ihu.gr</u>) was developed, providing access to Zoom virtual rooms only
  to authorized users. This eliminates the need for faculty members and students to maintain
  separate credentials for virtual rooms.
- IEEPubs: An application for collecting, organizing, and distributing the published research work of faculty members (<u>https://omea.iee.ihu.gr/ieepubs</u>). The application allows retrieval of research data from other applications and presentation on other websites. For example, personal websites of faculty members or research laboratory websites retrieve specific data from this service and present it.

# 9. INSITUTIONAL STUDENT SERVICES AND WELFARE

# 9.1 European programs office (Erasmus)

At the Alexandrian Campus, there is an Office of European Programs (Erasmus+ Office) that caters to both students and staff of the University. European and international programs constitute a significant part of the modern educational and scientific community. These programs aim to promote inter-institutional cooperation, cultural exchange, and the enhancement of participants' professional skills. Through these programs, students, researchers, and professionals have the opportunity to gain international experience, broaden their horizons, and develop personally and professionally. The programs include student exchanges, internships, scientific collaborations, and participation in international educational programs. This initiative enhances mobility, multiculturalism, and knowledge exchange, contributing to the development of a more open and understanding world.

For more information, you can visit: <u>https://www.ihu.gr/monades/intprogrs</u>.

The Department of Information and Electronic Engineering, in collaboration with the Erasmus+ Office of the Alexandrian Campus of the International Hellenic University (IHU), has signed Bilateral Cooperation Agreements with a large number of universities in Europe and beyond. Each academic year, a significant number of students from the department take advantage of these agreements and move abroad to pursue part of their studies. Students can engage in study or internships at all levels of their studies, for a total of 12 months in each study cycle (e.g., 12 months during the undergraduate studies, 12 months during the postgraduate studies, and 12 months during their Ph.D.). The Department of Information and Electronic Engineering accepts incoming students through the Erasmus+ program, who can attend courses in the 6th, 7th, 8th, and 9th semesters.

The students of the Department of Information and Electronic Engineering are informed about the Erasmus+ Program during their first month at the department, at the customary welcoming ceremony for first-year students. Additionally, every October, the Erasmus+ Office of the Alexandrian Campus organizes an open information session for students regarding study mobility and internships in a central amphitheater of the campus. Specifically for the Department of Information and Electronic Engineering, the academic coordinator of the department for the Erasmus+ program organizes a special informational event for the department's students at the beginning of each semester. Simultaneously, students of the department are informed about program developments through a dedicated bulletin board on the department's website and via a mobile application. Students can participate in study mobility only through the bilateral agreements established by the Department of Information and Electronic Engineering of IHU.

The list of institutions with which the Department of Information and Electronic Engineering has cooperation for student exchange through the Erasmus program is available at: <a href="https://www.iee.ihu.gr/erasmus/">https://www.iee.ihu.gr/erasmus/</a>.

The Erasmus+ Mobility Regulation of the Department Information and Electronic Engineering is available at <a href="https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-Κινητικότητας-Erasmus.pdf">https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-Κινητικότητας-Erasmus.pdf</a>.

# 9.2 Library

At the International Hellenic University, there is a Central Library operating under the official title "Library and Information Center of the International Hellenic University". Due to the University's geographical dispersion and to ensure efficient service to members of the academic community, the Central Library operates a network of organized libraries in all areas where individual academic units of the university are located. The mission of the Central Library is to enhance and support the educational and research activities of the staff and students of I.H.U. Specifically, the Unified Central Library aims to:

- Provide scientific and research information and operate as an Information Center for this purpose, serving the members of the academic community.
- Collect all information sources accessible to IHU and make them available to the institution's members.
- Gather and organize the scientific work of IHU members through repositories, digital libraries, and scientific publication databases, as well as promote and disseminate the produced work.
- Contribute to the retrieval, management, provision, and dissemination of specialized information to the broader national and international community.
- Actively participate in activities related to education and culture.
- Develop, organize, and maintain collections and ensure access to print and digital information sources.
- Develop information literacy and provide training to members of the academic community in acquiring information skills.
- Promote and preserve cultural heritage.

A branch of the Central Library is located In the Alexandrian Campus, where the Department of Information and Electronic Engineering resides. Apart from document lending services, access to electronic sources, and maintenance of a digital repository offered to the academic community, it also provides computer labs and study spaces.

For more information, please visit <u>https://www.ihu.gr/vivliothiki-kentro-pliroforisis</u>.



9.3 Student restaurant

A restaurant where students can have lunch and dinner is located at the Alexandrian Campus of the International Hellenic University. The restaurant caters to both undergraduate and postgraduate students, as well as Ph.D. candidates. Students are eligible for free meals provided their family income does not exceed a specific threshold. Students who are not eligible for free lunch and dinner can have meals at a low cost.

For more information, you can visit the link <u>https://www.ihu.gr/foititiki-merimna</u>.

#### 9.4 Student dormitory



The Alexandrian Campus of International Hellenic University has facilities for accommodating students of the campus departments. These facilities are located within the campus and offer 108 double rooms.

The Student Dormitory aims to meet the housing and welfare needs of students, especially those from economically disadvantaged backgrounds, during their studies. Specifically, it provides appropriate infrastructure for the development of intellectual, recreational, artistic, and sports initiatives and activities, in order to significantly assist students in continuing

and completing their studies, while also fostering the development and cultivation of social relationships.

For more information, you can visit the link: <u>https://www.ihu.gr/foititiki-merimna</u>.

## 9.5 Student health care

Uninsured undergraduate, postgraduate students, and PhD candidates are entitled, according to Ministerial Circular No. 171598/Z1/12.12.2017 of the Ministry of Education, to full medical, pharmaceutical, and hospital care within the National Health System, with the expenses covered by the Health Services Organization (EOPYY).

It is worth noting that the Alexandrian Campus operates a medical center staffed with nursing personnel and equipped with the necessary medical equipment. The contact phone number for the clinic is 2310013665.

Lastly, the Alexandrian Campus has a blood bank, and voluntary blood donations are organized on a regular basis during each academic year to support the blood bank. For more information, you can visit the following link: <u>https://aimodosia.iee.ihu.gr/</u>.

## 9.6 Sports center

The Alexandrian Campus operates a Sports Center whose mission is to provide a wide range of sports programs and activities for students, and all personnel of the Alexandrian Campus. The aim of all programs is the qualitative improvement of the members of the academic community through exercise, play, and physical activity.

The sports center includes all outdoor and indoor sports facilities located within the campus: Indoor Gym, open basketball courts, and a soccer field.



# 9.7 Network Management Center

The Network Management Center located at the Alexandrian Campus designs and develops the network and telecommunications infrastructure of the facilities, providing high-level services to the institution's members. Specifically, it is responsible for:

- Care for the installation, management, and maintenance of the network devices of the data network, core network, distribution network, and the expansion of their infrastructure.
- Care for the installation, management, and maintenance of the Voice over IP (VoIP) network of the Alexandria University Campus.
- Care for the installation, management, and maintenance of any expansion of the data network, wired or wireless, within and outside the facilities, as well as the management and maintenance of the data network's connection to the Internet and any other external data network.
- Management of the entire third-level logical addresses (IP addresses), both private and public.
- Routing policy for third-level packets (IP packets) within the autonomous system, as well as routing in collaboration with the National Research and Technology Network for proper connectivity of the institution with the Internet.
- Firewall service at the boundaries of the autonomous system to preserve the functionality of the systems and the quality of the services provided.
- Addressing and naming service for the computer systems connected to the data network.
- Management of the central mail relay and routing service, reinforced with server and user protection services against malicious users.
- Creation and maintenance of personal email accounts for all members of the academic community, including faculty, administrative staff, and students, with support for management through POP3S and IMAPS protocols, as well as through the webmail service.
- Creation and management of email distribution lists for user groups.
- Creation, maintenance, and management of a mechanism for controlling malicious emails.
- Creation and management of personal storage space for each member of the academic community, including faculty, staff, and students.
- Creation and maintenance of backups for systems supporting the offered services, using long-term storage media such as optical media (DVDs), NAS, magnetic tapes, or other suitable media.
- Management and hosting of websites for units within the institution, such as schools, departments, services, as well as hosting websites for individual users.
- Directory service and its integration with the directory service of the National Research and Technology Network.
- Multilayer security services covering physical, network, and application layers (use of secure protocols, encrypted transmission of personal data).
- Provision of an intermediate World Wide Web service (web proxy/cache).
- Computer time synchronization service (NTP).
- Training of the academic community and transfer of knowledge to individual organizational units on network services and infrastructure topics.
- Support for network users regarding the provided services (User Support Office, Help Desk).

• Responsibility for proposing the operational regulations of the data network to the relevant authorities of the Alexandrian Campus.

Some of the services provided or managed by the Network Management Center are:

- Management of academic accounts for students and staff of the Alexandrian Campus. Through these accounts, members of the academic community have access to both institutional services and services related to the student population nationwide (e.g., issuance of academic identification cards, etc.).
- Email service: Every member of the IHU academic community has a personal email account with the domain ihu.gr. The Network Management Center provides a webmail service for accessing the email account.
- ownCloud service: ownCloud is free software that runs on a server and provides cloud storage service. The Network Management Center has implemented this service for all administrative and educational staff of the institution.
- Eduroam: eduroam is an international roaming wireless internet access network developed for the international academic and research community. It connects a multitude of academic institutions and offers free internet access. Users from all over Europe can use the services provided by participating institutions through the eduroam infrastructure. Therefore, users visiting other institutions in Greece or abroad that are members of the eduroam service can use free internet access by using the credentials provided by their institution. Eduroam ensures secure transmission of user data and establishes a framework for collaboration between institutions, facilitating users when they are in foreign institutions.
- Digital Certificate & Digital Signature Issuance Service: (a) Issuance of digital certificates for IHU members' network servers to secure the exchanged data. (b) Issuance of digital certificates for IHU members' network users, which they can use to prove their identity (digital signature) and for secure communication via email or during the exchange of digital documents.
- VOIP Telephony: Voice over IP or VoIP, also known as internet telephony, provides real-time voice communication over the internet without cost.
- Student Information System: The student information system provides access for both the educational staff of the institution to record grades and for students to enroll in courses and view their grades and accumulated ECTS credits (<u>https://uniportal.ihu.gr/</u>).
- Moodle Asynchronous e-Learning System: IHU makes extensive use of Moodle as an asynchronous e-learning tool. In this system, educational staff of the institution can upload course materials, conduct online tests, etc. Similarly, students have access to the materials. Access to the asynchronous e-learning system for the Department of Informatics and Electronic Systems is provided through the address <u>https://exams-iee.the.ihu.gr/</u>.
- OpenVPN: This service offers you the ability to securely connect remotely to the network of the Alexandria University Campus. With a secure remote connection, you have access to all the private services provided by the University, such as electronic journals and articles.

For more information about the Network Management Center services, visit <u>https://noc.the.ihu.gr/</u>.

