SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY

DEPARTMENT OF INFORMATICS

UNDERGRADUATE STUDIES GUIDE

2026-2027

ATHENS, SEPTEMBER 2026

The Council of the Hellenic Quality Assurance and Accreditation Agency (HQA) has awarded the Department of Informatics with the accreditation of its undergraduate study program, for a duration of 4 years (from 17/07/2019 until 16/07/2024).

The accreditation was awarded after performing the relevant procedures ensuring the compliance of the undergraduate study program with the principles of the model quality undergraduate program of the HQA and the quality assurance principles of the European Higher Education Area (ESG).

The Accreditation Report is available here.

NB: THIS GUIDE IS THE ENGLISH TRANSLATION OF THE STUDENT GUIDE OF THE DEPARTMENT OF INFORMATICS OF AUEB. IN CASES WHERE THE TWO TEXTS DIFFER, THE GREEK VERSION APPLIES.

Contact Information

Department of Informatics

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AUEB

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Webpage