# **10. REFERENCE TO DEPARTMENT AND UNIVERSITY REGULATIONS**

# **10.1** Department regulations

- Internal Department Operations Regulation: <u>http://www.iee.ihu.gr/wp-content/uploads/2023/05/Εσωτερικός-κανονισμός-λειτουργίας-</u> <u>Τμήματος.pdf</u>
- Undergraduate Studies Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμος-σπουδών-Μηχανικών-</u> <u>Πληροφορικής-και-Ηλεκτρονικών-Συστημάτων\_v3.pdf</u>
- Quality Policy: <u>https://www.iee.ihu.gr/quality-policy/</u>
- Internship Regulation: https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-Πρακτικής-Άσκησης.pdf
- Diploma Thesis Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2021/03/Κανονισμός-Διπλωματικών-Εργασιών-</u> <u>R1.pdf</u>
- PhD Studies Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2020/02/KANONIΣMOΣ\_PhD\_ΦEK\_211\_03-02-</u> <u>2020.pdf</u>
- ERASMUS+ Mobility Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-Κινητικότητας-Erasmus.pdf</u>
- Academic Advisor Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-λειτουργίας-θεσμού-</u> <u>ακαδημαϊκού-συμβούλου.pdf</u>
- Student Complaints and Appeals Management Mechanism Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-λειτουργίας-διαχείρισης-</u> <u>παραπόνων-και-ενστάσεων-φοιτητών.pdf</u>
- Examination Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-εξετασεων\_TMΠHΣ.pdf</u>
- Written Assignments Regulation: <u>https://www.iee.ihu.gr/wp-content/uploads/2022/01/Κανονισμός-Εκπόνησης-Γραπτών-</u> <u>Εργασιών.docx.pdf</u>
- Internal Evaluation Reports of the Department: <u>https://omea.iee.ihu.gr/site/?p=Evaluations</u>

# **10.2** International Hellenic University Regulations

 Internal Institutional Operations Regulation: <u>https://www.ihu.gr/modip/wp-content/uploads/sites/5/2021/09/ΕΞΩΤΕΡΙΚΟΣ-ΚΑΝΟΝΙΣΜΟΣ-</u> <u>ΔΙΠΑΕ.pdf</u>

- Student Dormitory Regulation: <u>https://www.ihu.gr/wp-content/uploads/2020/12/ΦΕK\_5113\_B\_19-11-</u> <u>2020\_KANONIΣMOΣ\_ΕΣΤΙΑΣ.pdf</u>
- Academic Advisor Regulation
   <u>https://www.ihu.gr/modip/wp-content/uploads/sites/5/2021/11/Κανονισμός-Ακαδημαϊκού-Συμβούλου-Σπουδών.pdf</u>
- Code of Ethics and Conduct in Research <u>https://www.ihu.gr/modip/wp-content/uploads/sites/5/2022/12/Research\_Ethics.pdf</u>

# APPENDIX A. UNDERGRADUATE STUDY PROGRAM COURSES OUTLINE

#### A.1 1st Semester Courses

#### (1101) Mathematics I

Semester: 1st / ECTS credits: 6 Category: General Background (GB) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GGS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1101/</u> Coordinator: Efstathios Antoniou

#### **Course Contents**

- **Complex Numbers**: Definition, operations, polar and exponential forms, form conversions, roots of complex numbers, solution of polynomial equations.
- Linear Algebra: Vector Space, Linear dependence, Basis Dimension of a vector space, Inner Product, Matrices, Matrix Operations and properties, Matrix Inversion, Elementary Row Operations, Gauss Jordan elimination, Determinants and properties, Linear Systems, Eigenvalues Eigenvectors.
- **Differential Calculus**: Real functions, Limits, Continuity, Derivative, Derivative rules, Applications, Mean Value Theorem, Taylor Serial, De Hospital's rule, Study of functions.
- Integral Calculus: Indefinite Integral Integration by Parts by Factors by Substitution, Definite Integral, Properties, The Fundamental Theorem of Integral Calculus, Mean Value Theorem of Integral Calculus, Geometric Applications of Definite Integrals.

#### (1102) Structured Programming

Semester: 1st / ECTS credits: 6 Type: Special Background (SB) / Category: Compulsory (C) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1102/</u> Coordinator: Konstantinos Goulianas

#### **Course Contents**

The topics covered in the course (theoretical and laboratory part) are:

- Introduction to Algorithmic, Structured Programming and C
- Basic Data Types Operators Constant Variables
- Input Output Data
- If and switch commands
- Repeat Commands: while, do... while, for
- Functions parameters
- Arrays One-dimensional Two-dimensional
- Serial Binary Search, Classification Algorithms
- Recursion
- Indicators
- Structures
- Files

## (1103) Introduction to Computer Science

Semester: 1st / ECTS credits: 6 Category: General Background (GB) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GGS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1103/</u> Coordinator: Christos Ilioudis

### Course Contents

The topics covered compose the puzzle of computer science:

- Basic knowledge of data representation and numerical systems
- Elements of digital logic
- Von Newman architecture and computer organization
- Operating Systems
- Programming languages and application programs
- Fundamentals of Networks and network applications
- Databases
- Special Topics in Computer Science: Artificial Intelligence, Computer Information System Security.

#### (1104) Electronic Physics

Semester: 1st / ECTS credits: 6 Type: Special Background (SB) / Category: Compulsory (C) Knowledge area: General Knowledge and Skills (GGS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1104/</u> Coordinator: Ioannis Marmorkos

#### **Course Contents**

Electric charge and electric field, Gauss law, electric potential, capacitance and dielectrics, storing of electrical energy. Electric current, electric resistance, Ohm's law. Magnetism, sources of magnetic field. Electromagnetic induction, Faraday's law, electromagnetic oscillations, Maxwell's equations, electromagnetic waves Light: reflection and refraction, Snell's law. Wave nature of light: interference, diffraction, Huygen's principle, polarization of light. Principles of quantum theory, atomic models, basic principles of quantum mechanics, molecules and solids. Elements of nuclear physics, radiation, nuclear energy.

#### (1105) DC Circuits

Semester: 1st / ECTS credits: 6 Category: Special Background (SB) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GGS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1105/</u> Coordinator: Georgios Bamnios

- Fundamentals of electric circuits.
- Electricity, electric charge, Coulomb's law, electric field, potential difference.
- Electric current, electric circuit, voltage. Kirchhoff's Laws.

- Resistors, Ohm's Law, ideal independent and dependent sources. Source transformation.
- Series and parallel resistors, open circuit and short circuit, voltage and current divider, connection of sources, Millman's Theorem.
- Mesh Analyses and mesh analysis by inspection.
- Circuit theorems: superposition, source transformation, Wye-Delta transformations.
- Thevenin's and Norton's theorems, maximum power transfer, reciprocity theorem.

#### A.2 2nd Semester Courses

#### (1201) Mathematics II

Semester: 2nd / ECTS credits: 6 Category: General Background (GB) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GGS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1105/</u> Recommended prerequisite courses: (1101) Mathematics I Coordinator: Efstathios Antoniou

#### **Course Contents**

First Order Ordinary Differential Equations, Higher Order Linear Differential Equation with constant coefficients, Differential Calculus of two or more variables, Multiple Integrals, Path Integrals, Surface Integrals, Sequences, Series, Laplace Transform, Fourier Analysis.

#### (1202) Measurements and AC Circuits

Semester: 2nd / ECTS credits: 6 Category: Special Background (SB) / Type: Compulsory (C) Knowledge area: electronics (EL) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1202/</u> Recommended prerequisite courses: (1105) DC Circuits Coordinator: Iordanis Kioskeridis

- Measurement theory and errors.
- Electrical measuring instruments.
- Complex impedance and phasors.
- AC circuits.
- Active, inactive and apparent power. Power factor correction.
- Circuit resonance.
- Three-phase systems.
- Symmetric and non-symmetric load in Y and delta connection.
- Definition of power in three-phase systems.
- The Fourier method in circuit analysis.
- Transient analysis in RL, RC and RLC circuits.
- Mutual induction and transformers.
- Electrical installations (conductors and cables, charging, protection devices, switchboards, relays).

# (1203) Technical Writing, Presentation and Terminology of Foreign Language

Semester: 2nd / ECTS credits: 6 Category: General Background – Skills Development (SB-SD) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GGS) Teaching hours: 4 (Theory) / 1 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1203/</u> Recommended prerequisite courses: -Coordinator: Periklis Chatzimisios

#### Course Contents

- Purpose of technical texts: Technical references, scientific papers, brief reports, technical proposals, etc. The role of the engineer in writing technical texts. Recipients, readers, users of technical texts and reading styles.
- Structure of technical texts with emphasis on technical reports: Organize text into sections and sub-sections, key parts of the technical reports and their content.
- Writing rules: Writing style, length, important grammar rules, images, charts and tables.
- Bibliographic search: Purpose, source search methodology, source evaluation. Study of bibliographical sources. Organizing and recording bibliographic sources.
- Plagiarism issues: Legal framework, academic ethics. Types of plagiarism, methods of avoidance.
- Introduction to technical presentations: Purpose of technical presentations. Techniques for preparing a presentation. Audience Recommendation. Different kinds of presentations. Defining the content and message of the technical presentation.
- Types of technical presentations: Structure and anatomy of a successful presentation. Presentation style. Dynamic presentation techniques. Mistakes, omissions and methods to avoid them. Audiovisual techniques.

#### (1204) Digital Systems Design

Semester: 2nd / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) / 1 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1204/</u> Recommended prerequisite courses: -Coordinator: Georgios Bamnios

- Number systems and Codes.
- Basic logic gates and Boolean Algebra.
- Combinational logic and reduction techniques.
- Design of single-gate logic circuits using NAND or NOR gates.
- Combinational logic applications. Adders, comparators.
- Encoders, decoders, multiplexers, demultiplexers. Combinational logic circuits implementation.
- Introduction to Digital System Design and Implementation, NMOS, PMOS and CMOS logic, programmable logic devices (PLA, PAL, CPLD, FPGA) and VHDL language.
- Types and functions of latches and flip-flops.
- Registers: Serial & Parallel Input-Output.
- Synchronous Sequential Circuits SSC, Finite State Machines FSM, Analysis and Design using FFs, reducing or minimizing the total number of states, design counters.

• Asynchronous Sequential Circuits – ASC, Analysis and Synthesis of ASC, Logic Hazards, Digital Circuit Testing.

#### (1205) Object Oriented Programming

Semester: 2nd / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) / 1 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1204/</u> Recommended prerequisite courses: (1102) Structured Programming Coordinator: Panagiotis Adamidis

### Course Contents

- Object Oriented Programming in JAVA: Introduction, Principles, Advantages
- Classes, Objects, Constructors, Public and Private Members, Static Members, Types of Methods: Object and Static Methods, Wrapper classes, Final classes and Methods
- Recursion
- Introduction to Computational Complexity
- Searching Algorithms
- Sorting Algorithms. Presentation of five different algorithms (exchange and recursive)
- Inheritance and Composition
- Polymorphism
- Overloading, Overriding, Casting
- Abstract Classes
- Interfaces
- Inner Classes
- Exception Handling
- Packages
- Wrapper Classes Memory Management
- Collections All types ArrayLists
- Generics
- The JAVA Reflection and Initialization

# A.3 3rd Semester Courses

#### (1301) Probability Theory and Statistics

Semester: 3rd / ECTS credits: 6 Category: General Background (GB) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GKS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1301/</u> Recommended prerequisite courses: -Coordinator: Panagiotis Tzekis

#### **Course Contents**

Combination Analysis, Probability, Conditional Probability, Bayes Theorem, Descriptive Statistics, Random Variable-Population-Sample, Probability Distribution Functions, Probability Density Functions, Continuous Distributions (Normal, Student), Distinctive distributions (Binomial, Poisson), Confidence Space, Hypothesis tests, homogeneity and independence tests, fitting tests, Linear regression.

# (1302) Mathematics III

Semester: 3rd / ECTS credits: 6 Category: General Background (GB) / Type: Compulsory (C) Knowledge area: General Knowledge and Skills (GKS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1302/</u> Recommended prerequisite courses: -Coordinator: Efstathios Antoniou

#### Course Contents

- Elements of Set Theory: Introduction, Definition of Sets, Set operations, Powersets, Enumerable non Enumerable Sets, Cardinality of a Set, Relations and Functions, Equivalence Relations, Partial Order Relations.
- **Propositional Logic**: Propositions Syntax, Connectives Truth Tables, Tautology Contradiction, Tautological Equivalence.
- Mathematical Induction: Basic and Strong form of Mathematical Induction.
- Combinatorial Analysis: Sum and Product Rules, Permutations, Combinations, Balls and Bins.
- **Generating Functions**: Ordinary Generating Functions, Properties, Exponential Generating Functions, Application to Combinatorial Analysis.
- **Recursive Relations**: Recursive Sequences and Relations, Solution of Linear Recursive Relations using Generating Functions.
- Elements of Graph Theory: Definitions Terminology, Directed and Undirected Graphs, Vertex Degree, Paths, Connected Graphs, Subgraphs, Special types of Graphs, Isomorphic Graphs, Euler and Hamilton Cycles, Graphs and Matrices, Shortest Path and Dijkstra's Algorithm, Trees, Rooted Trees, Weighted Trees, Minimum Spanning Tree, Binary Trees.

#### (1303) Signal Processing

Semester: 3rd / ECTS credits: 6 Category: Special Background (SB) / Type: Compulsory (C) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1303/</u> Recommended prerequisite courses: (1101) Mathematics I, (1201) Mathematics II Coordinator: Rigas Kotsakis

- Basic signal theory: Classification, operations and transformations of signals in continuous and discrete time, periodicity, correlation and orthogonality of signals. Analog and digital frequency, power and energy. Basic signals.
- Basic systems theory: Classification, the concepts of linearity and time invariance. Differential and difference equations. Convolution and response of signals. Realization of discrete time systems.
- Frequency domain analysis: Fourier series, Fourier transform in continuous and discrete time (FT, DTFT). Discrete Fourier transform (DFT) and fast Fourier transform (FFT). Sampling. Analysis of continuous and discrete time signals with DFT/FFT. Frequency response of systems.

- Ideal analog and digital filters. Introduction to modulation. Amplitude modulation and frequency translation.
- Laplace and Z transforms: Properties and inverse transforms. Analysis of analog and digital systems in the complex frequency domain. Transfer function, systems interconnection, zeros-poles diagrams. BIBO system stability.

## (1305) Data Structures and Analysis of Algorithms

Semester: 3rd / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1305/</u>

Recommended prerequisite courses: (1102) Structured Programming, (1205) Object Oriented Programming Coordinator: Dimosthenis Stamatis

#### Course Contents

- Introductory Concepts: Data structures, Data types and implementation, Abstract data types
- Information hiding, data encapsulation, inheritance and polymorphism, Primary data types in Java, Java reference types, Type checking
- Complexity Analysis: Types of complexity, Examples of complexity analysis and classification of algorithms
- Linear Data Structures: Arrays, ArrayLists, VectorsStrings, The String Tokenizer class in Java.
- Stacks & Queues: Stack implementation using arrays, Queue implementation using arrays, Circular queues
- **Dynamic Data Structures**: Linked Lists, Dynamic Memory Allocation, Stack and Queue Implementation using Linked Lists
- Recursion: Recursive algorithms and recursive data structures, Recursion as a Programming Methodology.
- **Trees**: Definitions and terminology, Binary Trees, Implementation of Binary Trees by linked structure, Methods of visiting the Binary Tree Nodes, Binary Search Trees, Heaps-Priority Queues.
- Graphs: Definitions and terminology, Ways to implement graphs, Basic graph algorithms.
- Files & Streams: Physical and Logical File Organization, Sequential files, The Stream Concept in Java, File Input Streams, File Output Streams, Various Types of Streams Filters, Direct access files, hashing.

#### (1405) Web Languages and Technologies

Semester: 3rd / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1405/</u> Recommended prerequisite courses: (1102) Structured Programming Coordinator: Michalis Salampasis

- History of evolution, generations and evolution of languages and web technologies, causes and needs of evolution.
- The World Wide Web as a system, the WWW as a distributed hypermedia system. Elements that make up the WWW as a system.
- Web Application Development Platforms.
- The fundamental languages of the web.

- Cascading Style Sheets.
- The Javascript language.
- Javascript functions, non-class, prototype-based object orientation. Document Object Model (full in-depth analysis).
- Client-Side Scripting using Javascript.
- Debugging techniques for web applications (use of debuggers-firebug etc.)
- Introduction to XML (syntax, well-formed, valid schemas) without extensive reference to accompanying technologies of XML.
- Using XML documents as data islands.
- Introduction to AJAX technology.
- Introduction to JQuery technology.
- What is web accessibility, measurement and evaluation of website accessibility.

## A.4 4th Semester Courses

#### (1304) Computer Systems Organization and Architecture

Semester: 4th / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1304/</u> Recommended prerequisite courses: (1103) Introduction to computer science Coordinator: Konstantinos Diamantaras

#### Course Contents

- Hierarchical Architecture of the serial Computer: Units, actions, interconnection structures (busses)
- Cache memory: Description of memory systems, basic cache-related concepts, design and organization of cache memory.
- Main memory: Physical and logical organization of main memory. Connection between cache and main memory.
- Input-output system: External units, I/O subcomponents, I/O through interrupts, I/O through programming, Direct Memory Access (DMA).
- External memory: Magnetic disks, RAID systems, optical and electronic disks.
- Machine language: Structure, instruction set, operations, operators, instruction format, addressing schemes.
- Central Processing Unit: CPU organization, register organization, architecture taxonomy, fetch-execution cycle, pipelining, control flow prediction, short description of RISC and CISC architectures.
- Control unit: micro-execution, processor control, hardware implementation, microcode implementation.
- Implementation examples of the above architectural choices in real systems.

#### (1401) Database Management Systems

Semester: 4th / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) / 1 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1401/</u> Recommended prerequisite courses: (1305) Data Structures and Analysis of Algorithms Coordinator: Dimitrios Dervos

### Course Contents

- Data Models: Conceptual, Logical, Physical, Entity-Relationship (ER) Diagrams, Extended ER (EER) Diagrams.
- Data Normalization: Synthesis and Decomposition, Functional Dependencies, First- (1NF), Second- (2NF), Third (3NF) Normal Forms, from 3NF to the Relational Database Schema and vice versa, Primary and Foreign Keys, Entity and Referential Data Integrity.
- Relational Algebra (RA), Relational Algebra vs. Relational Calculus, Basic and Composite RA Operators, RA Expressions and User Queries.
- Structured Query Language (SQL), ANSI/ISO SQL Standard, Relational Schema Data Integrity Constraints Materialization, the SQL CONSTRAINT Clause, Triggers, Assertions, Data Domain Check Constraints. Logical Data Independence.
- User Query and SQL Command Syntax Examples. Inner/Outer Joins, Division, Nested and Recursive SQL Code, SQL Views.
- RDBMS Server Residing Stored Routines.
- The Internal (Physical) Level: Data Organization and Indexing Schemes, Clustered / Sparse / Dense / Primary /Secondary Indexes, Index Keys, ISAM and B+ Trees, Index Creation/Dropping in SQL. Physical Data Independence.

# (1402) Telecommunication Systems

Semester: 4th / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1402/</u> Recommended prerequisite courses: (1303) Signal Processing, (1301) Probability Theory and Statistics, (1104) Electronic Physics Coordinator: Melina Ioannidou

### Course Contents

- Introduction to telecommunication systems: Structure, operation and quality criteria.
- Review of signal analysis in the frequency domain. Signal spectrum and bandwidth, power spectral density, spectral efficiency.
- Principles of sampling and analog to digital conversion.
- Information theory and source coding: Measure of information, basic source coding techniques, Huffman coding, voice coding, JPEG, MPEG.
- Transmission: Transmission lines (TLs), the differential equation of the uniform TL, time domain and frequency domain, lossless TL, characteristic impedance, reflection coefficient and matching, standing wave patterns, standing wave ratio, matching networks. Types of TLs. Basic principles of wireless transmission.
- Digital transmission and noise: Line coding. Additive white Gaussian noise analysis, signal-to-noise ratio and noise figure. Maximum aposteriori detector and error probability. Intersymbol interference and pulse shaping. Baseband MPAM, eye diagram. Shannon channel capacity theorem.
- Error control: ARQ, Forward Error Correction (FEC) coding and decoding. Basic block, convolutional, turbo and LDPC codes. Performance of codes. Interleaving.

# (1403) Introduction to Operating Systems

Semester: 4th / ECTS credits: 6

Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C)

Knowledge area: Embedded – Computational Systems (ECS)

Teaching hours: 4 (Theory) / 1 (Lab)

Web page: <a href="https://www.iee.ihu.gr/en/course/1403/">https://www.iee.ihu.gr/en/course/1403/</a>

Recommended prerequisite courses: (1103) Introduction to computer science, (1102) Structured Programming Coordinator: Antonis Sidiropoulos

## Course Contents

- Introduction to UNIX: Understanding the UNIX operating system, Description of the philosophy and mode of the OS, Files, users, user groups, processes, kernel.
- Applications-Shell-Kernel: Introduction to shell usage, use of basic commands, shell variables, environment variables, quotes, basic file management and editing commands.
- File system: Access to file system, paths, access permissions, file management, links, basic types of UNIX file systems and other operating systems (fat, ntfs, ext, ...), UNIX devices.
- Shell and files: use of wildcards.
- Processes: process management, properties, signals, the /proc system.
- Process communication: pipelining & redirection, use and programming of filters.
- Regular expressions and their use through UNIX tools (grep, sed).
- Shell programming: UNIX command interpreters, Command execution check, Command operators, Repeat structures.
- Introduction to mobile Operating Systems: Kernel, Users, Groups, Applications, File System.

# (1404) Electronic Circuits

Semester: 4th / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1404/</u> Recommended prerequisite courses: (1202) Measurements and AC Circuits Coordinator: Argyrios Chatzopoulos

- Introduction: Symbolism on electronics, Voltage source's stiff region, Thevenin's and Norton's theorem.
- **Diode circuits**: Diode physical structure, Ideal model, Load line and V-I characteristic, Diode circuits: clipper, clamper, peak detector, rectifier, regulators, Special purpose diodes, Zener diode.
- **Bipolar Junction Transistors (BJTs)**: BJT physical structure, Transistor currents, Load line and V-I characteristics, DC operating point, Saturation, Transistor Switch, Biasing circuits: voltage-divider bias, two-supply emitter bias, AC models, Transistor amplifiers: common emitter, common collector (emitter follower), common base, Two stage transistor amplifiers.
- Junction Field Effect Transistor (JFETs): JFET physical structure, V-I characteristics, DC operation: ohmic and active regions, JFET analog Switch, JFET amplifiers.
- Metal Oxide Semiconductor Field Effect Transistor (MOSFETs): MOSFET physical structure, V-I characteristics, DC operation: ohmic region, MOSFET digital Switch, CMOS.

## A.5 5th Semester Courses

#### (1501) Wireless Communications

Semester: 5th / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory)/ 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1501/</u> Recommended prerequisite courses: (1402) Telecommunication Systems, (1104) Electronic Physics Coordinator: Athanasios lossifides

#### Course Contents

- Introduction: Electromagnetic (EM) spectrum and applications. General description of a contemporary wireless communication system.
- Antennas: Far field parameters (radiation power density, total radiated power, radiation intensity, radiation pattern, half-power beamwidth, directivity, gain). Reciprocity. Polarization. Input impedance-resonancestanding wave ratio. Infinitesimal dipole and linear wire antennas. Linear arrays. Modern antennas and applications.
- Radiowave propagation: Propagation mechanisms. Free-space propagation. Knife-edge diffraction losses. Attenuation by rain and atmospheric gases. Depolarization of radiowaves. Radiation of an antenna located over a flat earth. Multipath and fading. Large and small-scale fading. Frequency selective and non-selective channels. Link budget.
- Analog and digital modulation: Analog modulation/demodulation techniques (amplitude and frequency) impact of noise. Superheterodyne receiver. Noise figure. M-ary digital modulation/demodulation techniques (MQAM, MPSK, MFSK). Optimum receiver architecture. Performance of digital modulation over AWGN and fading channels. Calculation and analysis of quality parameters of wireless communication systems.
- Mutliplexing and multiple access techniques.
- Advanced wireless transmission techniques. OFDM, adaptive modulation and coding, diversity techniques, introduction to MIMO.

#### (1502) Microcontrollers

Semester: 5th / ECTS credits: 6 Category: Scientific Area / Type: Compulsory (C) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1502/</u> Recommended prerequisite courses: (1204) Digital System Design, (1102) Structured Programming Coordinator: Aristotelis Kazakopoulos

- Introduction to microcontrollers and to Assembly language.
- Internal structure of PIC18F4550 microcontroller.
- Memory organization of PIC18F4550 microcontroller.
- Arithmetic and logic functions.
- Internal and external interrupts.
- Timer systems.

- Seven segment display driving.
- LCD driving.
- Keypad control.
- Step motor driving.
- Use of internal and external EEPROM.
- Use of data tables.

## (1503) Operating Systems Design

Semester: 5th / ECTS credits: 6 Category: Scientific Area / Type: Compulsory (C) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1503/</u> Recommended prerequisite courses: (1103) Introduction to computer science, (1403) Introduction to Operating Systems Coordinator: Ignatios Deligiannis

- Introduction: Evolution of OS, Computer Systems Overview: Introduction to Operating Systems, Objectives, Basic and Desired Features of Operating Systems.
- **Operating System Architecture**: Operating System Architecture, Operating System kernel.
- Processes: Mutual exclusion, and Deadlocks, Introduction to processes, interrupts, representation of
  processes with graphs (AND symbols, parbegin-parend, fork-join). Key issues (mutual exclusion,
  synchronization, deadlocks) and the Critical Section problem. Communication between processes. Using
  semiconductors to solve synchronization and process blocking problems. Classical process communicationsynchronization problems (reader-writer problem, producer-consumer problem, philosophers eating
  problem).
- Manage Input-Output and Drives: I/O hardware and software principles, drive management and scheduling. Disk Scheduling algorithms (FCFS, SSTF, SCAN, LOOK, C-SCAN, C-LOOK, N steps scan, F-SCAN) RAID technology.
- Centralized and Ideal Memory Management and Organization: Memory Hierarchy. Introduction and Key Issues in Central Memory Management (MS), Exchange, Static and Dynamic Distribution. Memory management strategies (transfer strategy, placement strategy, replacement strategy). Page replacement algorithms (FIFO, LRU, Clock, Optimal), buddy system, Paging, segmentation and combination of paging and segmentation. Memory protection.
- **Central Processing Unit Management (CPU)**: Introduction and principles of single processor scheduling. CPU scheduling algorithms (First-Come-First-Served, Shortest Job First, Response ratio, Priority-based service). Switching algorithms. Evaluation of scheduling algorithms. Principles of multiprocessor and real time scheduling.
- Organizing and Managing Files: Description, access and how to organize files. File system management. Logical organization and file directories. File storage methods. File system security. Distributed File Systems: Distributed File System Requirements (transparency, concurrency, security, efficiency, error tolerance), File Service Architecture, Access Control.
- **Special issues**: Embedded operating systems: Introduction, principles and features. Examples of embedded operating systems. Modern operating systems: Principles and key features of Windows, Linux, Chrome OS, Mac OSX as well as those for Android, iOS, Windows Phone, Firefox OS, Tizen.

## (1504) Electronic Devices

Semester: 5th / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD)/ Type: Compulsory (C) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory)/ 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1504/</u> Recommended prerequisite courses: (1404) Electronic Circuits Coordinator: Dimitrios Papakostas

### **Course Contents**

- **Power amplifiers**: Classification of Power amplifiers, Class A, Class B, Class AB, Class C and Class D output stages, Power consumption of BJTs.
- **Feedback**: General feedback structure, Properties of Negative feedback, Four Basic feedback topologies, Effect of Feedback on amplifiers.
- Differential and multistage amplifiers: BJT Differential pair, Biasing, DC and small-signal operation of the differential amplifier, CMMR, Non-linearities, BJT differential amplifier with Active load, Current mirror circuit, Multistage amplifiers.
- **Operational amplifiers**: Basic op-amp circuit, Ideal model, DC and small-signal analysis, Gain and Frequency response, Inverting, Non-Inverting, Follower, Adder configurations, Integrator, Differentiator, Difference amplifier, Instrumentation amplifier, Circuit design using op-amp, Problems on op-amp operation.
- **Frequency response**: Amplifier transfer function, Fourier analysis, Low and High frequency response, Bandwidth, Bode diagram.

#### (1505) Human-Machine Interaction

Semester: 5th / ECTS credits: 6 Category: Scientific Area (SA)/ Type: Compulsory (C) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1505/</u> Recommended prerequisite courses: (1103) Introduction to computer science Coordinator: Efkleidis Keramopoulos

- Fundamental Concepts: Psychological and physiological characteristics of the user, interaction models, ergonomics.
- Design Process: Usability, Practical Designs of Usable Interactive Systems, Color, Transportation.
- User-centered design: Usability technology, iterative design and prototyping.
- Design Rules: Basic Usability Principles, Shneiderman's Rules, Norman Principles.
- DevelopmentTools: Study of modern development tools based on event-driven programming, such as Java Swing and JavaFX. Visual programming.
- Interface Evaluation Techniques: Evaluation Objectives, Evaluation Methods.
- Universal Design: Principles of Universal Design, Multimodal Interaction, User-Oriented Design.
- Help System: User Support Requirements / Approaches, AdaptiveHelp Systems.

## A.6 6th Semester Courses

### (1601) Artificial Intelligence

Semester: 6th / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Data Management – Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1601/</u> Recommended prerequisite courses: (1305) Data Structures and Analysis of Algorithms Coordinator: Dimosthenis Stamatis

#### Course Contents

- Introduction to Artificial Intelligence (AI)
- Definitions of AI, history and evolution
- AI and philosophical issues
- The nature of the problems encountered by AI, the Turing test
- Defining AI Problems Knowledge Representation Intelligent Search
- AI Application Categories
- Declarative programming languages: Special features and comparison with procedural languages
- Logical and Functional programming.
- Logical programming and as a methodology: Recursive programming, Top-Down and Bottom-Up program development, incremental programming, nondeterminitic programming.
- Applications: Examples of intelligent systems and their implementation
- The moral and ethical dimensions of AI and its impact on society.

#### (1602) Embedded Systems

Semester: 6th / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1602/</u> Recommended prerequisite courses: (1204) Digital System Design, (1102) Structured Programming, (1502) Microcontrollers Coordinator: Aristotelis Kazakopoulos

- Use of parallel ports
- Data processing
- Internal and External interrupts
- Applications with timers
- Seven segment displays
- Keypad drivers
- Display drivers
- Step motor drivers
- External clocks(RTC)

- EEPROM management
- Serial ports management
- Connection of sensors
- Connection of wireless modules

## (1611) Synthesis of Electronic Circuits

Semester: 6th / ECTS credits: 6 Category: Specialization – Skills Development (SA-SD) / Type: Compulsory Elective (CE) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1611/</u> Recommended prerequisite courses: (1504) Electronic Devices, (1204) Digital System Design, (1404) Electronic Circuits Coordinator: Argyrios Chatzopoulos

## Course Contents

- Analysis and design of low-frequency oscillator sinusoidal circuits RC (Wien, phase shift), and high-frequency LC (Colpitts, Clapp, Hartley), crystal.
- Analysis and design of function generator circuits (square, triangular and saw waveforms).
- Analysis and design of voltage-controlled oscillator (VCO) circuits.
- Timing circuit analysis and design.
- Analysis and design of analog switches circuits with bipolar transistors, FETs, MOSFETs, and integrated circuits.
- Analysis and design of PWM power control circuitry. Half wave and full wave D Class amplifiers.
- Circuit Analysis and Design Using Phase-Locked Loops (PLL).
- Analysis and Design of High-Frequency Amplifier Circuits using Bipolar Transistors, FETs and Operational Amplifiers.
- Circuit Analysis and design using current feedback operational amplifiers CFOAs, similarities and differences with voltage feedback operational amplifiers (VFOAs).

# (1612) ) Quantum Computing

Semester: 6th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1612/</u> Recommended prerequisite courses: (1101) Mathematics I, (1201) Mathematics II, (1104) Electronic Physics Coordinator: Ioannis Marmorkos

- Introduction and historical review of Quantum Computation, Postulates of Quantum Mechanics, Schrodinger equation, Dirac formalism, vector spaces and quantum states in Hilbert space, superposition of quantum states, quantum entanglement, quantum states of composite particles.
- Two level quantum systems, qubits, Bloch sphere, multiple qubits (quantum registers), quantum parallelism.
- Operators in quantum mechanics, projector operators, quantum measurement.
- Quantum gates, quantum computation circuits, no cloning theorem.

- Deutsch's quantum algorithm, Grover's algorithm, quantum searching, Shor's algorithm, quantum Fourier transform, quantum cryptography.
- Quantum communications, teleportation.

## (1613) Microelectronic Circuit Design Methodologies

Semester: 6th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1613/</u> Recommended prerequisite courses: (1504) Electronic Devices Coordinator: Dimitrios Papakostas

#### Course Contents

- Chronology. Crystal Growth Techniques. Microcircuit types. Manufacturing process: silicon purification, crystal growth, wafers cutting, molding, oxidation, photolithography, ion diffusion or implant insertion, plating, packaging.
- Integrated resistors, capacitors, diodes, BJT, MOSFET, CMOS.
- Proportional integrated circuits: power mirrors, differential amplifiers, effect amplifiers.
- Digital integrated circuits: inverter, switch, key gates, complex combinatorial and sequential circuits.
- Integrated Circuit Design Methodologies and Tools.
- Reliability and quality control. Examination methods. Signal addition, detection and comparison. Boundary scan. Digital Circuit Control. Error models. Complexity of tests. Built-in self-test (BIST). Signature Analysis.
- Layout analysis and design software.

# (1641) Numerical Methods

Semester: 6th / ECTS credits: 6 Category: Specialization (SP) / Type: Compulsory Elective (CE) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1641/</u> Recommended prerequisite courses: (1101) Mathematics I, (1102) Structured Programming Coordinator: Konstantinos Goulianas

- Error Theory: Errors, Floating Arithmetic, Error Transfer.
- Calculation of Series of Mathematical Functions: Series Calculation, Clipping Error, Correction.
- Numerical Solution of Equations: Isolation of Roots of Nonlinear Equations, Value Calculation, Polynomial Derivatives (Horner Scheme), Methods of Solving Nonlinear Equations (Convergence, Convergence Speed), Partitioning Method, Misfit, New, Sequential.
- Solving Linear Equation Systems: Direct Methods (Diagonal Solution, Upper-Lower Triangular System, Gauss Deletion), Repetitive Methods (Gauss-Seidel, Jacobi Method).
- Ascending Differences: Forward, Backward, Central Differences, Error Transfer, Difference Rulers.
- Linear Interpolation: Newton-Gregory Interpolation types, Lagrange Interpolation types, correction to Interpolation types.
- Numerical Integration: Tables Method, Newton-Cotes Method, Simpson Method, Gauss Method.

## (1642) Advanced Topics of Human-Computer Interaction (Mobile Programming)

Semester: 6th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1642/</u> Recommended prerequisite courses: (1505) Human-Machine Interaction Coordinator: Efkleidis Keramopoulos

#### **Course Contents**

- Introduction to mobile application development principles and technologies.
- Introducing mobile platforms (iOS, Android, Windows Phone).
- Familiarization with the Android operating system and the environment of the Android Studio toolkit (Configuration interface, Android SDK, ADT for Eclipse, emulators).
- Study the key features of a standard Android application.
- Design custom user interfaces for small screens.
- Study and use of SQLite.
- Storing, file management, debugging.
- Sensor usage and interaction with special devices / sensors such as RFID, NFC, Beacons, Bluetooth
- Geographical location services.
- Web services, audio, image.
- Study the key features of adaptive User Interfaces.
- Study the key features of virtual and augmented reality applications.
- Study of frameworks and APIs for virtual reality and augmented reality applications.
- Study the basic features of the holograms and the basic development approaches.

#### (1643) Project Management

Semester: 6th / ECTS credits: 6 Category: General Background (GP) / Type: Elective (E) Knowledge area: General Knowledge and Skills (GKS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1643/</u> Recommended prerequisite courses: -Coordinator: Vasilis Kostoglou

- Introduction to Network Analysis (activities, events, activities relations, arc and node networks)
- The characteristics of ICT Projects (features, characteristics, life cycle, cost elements, human resources and equipment
- Network Solution (solving algorithms regarding activities and overall project times)
- PERT technique (distribution B, normal distribution, use of statistical tables)
- Cost minimization CPM method (cost vs duration of activity, cost minimization algorithm, optimal time determination, compression methods)
- Resource planning (resource planning methodologies, Gantt chart, heuristics, resource aggregation, smoothing and leveling methodologies)

- Monitoring the progress of a project (identifying and measuring time and financial differences over initially planned scheduling
- Use of project management software
- Solution of problems and case studies

# (1671) Microwave Technology and Remote Sensing

Semester: 6th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1671/</u> Recommended prerequisite courses: (1501) Wireless Communications Coordinator: Melina Ioannidou

#### Course Contents

- Microwave frequency spectrum and applications. Frequency bands, operation principles and applications of remote sensing systems. Ionizing and non-ionizing radiation. Biological and environmental effects of microwaves. Medical applications of microwaves.
- TEM waves, TE waves and TM waves. Waveguides with emphasis to parallel plate and rectangular waveguide (modes, cutoff frequency, phase velocity, group velocity, wave impedance).
- S-parameters (scattering matrix) of microwave networks. Passive microwave components. Power dividers and directional couplers. Microwave filters. Design and construction of microstrips. Microwave resonators. Microwave sources.
- Radar equation and calculation of signal-to-noise ratio. Radar cross-section of various targets.
- Analysis of the operation of pulse radar, CW radar, FM-CW radar, pulse Doppler radar and imaging radar. Resolution in range and azimuth. Radar receivers and detection of radar signals.
- Basic principles in radiometry.
- Remote sensing for geoscience applications. Response of various targets encountered in the environment (soil, precipitation, vegetation, sea) to microwaves. Detection and mapping of the targets' characteristics. Spaceborne radars and remote sensing systems.

# (1672) Optoelectronics and Optical Communications

#### Semester: 6th / ECTS credits: 6

Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1672/</u> Recommended prerequisite courses: (1101) Mathematics I, (1104) Electronic Physics, (1201) Mathematics II

Coordinator: Maria Papadopoulou

- Introduction-technologies of constructing modern semiconductor devices
- Electronic properties of materials, energy band theory in solids, metals-insulators-semiconductors, theory of semiconductor junctions.
- Optical properties of semiconductors-Interaction of light with semiconductors
- Modern optoelectronic devices for light detection
- Noise in photodetectors

- Light Emitting Diode (LED)
- LASER, optical modulators and optical amplifiers
- Fiber optic wave guides, Optical communication systems, optical transmitters and receivers, Optical filters and amplifiers, wavelength division multiplexing (WDM), fiber optic sensors.

## (1673) Mass Media Communication Systems

Semester: 6th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1673/</u> Recommended prerequisite courses: (1303) Signal Processing, (1501) Wireless Communications Coordinator: Rigas Kotsakis

#### Course Contents

- Human hearing and vision. Audiovisual perception.
- Analog and Digital TV.
- Audiovisual capturing, archiving, processing, and signal transmission.
- Compression and storing techniques.
- New technologies of TV production and content processing
- High-Definition Image and Video (4K, 8K).
- Stereophonic audio and stereoscopic television/cinema.
- Multimedia technologies and properties (fps, resolutions, etc.)
- Convergence of digital technologies of informatics and television/cinema.

## A.7 7th Semester Courses

#### (1701) Computer Networks

Semester: 7th / ECTS credits: 6 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (C) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1701/</u> Recommended prerequisite courses: (1402) Telecommunication Systems Coordinator: Vasilis Vitsas

- Introduction: Internetworking, open system interconnection, Internet services and applications, historical data.
- Protocol layering: Layering principle, ISO reference model, X.25 protocol, TCP / IP reference model.
- Architectural modeling internetworking: Interconnectiong application and network levels, properties and architecture of the Internet.
- Internet addressing: Classful addressing model, subnetting and supernetting, special IP addresses (directed broadcast, restricted broadcast, return loop).
- Address Resolution Protocol (ARP): Converting IP addresses to physical addresses, direct mapping, dynamic assignment, cache, ARP enhancements, ARP implementation, ARP message format, Reverse Address Resolution Protocol (RARP).

- Internet Protocol (IP): Connectionless packet delivery system, purpose of the IP protocol, standalone IP packet format, IP packet header fields, packet segmentation and reassembly, Time-To-Live, IP packet options (record route, loose and strict source routing), routing of standalone IP packets (direct and indirect delivery, next hop routing).
- **ICMP protocol**: Error reporting and correction, ICMP message delivery, ICMP message format, ping command, congestion, source suppression.
- Internet Routing: Static and Dynamic Routing, the Concept of Autonomous Systems, Metric and Routing Performance, Routing Tables, Routing Algorithms (Short Path, Flooded, Distance Vector, Link State), Routing Information Protocol (RIP), Open Shortest Path First (OSPF) protocol, Border Gate Protocol (BGP).
- User Datagram Protocol (UDP): Definition of final destination, UDP message format, UDP encapsulation and layering, multiplexing / demultiplexing, UDP ports.
- Transmission Control Protocol (TCP): Reliable data stream service, properties, sliding windows, TCP ports, passive / active opening functions, sequence numbers, variable window size and flow control, TCP header format, maximum segment size TCP, acknowledgements, timeout and retransmission time, Round Trip Time, congestion control (congestion window, congestion avoidance with multiplicative decrease, slow start, queue drop, random early drop), silly window syndrome, delayed acknowledgements.
- **Domain Name System (DNS) Naming**: Internet domain names, hierarchy and domain name server architectures, performance optimization, domain name shortening.
- Internet services and applications: E-mail. File transfer and access. Worldwide web. Teleconnection. Internet Telephony.

## (1702) Power Electronics

Semester: 7th / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1702/</u> Recommended prerequisite courses: (1202) Measurements and AC Circuits Coordinator: Iordanis Kioskeridis

#### **Course Contents**

- Principle of operation of power circuits.
- Ideal power switches.
- Semiconductor power switches.
- Single phase rectifiers.
- Multi phase rectifiers.
- Applications of rectifiers with diodes and SCRs.
- Single phase cycloconverters.
- Single and multi-phase ac voltage regulators.

#### (1711) Control Systems

Semester: 7th / ECTS credits: 6

Category: Specialization (SP) / Type: Compulsory Elective (CE)

Knowledge area: Embedded – Computational Systems (ECS)

Teaching hours: 4 (Theory)

Web page: <a href="https://www.iee.ihu.gr/en/course/1711/">https://www.iee.ihu.gr/en/course/1711/</a>

Recommended prerequisite courses: (1201) Mathematics II, (1303) Signal Processing

#### Coordinator: Panagiotis Tzekis

#### **Course Contents**

- Introduction to control systems
- Laplace Transform and inverse Laplace Transform for control systems
- Computer Control (CC) και MATLAB software for control systems
- Time response of control systems
- Modelling control systems (Transfer Function)
- Control systems stability
- Block diagrams simplification
- Root Locus method analysis
- Frequency response method analysis
- Digital Control Systems
- Digital Control systems stability
- Time response of digital control systems
- Root locus method analysis of digital control systems
- Control systems design with PID etc. by root locus and frequency response methods

# (1712) Sensors and Signal Conditioning

Semester: 7th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Compulsory Elective (CE) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1712/</u> Recommended prerequisite courses: (1611) Synthesis of Electronic Circuits Coordinator: Argyrios Chatzopoulos

- Types of sensors, passive sensors, active sensors
- Temperature sensors (thermistor, bimetallic, RTD, semiconductor)
- Humidity sensors (ohmic and capacitive)
- Position and motion sensors (Linear Variable Differential Transformer (LVDT), Hall)
- Strain, force, pressure, flow sensors (ohmic, strain gage and semiconductor)
- High resistance sensors for measuring luminance (photodiodes), acceleration (piezoelectric), acidity PH (chemical reaction)
- Characteristics of measuring systems. Accuracy, precision, resolution, linearity.
- V / V, V / I, I / V, I / I, signal converters with operational amplifiers
- Instrumentation amplifiers (INA). Differential amplifier, INA with two OpAmps, INA with three OpAmps, INA integrated circuits
- Reference voltage sources, Reference current sources for floating loads, for loads with one end in supply rail and for grounded loads
- Signal conditioners. Voltage dividers, current sources, DC and AC bridges
- Capacitance Multipliers, Gyrators, Precision Rectifiers, Peak Detectors, Sample and Hold Circuits
- Wired data transmission. 4-20mA current Transmitters, Frequency to voltage and vice versa (V/F and F/V)
- Converters from Analog to Digital (A / D). Successive Approximation (SAR), ( $\Sigma$ - $\Delta$  ADC)
- Digital to Analogue Converters (D / A), digital potentiometers

## (1713) Programmable Logic Controllers

Semester: 7th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area Embedded – Computational Systems (ECS) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1713/</u> Recommended prerequisite courses: (1711) Control Systems Coordinator: Panagiotis Tzekis

### **Course Contents**

- Historical review of PLCs.
- Definitions.
- Basic operating principles and structure of Programmable Logic Controllers.
- S7-200 models with Micro-Win software, and their features.
- Power supply, input-output units (Input / Output modules), Central Processing Unit (CPU) and extensions).
- Advantages, disadvantages, expansion units.
- Basic programming principles, characteristics and nomenclature of components Description and explanation of commands program structure.
- Electrical diagrams (examples).
- Logic principles –Gates, Counters, Timers (examples). Logic equations truth tables and logic diagrams, Description General description of Micro/Win.
- Contact diagrams (examples).
- Comparative or correspondence table. Programming the S7-200.
- Explanation of commands.
- Commands Normally Open Close.
- Counters.
- Set Reset commands.
- Software PLC programming. Programming languages (Ladder Diagram).
- List of commands (STL Statement List).
- Logic Gate Diagram (FBD Function Block Diagram).
- Electrical diagrams, simulation Examples applications.

### (1714) Design of Reconfigurable Digital Systems (FPGAs)

Semester: 7th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area Embedded – Computational Systems (ECS) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1714/</u> Recommended prerequisite courses: (1504) Electronic Devices, (1204) Digital System Design Coordinator: Dimitrios Papakostas

### **Course Contents**

• FPGA Structure and Function

- Introduction to the implementation of digital systems with FPGA
- Modeling Introduction to VHDL Material Schematic Language
- Introduction to Verilog hardware description language
- VHDL Language Entities and Architecture
- Ways to describe with VHDL: behavior, data flow, structural
- Data types, circuit data statement
- Creation of subprograms, packages, libraries, layouts
- Time Flow Handling Sequential and Concurrent Suggestions
- Description of laboratory development system
- Using specialized software Utilities
- Embedded systems
- FPGA system design methodology
- Modern FPGA technology and architecture
- Virtex and Spartan FPGAs as examples of modern redesigned architectures.
- Synthesis, placement, routing in FPGAs
- Embedded processors (Xilinx Microblaze processor example)
- Microblaze Processor System on chip architecture
- Matlab Simulink Xilinx System Generator Xilinx ISE

## (1741) Introduction to Data Analytics

### Semester: 7th / ECTS credits: 6

Category: Specialization (SP) / Type: Compulsory Elective (CE) Knowledge area: Data Management - Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1741/</u> Recommended prerequisite courses: (1301) Probability Theory and Statistics Coordinator: Dimitrios Dervos

### Course Contents

- The R/R-Studio Environment
- The Comprehensive R Archive Network (CRAN) Repository
- The R Language: Data Types, Objects, Vectors and Lists, Matrices, DataFrames, Vectorization, The IF-ELSE Clause, FOR, REPEAT, and WHILE Commands, Functions, Data Importing/Exporting, RDBMS Coupling (MySQL, PostgreSQL)
- Extract-Transform-Load (ETL) Operations: Data Cleaning and Homogenization, Noise, Missing Values, Data Discretization and Data Standardization, Data Transformation,
- Descriptive Statistics / Exploratory Analysis: Mean, Median, Standard Deviation, Quartiles, Interquartile Range (IQR), Frequency Tables, Bar Charts, Histograms, Pie Charts, Boxplots, Scatter Plots, Contingency Tables
- Simulation of Data Distributions: Density Plots, Data Sampling
- The Pearson Correlation Coefficient

# (1742) Software Engineering

Semester: 7th / ECTS credits: 6 Category: Specialization (SP) / Type: Compulsory Elective (CE) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1742/</u> Recommended prerequisite courses: (1205) Object Oriented Programming Coordinator: Ignatios Deligiannis

## Course Contents

- Object-Oriented Technology Introductory Concepts
- Unified Modeling Language UML (Unified Modeling Language)
- Integrated Process RUP (Rational Unified Process)
- Agile methods
- Software Refactoring
- Management of software projects using the SCRUM method
- Software evaluation with metrics
- Design principles
- Design patterns

## (1743) Database Technology

Semester: 7th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management - Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1743/</u> Recommended prerequisite courses: (1401) Database Management Systems Coordinator: Dimitrios Dervos

- Embedding SQL code in third generation programming environments.
- The Open Access Architecture using JDBC. Create integrated applications using popular DBMSs, such as Oracle, PostgreSQL, Microsoft SQL Server and MySQL.
- Frameworks and Object Connection APIs, created in an object-oriented programming language such as Java, with relational database systems or other forms of information management, such as Hybernate, Spring, JPA, JDO and more.
- Stored procedures and triggers on the database server.
- Online data management services: Explain the design of data web services, their implementation through stored SQL procedures and SQL commands.
- Designing databases for an object-relational database system, extending the relational model, embedded collections, the SQL3 query language, and in particular its object-relational extensions, implementing a complete example in Oracle.
- Study of the main types of NoSQL databases and their most popular implementations, such as google firebase, mongo db, Neo4j, db4o and more.
- Semi-structured data organization technologies such as XML, XML Schema, SQL2008, XQuery, Xpath. Support XML formatting and management of corresponding data in ORDBMS and in native XML environments such as BaseX.
- Transaction as a logical unit of work in the DBMS client / server environment.
- Errors and diagnostics when executing SQL code.

- SQL error and exception handling
- Transaction anomalies: lost update, dirty read, non-repeatable read, phantoms/ghosts.
- ACID properties, the ideal transaction.
- Transaction isolation levels.
- Technologies / mechanisms for implementing simultaneous control of transaction execution: Multi-Granular Locking Concurrency Control (MGLCC), Multi-Versioning Concurrency Control (MVCC), Optimistic Concurrency Control (OCC).

## (1744) Advanced Computer Architecture and Parallel System Programming

Semester: 7th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1744/</u> Recommended prerequisite courses: (1304) Computer System Organization and Architecture, (1102) Structured Programming Coordinator: Konstantinos Diamantaras

### Course Contents

- Introduction: advanced architectures and parallel processing, computer system classification (SISD, MISD, SIMD, MIMD), UMA/ NUMA classification, memory models (shared memory, distributed memory, distributed shared memory), message-passing model, multiprocessors, multicomputers
- Memory technology: hierarchical memory, cache organization, storing and retrieving data from the cache, cache performance, handling multiple caches, the cache coherence problem, the snooping and directorybased protocol
- Pipelining: Instruction pipeline, instruction execution phases, the DLX language, DLX pipeline, pipeline hazards, floating-point pipeline, normalization, pipeline control.
- Parallel programming: Amdahl's law, semaphores, locking, synchronization, deadlocks, and their avoidance
- Parallelization: dependence graph, nested loops, algorithms mapping, linear mapping methods, scheduling, optimal scheduling for special cases, heuristic scheduling
- Parallel programming on shared memory, multithreading, POSIX Threads, multi-processing, the OpenMP model
- Parallel programming on distributed memory, message passing, the MPI model
- Programming General Purpose Graphical Processing Units (GPU), the CUDA model

# (1771) Audio and Image Technologies

Semester: 7th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1771/</u> Recommended prerequisite courses: (1303) Signal Processing Coordinator: Rigas Kotsakis

- Basic concepts of audiovisual signals.
- Electroacoustic chain.

- Digitization process of audio and video content.
- Audio and visual properties extraction.
- Comparison of audiovisual parameters.
- Classification models on audio and image content.

# A.8 8th Semester Courses

### (1801) Information Security

Semester: 8th / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Data Management - Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1801/</u> Recommended prerequisite courses: (1405) Web Languages and Technologies Coordinator: Christos Ilioudis

# Course Contents

- Introduction to information security
- Security models,
- Access control policies,
- Risk analysis
- Cryptographic algorithms, public-key cryptography
- Identification authentication (smart cards, biometrics, etc)
- Public Key Infrastructure,
- Introduction to Internet Security,
- Security protocolls on internet (IPSEC, SSL etc)
- Security mecahanisms on internet (firewalls, IDS, VPN)
- Web security (SQL injections, etc)
- Legal framework on information security

# (1802) Machine Learning Principles and Methods

Semester: 8th / ECTS credits: 6 Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Data Management - Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1802/</u> Recommended prerequisite courses: (1301) Probability Theory and Statistics, (1101) Mathematics I, (1201) Mathematics II Coordinator: Konstantinos Goulianas

- Introduction to Machine Learning, basic concepts, the problems of pattern recognition regression, clustering and feature extraction
- Useful mathematical concepts from linear algebra, matrix theory, eigenvalue decomposition, probability theory, and optimization theory
- Generalization, the cross-validation method

- Introduction to Artificial Neural Networks, the linear neuron, the Perceptron, and ADALINE models
- Multi-Layer Neural Networks, the Back-Propagation learning algorithm
- Competitive Learning, Self-organizing networks
- Basic Recurrent models, associative memory, the Hopfield model
- Support Vector Machines, the concept of margin, linear and nonlinear kernels, support vector regression
- Basic clustering methods, the k-means algorithm
- Feature extraction
- Principal Component Analysis (PCA), Factor Analysis

### (1803) Internet of Things

Semester: 8th / ECTS credits: 6

Category: Scientific Area (SA) / Type: Compulsory (C) Knowledge area: Communications and Networks (CN)

Teaching hours: 4 (Theory)

Web page: https://www.iee.ihu.gr/en/course/1803/

Recommended prerequisite courses: (1701) Computer Networks, (1501) Wireless Communications, (1402) Telecommunication Systems, (1303) Signal Processing Coordinator: Periklis Chatzimisios

Coordinator: Periklis Chatzimisio

### **Course Contents**

- Introduction to Internet of Things (IoT): Definition, fundamental characteristics and IoT architectures, challenges of IoT such as standardization, scalability, device size, energy consumption, addressing as well as issues of security/privacy, quality of service, energy saving and mobility management.
- **IoT and hardware**: Smart devices/sensors/actuators, Cyber-Physical systems, Arduino and RaspberryPi platforms.
- **IoT and communications**: Next generation protocols and architectures of wireless and mobile communications with emphasis on low energy consumption (IEEE 802.11ac/ad/ah/ax/ba, LoRaWAN, Sigfox, NB-IoT), ad-hoc networks, wireless sensor networks, IEEE 802.15.4 and ZigBee protocols, Radio Frequency Identification (RFID), Machine-to-Machine (M2M) communications, 6LoWPAN and RPL protocols.
- **IoT and software**: Operating systems for limited resources devices (Contiki, TinyOS), application-layer protocols for IoT such as Constrained Application Protocol (CoAP), Message Queue Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Representational State Transfer (RESTFUL Services), Advanced Message Queuing Protocol (AMQP), Websockets.
- **IoT and Mobile and Pervasive Computing Systems (MPCS)**: Architectures and design issues for MPCS, MPCS applications, localization issues.
- Services, applications and case studies for IoT: Tactile Internet, Smart Cities, Smart Grid, intelligent transportation systems, health services, smart environments (home/office/buildings), smart agriculture, smart industry.
- **Big Data, cloud computing and data centers**: Crowdsourcing, interoperability, smart collection/storage/processing/analysis of data.
- **The future of IoT**: Demands, architectures, infrastructure and applications of the 5th Generation (5G), 4th Industrial Revolution (Industry 4.0).

### (1811) Applications of Control Systems

### Semester: 8th / ECTS credits: 6

Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1811/</u> Recommended prerequisite courses: (1711) Control Systems Coordinator: Panagiotis Tzekis

### Course Contents

Introduction to Robotics (Historical Review, Contemporary and Future Technology). Structure and Classification of Robots. Basic Robot Control Techniques Robotic Arm Analysis. Models. Robotic Arm Trajectory Design. General characteristics of mechanics and high and low power electromechanical switches. General electrical characteristics machines. Rotary motors S.R., E.R., servo motors, stepper motors, motors without brushes, reducers. Linear displacement motors. Sensors, special sensors an-gular velocity and position measurement. Tachogenerators, linear and rotary encoders. Reference to new natural resource control technologies (Petroleum – Natural gas).

Demonstration of multi-degree-of-freedom robotic arm operation, D.C. speed control motor, open and closed loop no load & with load. Servo control position. Fluid level control system. Two fluid flow control system. Examples and applications (Liquid mixing control – oven temperature). Ball control system and Beam – Digital Pendulum Control System (Inverted Pendulum) with PC – Analog control systems: Simulating systems and solving 1st and 2nd order differential equations with the use of software and analog computers.

### (1812) Power Converters

Semester: 8th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1812/</u> Recommended prerequisite courses: (1702) Power Electronics Coordinator: Iordanis Kioskeridis

### Course Contents

- MOSFET and IGBT.
- PWM techniques.
- Non isolated dc-dc convertes.
- Isolated dc-dc convertes.
- Power supplies design.
- Voltage and current source inverters.
- Electric motor control.
- Industrial applications and traction systems.

### (1837) Microelectronics

Semester: 8th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1837/</u> Recommended prerequisite courses: (1504) Electronic Devices Coordinator: Dimitrios Papakostas

### **Course Contents**

• Chronology. Crystal Growth Techniques. Microcircuit types. Manufacturing process: silicon purification,

crystal growth, wafers cutting, molding, oxidation, photolithography, ion diffusion or implant insertion, plating, packaging.

- Integrated resistors, capacitors, diodes, BJT, MOSFET, CMOS.
- Proportional integrated circuits: power mirrors, differential amplifiers, effect amplifiers.
- Digital integrated circuits: inverter, switch, key gates, complex combinatorial and sequential circuits.
- Integrated Circuit Design Methodologies and Tools.
- Reliability and quality control. Examination methods. Signal addition, detection and comparison. Boundary scan. Digital Circuit Control. Error models. Complexity of tests. Built-in self-test (BIST). Signature Analysis.
- Layout analysis and design software.

# (1839) Electric Motor Drives and Smart Grid

Semester: 8th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1839/</u> Recommended prerequisite courses: (1504) Electronic Devices Coordinator: Iordanis Kioskeridis

### **Course Contents**

- Direct current machines.
- Alternating current machines.
- Power converters.
- Open and closed loop control.
- Electric vehicles.
- Smart grid technologies.

### (1841) Data Organization and Data Mining

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management - Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1841/</u> Recommended prerequisite courses: (1741) Introduction to Data Analytics Coordinator: Stefanos Ougiaroglou

- Introduction to data organization and mining
- Data preparation (Data cleaning, missing values imputation, feature selection and extraction, discretization, handling imbalances in classification problems, etc.)
- Introduction to classification, categories of classification problems, categories of classification algorithms, probability-based algorithms (e.g., naive Bayes), space-partitioning algorithms (e.g., decision trees), similarity/distance-based algorithms (e.g., nearest neighbors), efficient nearest neighbor search through data indexing (e.g., k-d tree), data reduction techniques, Multi-label classification
- Performance metrics of classification and techniques for validating the performance of classification algorithms

- Introduction to data clustering, types of clusters, categories of clustering algorithms, clustering algorithms: k-means algorithm and its variations (k-medians, k-modes, and k-prototypes), hierarchical clustering, density-based clustering, DBSCAN algorithm, techniques for parameter determination of clustering algorithms (Elbow, Silhouette, dendrogram, k-dist graph), Interpretation of clustering results and estimation of clustering performance
- Association rules, Apriori algorithm for discovering association rules, evaluation measures of association rules, FP-growth and Eclat algorithms
- Data mining scenarios using the WEKA software and the scikit-learn library in Python
- OLTP and OLAP, Data Warehouse design and implementation, star and snowflake schemas, Extract-Transform-Load (ETL) processes, multidimensional data cubes, OLAP queries and data mining in data warehouses
- Introduction to Recommender Systems

# (1842) Added-Value Internet Services

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1842/</u> Recommended prerequisite courses: (1405) Web Languages and Technologies Coordinator: Christos Ilioudis

## Course Contents

- **Overview of Web Services Technologies**: Emphasis on Web Services Framework, Protocols (XACML, XrML, etc.), New and Evolving Standards for Service Oriented Architectures (SOA).
- Models and techniques in using data and knowledge online to develop "smart" new services.
- **E-Government**: Introducing e-government technology and the challenges in developing, managing and delivering services and information electronically to citizens. Good eGov practices and entrepreneurship, technological development and e-gov (web 2.0).
- **E-commerce**: Entrepreneurship models, technologies and infrastructure e-commerce, functions, e-shop types and applications, e-payments, e-commerce system architecture, e-commerce security.
- **E-learning**: Education Management Systems and their evaluation, e-learning development tools, standardization of learning technologies, educational metadata, synchronous and asynchronous e-learning, pedagogical issues, e-learning process performance evaluation, learning materials evaluation, smart learning environments.
- Electronic health: coding, management and representation of medical information. (CORBA, HL7, DICOM, XML, SOAP,), intelligent medical data analysis and processing mechanisms and systems, Electronic Health Record (EHR), synchronous and asynchronous telemedicine services.

# (1871) Wireless Networks

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1871/</u> Recommended prerequisite courses: (1701) Computer Networks, (1501) Wireless Communications Coordinator: Athanasios lossifides

### Course Contents

- Institutional framework, economic and legal issues in Telecommunications: European legislation on competition and telecommunications. National and international supervisory authorities. Spectrum licensing and management. Charging of network data transmission services, congestion charging, network resource allocation criteria, flow control models, Internet charging.
- Introduction to wireless communications: Basic characteristics of wireless propagation, types of interference, multiplexing methods, physical layer (PHY), medium access control layer (MAC), multiple access (FDMA/TDMA/CDMA/WCDMA) and packet collision avoidance (CSMA) techniques /CA, polling).
- The IEEE 802.11 standard for high-speed wireless local area networks: Architecture, services, physical layer, medium access control layer, current and under development versions of the protocol (e.g. 802.11aa/ac/ad/af/ah).
- Metropolitan wireless technologies (IEEE 802.16 WiMAX) and personal networks (UWB, Bluetooth, Zigbee, IrDA).

### (1872) Special Network Topics (CCNA) 1

Semester: 8th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 2 (Theory) / 4 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1872/</u> Recommended prerequisite courses: (1701) Computer Networks Coordinator: Vasilis Vitsas

### Course Contents

- Layer analysis, TCP/IP protocol stack
- Configuration of CISCO devices for the operation and security of switch and router devices
- Design of local networks, operation of ethernet switched network
- Operation of 2nd level network devices (switch)
- ARP, ICMP, Ethernet II, NDP (IPv6) protocol function
- Structure of IPv4, IPv6 packets, addressing subnetting
- Structure and operation of TCP, UDP
- Design and implementation of virtual local area networks (VLAN) and InterVlan Routing
- Design and implementation of network device security settings and policies
- Design and implementation of DHCPv4, Slaac and DHCPv6
- Operation of FHRP protocols. Planning and implementation of the HSRP
- Router function, packet routing analysis
- Design and implementation of static routing
- Strategies and approaches for analyzing and solving problems (troubleshooting) in a network. Exercises and troubleshooting case studies

### (1873) Advanced Network Topics

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1873/</u> Recommended prerequisite courses: (1701) Computer Networks Coordinator: Vasilis Vitsas

### **Course Contents**

- Character codes (basic principles, ASCII codes, unicode etc.)
- Interfaces (main features, V.24 interfaces, USB, HDMI, parallel interfaces)
- Geographical and topological division of networks, switching networks and listening networks, switching methods
- OSI model and functions of communication protocols
- Network routing, link state and distance vector algorithms

# (1874) Mobile Communication Systems

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communications and Networks (CN) Teaching hours: 4 (Theory)

Web page: <u>https://www.iee.ihu.gr/en/course/1874/</u>

Recommended prerequisite courses: (1701) Computer Networks, (1501) Wireless Communications Coordinator: Athanasios Iossifides

## Course Contents

- **Mobile communications at a glance**: Evolution of mobile communication systems. Description of basic services, service categories, use cases and quality of service (QoS). Present and future with numbers. Standardization.
- Basic principles, functionalities and techniques of cellular systems: Basic network elements. Duplexing and multiple access. The concept of the cell and the cellular structure. Introduction to basic functionalities of mobile communication systems. Review of signal processing techniques.
- Radio propagation and modelling in mobile communication systems.
- The GSM/GPRS system: Architecture of 2G-2.5G mobile communication systems (core network, access network, control plane and user plane). Interfaces and protocol stacks. Air interface. Radio resource management. Basic network functionalities (mobility management, access procedures, cell selection, location update, paging, connection management and handover). Principles of planning and dimensioning.
- UMTS/HSPA systems: Architecture of 3G-3.5G mobile communication systems. Interfaces and protocol stacks. Air interface and CDMA. Radio resource management. Basic network functionalities. Differences with respect to 2G systems. HSPA. Principles of planning and dimensioning.
- LTE/LTE Advanced systems: Architecture of 4G mobile communication systems. Evolved packet system and communication protocols. Air interface, OFDM and SC-FDMA, MIMO techniques. Radio resource management. Enhancements with respect to 3G. Advanced techniques of carrier aggregation and Intecell Interference Coordination. Principles of planning and dimensioning.
- **5G mobile communications**: ITU definitions and requirements, standardization procedures. Services and use cases. Network architecture, network slicing, NFV and SDN. Multiple access techniques, multi-user MIMO and beamforming.

# (1898) Free Selection B

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: General Knowledge and Skills (GKS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1898/</u> Recommended prerequisite courses: -Coordinator: Vasilis Kostoglou

### **Course Contents**

The course "Free Selection B" serves as a placeholder for courses successfully completed by department's students, which belong to third-party national or international (Erasmus) programs of study, following the approval of the home department's Study Program Committee or the Erasmus academic coordinator.

### (1948) Development of Large Software Systems

Semester: 8th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1948/</u> Recommended prerequisite courses: (1405) Web Languages and Technologies Coordinator: Michalis Salampasis

### **Course Contents**

- Collaborative software development principles & tools
- Git, SVN, Mercurial
- Unit testing
- Introduction to .NET
- Introduction to two basic .NET languages (Visual Basic and C#) OOP Component based programming
- The Visual Studio IDE
- Objects, Controls, Components
- Common Controls
- Event Management
- Collaborative code development (Subversion, Git, Mercurial) Version Control
- ADO .NET
- Data Binding, data bound controls
- Access to databases, DataGridView, Client-Server n-tier models
- Distributed applications based on distributed and other complex databases (replication)
- Project Settings, Project Publishing
- Compiler Options
- Error handling
- Multi-threaded programming

## A.9 9th Semester Courses

### (1911) Applications of Embedded Systems

Semester: 9th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Compulsory Elective (CE) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 2 (Theory) / 2 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1911/</u> Recommended prerequisite courses: (1502) Microcontrollers, (1602) Embedded Systems, (1102) Structured Programming

Coordinator: Angelos Giakoumis

### **Course Contents**

- Use of digital and analog inputs.
- Timers and interrupts.
- Motor Control and Pulse Width Modulation (PWM).
- Applications with serial ports.
- Storing data to SD card, USB flash stick.
- Applications with analog and digital sensors.
- Communication with computer via USB.
- Applications to control power electronic devices, photovoltaic systems and power supplies.

### (1912) Robotics

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Compulsory Elective (CE) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1912/</u> Recommended prerequisite courses: (1602) Embedded Systems Coordinator: Maria Papadopoulou

### **Course Contents**

- Introduction to Robotics
- Translation and orientation of a rigid body
- Kinematic analysis of a robotic system
- Trajectory planning
- Dynamic analysis of a robotic system
- Robot motion control
- Control for physical interaction of the robot with the environment/human
- Programming tools for robot control

### (1913) Renewable Energy Sources and Smart Grid

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1913/</u> Recommended prerequisite courses: (1812) Power Converters Coordinator: Iordanis Kioskeridis

- Solar radiation and geometry.
- Photovoltaic modules and systems.
- Design of photovoltaic installations.

- Solar power plants.
- Conversion of wind energy.
- Wind turbines.
- Geothermal energy.
- Smart grid technologies.

## (1914) Tangible User Interfaces

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Embedded – Computational Systems (ECS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1914/</u> Recommended prerequisite courses: (1505) Human Machine Interaction, (1602) Embedded Systems Coordinator: George Kokkonis

### **Course Contents**

This course will explore the theory and practice of tangible / tactile user interfaces. These interfaces are a relatively new HCI (Human Computer Interaction) field. Topics covered in the course include:

- Theoretical framework of tangible / tactile user interfaces
- Design examples
- Development technologies
- Ways of evaluation
- Design and development by students

### (1915) Biomedical Technology

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1915/</u> Recommended prerequisite courses: (1712) Sensors and Signal Conditioning Coordinator: Aristotelis Kazakopoulos

- Introduction to biomedical instruments and measurements.
- Electrodes and sensors.
- Bio-electric amplifiers, signals and noise.
- Electrocardiograms.
- The human respiratory system and its measurement.
- The human nervous system and instruments for measuring brain function.
- Medical ultrasound scans.
- Radiology and nuclear medicine.
- Electromagnetic interference in medical electronic equipment.
- Medical bioinformatics Auto diagnosis and Technologies.
- Maintenance of medical equipment.

## (1916) Computer Assisted Measurement Systems

Semester: 9th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Electronics (EL) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1916/</u> Recommended prerequisite courses: (1504) Electronic Devices, (1502) Microcontrollers Coordinator: Argyrios Chatzopoulos

### **Course Contents**

- Designing virtual instruments on a computer
- Measuring instrumentation specifications
- Sensor interface with computer
- Measuring instruments interface with computer
- Storage and processing of measurement data
- Data transmission and control over the Internet

## (1941) Development of Web Systems and Applications

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Compulsory Elective (CE) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1941/</u> Recommended prerequisite courses: (1405) Web Languages and Technologies Coordinator: Antonis Sidiropoulos

### Course Contents

- WWW Overview, Historical Overview, Web Servers, URLs, The WWW Client-Server Model
- Client side technologies and languages overview (HTML, CSS, Javascript, DOM, bootstrap)
- Introduction to PHP (Conditional Statements, Loops, Functions, forms, get, post, sessions, cookies)
- PHP and MySQL (MySQLI library, PDO. Database connection, SQL DML and DDL execution from PHP code, SQL Injections and prepared statements)
- The http protocol
- The JSON language and the XML language. XML validation by using DTD
- Server-client asynchronous communication via AJAX. Updating webpage without reloading.
- The JQUERY library
- Web services, Web APIs, REST APIs. Independent development of front-end and back-end. Data exchange through WEB API.
- Versioning Control Systems (VCS). Collaborative web development, use of git
- PHP frameworks (Laravel) and Content Management Systems (CMS)

# (1942) Operational Research

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Compulsory Elective (CE) Knowledge area: General Knowledge and Skills (GKS) Teaching hours: 4 (Theory) Web page: <a href="https://www.iee.ihu.gr/en/course/1942/">https://www.iee.ihu.gr/en/course/1942/</a>

Recommended prerequisite courses: (1301) Probability Theory and Statistics, (1102) Structured Programming Coordinator: Vasilis Kostoglou

### **Course Contents**

- Introduction to Operational Research (the nature of OR Mathematical models and algorithms)
- Linear Programming (mathematical model, problems formulation, the Simplex method, grahical solution, sensitivity analysis)
- Transportation and Transhipment Problems (mathematical model, initial feasible solution, optimal solution algorithm, special cases, solution of given problems and case studies) εφαρμογών)
- Stock Control (interpretation, costs analysis, main variables and terminology, main stock control systems, systems graphical representation, calculation of main variables)
- Production Systems Planning (assignment problems task scheduling in one, two or three media production line balancing)

### (1943) Information Retrieval – Search Engines

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management – Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1943/</u> Recommended prerequisite courses: (1405) Web Languages and Technologies, (1401) Database Management Systems Coordinator: Charalampos Bratsas

### Course Contents

- Introduction to Information Retrieval (IR)
- Text indexing
- Evaluation of Effectiveness (Evaluation of IR systems)
- The Logical Model
- The Vector Model
- The Probabilistic Model
- Search engines
- Interactive IR
- WEB IR

### (1944 DBMS Systems and Services Administration

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management – Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1944/</u> Recommended prerequisite courses: (1401) Database Management Systems Coordinator: Antonis Sidiropoulos

### **Course Contents**

• The role of the DBMS administrator

- The architecture and instances of the DBMS server
- Install/create a DBMS and configure its snapshots
- Management of DBMS users and resources
- The SQL standard in system management
- Metadata and views on the functional content of the DBMS
- Buffer: control, data, history (logging), transaction log file
- Manage transaction history records
- Continuous (online) action history rescue, data recovery in case of local (soft) failure
- System restore after generalized crash (hard crash). The ARIES algorithm
- Backup management, ROLLBACK and ROLL-FORWARD actions. Restore point-to-time DBMS information content
- Directory design, loading / exporting / data transfer policies, reorganization of DBMS information content
- Monitor and optimize DBMS performance
- The architecture of the distributed DBMS environment
- Data partitioning and distribution in the distributed DBMS

# (1945) Intelligent Systems

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management – Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1945/</u> Recommended prerequisite courses: (1601) Artificial Intelligence Coordinator: Panagiotis Adamidis

### **Course Contents**

Evolutionary Computation: Introduction, Main paradigms of Evolutionary Computation, (Genetic Al-gorithms, Evolution Strategies, Evolutionary Programming, Genetic Programming). Basic elements in implementing an evolutionary algorithm. Mechanisms, operators, parameters. Use in search, optimi-zation and problem solving. Demos and applications.

Fuzzy Systems: Introduction, fuzzy sets, operations, and relations, fuzzy sets and rules, Mamdani and TSK fuzzy rules and systems, design and implementation of fuzzy systems.

### (1946) Advanced Topics in Artificial Intelligence

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management – Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1946/</u> Recommended prerequisite courses: (1601) Artificial Intelligence Coordinator: Dimosthenis Stamatis

- The Field of Artificial Intelligence (AI): The weak and general View of AI
- Knowledge Representation and Reasoning
- State Space Problems and Solution Search Algorithms

- Constrain Based Problem Solving Techniques
- Intelligent Agents
- Natural Language Processing
- Digital Assistants
- The impact of AI on work and its moral and social implications
- National and European policies on AI

# (1947) Advanced Machine Learning

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Data Management – Artificial Intelligence (DMAI) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1947/</u> Recommended prerequisite courses: (1802) Machine Learning Principles and Methods Coordinator: Konstantinos Diamantaras

## Course Contents

- Supervised Learning: Multilayer Neural Networks, methods and training issues. Deep Learning, Deep Belief Networks, Deep autoencoders, Convolutional Neural Networks. Probabilistic Bayesian models, Gaussian mixture models, the Expectation-Maximization (EM) algorithm. Combining models, Bagging, Boosting, mixtures of experts. Recurrent Neural Networks, Time Delay Neural Networks, training using Backpropagation Through Time, LSTM model, GRU model. Bayesian networks, graphical inference models, directed and undirected graphs, Hidden Markov Models.
- Unsupervised Learning: Principal Component Analysis (PCA), Factor Analysis.
- Reinforcement Learning: The armed-bandit problem, Markovian Decision Processes, Dynamic Programming, Monte Carlo methods.
- Application examples

### (1949) Distributed Systems

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1949/</u> Recommended prerequisite courses: (1205) Object Oriented Programming, (1701) Computer Networks, (1744) Advanced Computer Architecture and Parallel System Programming Coordinator: Konstantinos Diamantaras

### **Course Contents**

Indicative topics covered: communication protocols, reliable data transfer, request-reply, remote pro-cedure call, remote objects, mobile code, messaging, multicasting, publish-subscribe communication, group communication with message delivery in FIFO, causal and total order, distributed directory and file systems, physical and logical clocks, consistent monitoring, consistent global states, algorithms for mutual exclusion, elections, algorithms for deadlock detection, termination, fault tolerance with restarts/rollbacks and replication, distributed consensus/agreement. The course includes assignments in C/Java/python for the development of distributed mechanisms and applications.

### (1950) Semantic Web

Semester: 9th / ECTS credits: 6

Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1950/</u> Recommended prerequisite courses: (1405) Web Languages and Technologies Coordinator: Efkleidis Keramopoulos

## Course Contents

- Introduction to Semantic Web
- Semantic Web Architecture and Tools
- Introduction to Ontologies
- RDF, RDF Schema and Linked Data
- Ontology development, OWL, ontology creation with Protégé
- The SPARQL query language and its end-point usage
- The Jena API
- Ontologies and reasoning
- Ontology mapping
- Folksonomies
- Semantic and social web
- Ontologies: Automatic development
- Ontology integration and web services
- Semantic Web Services

# (1969) Computer Graphics

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Programming and Algorithms (PA) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1969/</u> Recommended prerequisite courses: (1302) Mathematics III Coordinator: Efkleidis Keramopoulos

- Hardware: Input devices such as camera driven systems, gyroscopic devices, 3D scanners, gloves and virtual reality forms, experimental devices. Graphics output devices such as monitors, 2D/3D printers, videos
- Techniques for Graphic Representation, Geometric Transformations
- Algorithms for drawing lines and curves
- Polygon fill area functions
- Antialiasing methods
- Coordinate systems and transformations
- Surface Detection methods
- Color models, transparency
- Reflection, texture mapping and bump mapping (texture mapping techniques), surface rendering (Phong, Gauraud)
- Illumination models and ray detection

• OpenGL, Animation

# (1970) Work Placement

Semester: 9th / ECTS credits: 6 Category: Skills Development (SD) / Type: Elective (E) Knowledge area: -Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1970/</u> Recommended prerequisite courses: -Coordinator: Konstantinos Goulianas

### Contents

H Work Placement (WP) is optional for students following the five-year Study Program. The employer can belong to the private or the wider public sector. The subject of students' employment covers the entire spectrum of the cognitive subject of the studies. For the most successful realization of the WP, the intern is supervised both by a designated academic supervisor from the Department's side, and by a work manager (trainer) from the employer's side. The student keeps a WP booklet (diary) in which he records, on a weekly basis, the tasks and subjects in which he practiced. The workplace trainer supervises the trainee and notes his observations in the WP booklet. Each absence of the stu-dent from work is recorded in the WP booklet.

## (1971) Network and Communication Security

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communication and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1971/</u> Recommended prerequisite courses: (1701) Computer Networks, (1801) Information Security Coordinator: Christos Ilioudis

### **Course Contents**

- Introduction to Internet security: mechanisms and protocols at TCP/IP layers (IPSEC, SSL).
- Firewalls: architecture and models
- Virtual private networks: characteristics, protocols
- Cloud computing security, ubiquitous computing security
- IOT security
- Telecommunication security: 3G/4G/5G, NFC, Bluetooth, Wifi BAN, etc.)
- Penetration Testing, Digital forensics

# (1972) Software Defined Networking

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communication and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1972/</u> Recommended prerequisite courses: (1701) Computer Networks, (1102) Structured Programming Coordinator: Periklis Chatzimisios

### **Course Contents**

• Introduction to Software Defined Networking (SDN)

- Decoupling of control and data planes
- The Openflow protocol
- SDN controllers
- Fundamental and functions of Data centers
- Network Function Virtualization
- Study and development of SDN frameworks
- Case studies of SDN

# (1973) Special Network Topics (CCNA) 2

Semester: 9th / ECTS credits: 6 Category: Specialization – Skills Development (SP-SD) / Type: Elective (E) Knowledge area: Communication and Networks (CN) Teaching hours: 2 (Theory) / 4 (Lab) Web page: <u>https://www.iee.ihu.gr/en/course/1973/</u> Recommended prerequisite courses: (1872) Special Network Topics (CCNA) 1 Coordinator: Vasilis Vitsas

## Course Contents

- Design and implementation of Etherchannel and STP protocols
- Dynamic routing protocols (link state distance vector)
- Design and implementation of EIGRP and OSPF protocols
- Network security and cyber security issues
- Design and implementation of LAN security technologies and protocols
- Design and implementation of a wireless network
- Wide Area Network (WAN) technologies and security
- Control Access Lists
- Analysis and implementation of NAT
- QoS planning
- Design and implementation of network management protocols (SNMP, Syslog, SPAN, etc.)
- Virtual Private Network (VPN) technologies
- IoT, cloud and virtualization technologies
- SDN technology

### (1974) Satellite Communications

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communication and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1974/</u> Recommended prerequisite courses: (1501) Wireless Communications Coordinator: Ioannis Marmorkos

- Introduction to satellite communications, historical evolution and standards of International Organizations.
- Mechanics of satellite orbits, geostationary orbit

- Structure and architecture of satellite systems, on Earth satellite stations.
- Transmission of satellite signals, analysis and design of satellite links
- Satellite networks (architectures and topologies), satellite systems for DVB, DTH, VSAT networks
- Satellite systems for mobile communication services, satellite systems for location and navigation services (GPS).

# (1975) Multimedia Technology

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: Communication and Networks (CN) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1975/</u> Recommended prerequisite courses: (1701) Computer Networks, (1505) Human Machine Interaction Coordinator: Rigas Kotsakis

### Course Contents

- The features of media, applications and multimedia systems.
- The nature and characteristics of media (audio, video, analogue/digital television).
- Information theory, mean information and entropy.
- Coding principles (types of coding, entropy coding).
- Multimedia synchronization issues.
- Network media: multicast, multimedia transmission protocols (RTP/RTCP/SIP), multimedia streaming, besteffort services.
- Quality of Service (QoS), network flow and congestion control, Integrated and Differentiated (IntServ/ DiffServ) services.
- The role of coding, compression and real-time protocols.
- Real-time applications and services using the Internet (VoIP, VoD, integrated voice, data and compressed video services).
- Quality of Experience (QoE), objective/subjective assessment.
- Modern telematics applications in education, medicine and administration.

# (1998) Free Selection A

Semester: 9th / ECTS credits: 6 Category: Specialization (SP) / Type: Elective (E) Knowledge area: General Knowledge and Skills (GKS) Teaching hours: 4 (Theory) Web page: <u>https://www.iee.ihu.gr/en/course/1998/</u> Recommended prerequisite courses: -Coordinator: Vasilis Kostoglou

### **Course Contents**

The course "Free Selection A" serves as a placeholder for courses successfully completed by department's students, which belong to third-party national or international (Erasmus) programs of study, following the approval of the home department's Study Program Committee or the Erasmus academic coordinator.

### A.10 10th Semester Courses

### 1999) Diploma Thesis

Semester: 10th / ECTS credits: 30 Category: Scientific Area – Skills Development (SA-SD) / Type: Compulsory (E) Knowledge area: -Teaching hours: -Web page: <u>https://www.iee.ihu.gr/en/course/1999/</u>

### Content

The Thesis is prepared by the students of the Department, under the supervision of a faculty member, during the 10th semester. The typical preparation period of Thesis is one semester. This duration is prohibited to be less than one semester, but may be extended, depending on the scope and the re-quirements of the subject up to two years. A subject may be assigned to a group of up to two students, with the work being appropriately distributed to each student. Right to undertake and prepare a Diploma Thesis have students who have reached 210 ECTS credits at least. The evaluation Diploma Theses takes place three times a year, after the February and September exam periods and before the June exam period, by an appropriate appointed committee of three faculty members.

The Thesis is an extensive document that includes: (a) summary, (b) theoretical framework of the topic and the relative achievements of science and technology, (c) detailed presentation of the methodology followed, (d) results certifying the correctness of the approach used and demonstrating the topic usefulness, (e) conclusions and (f) bibliography – references and optionally appendices with scripts, device specifications, etc.

The Diploma Thesis must include at least one of the following: Design and assembling of an electronic system, developing original software, using specific software in an application, developing software models, performing measurements.

Further information can be found in the Diploma Thesis Regulation.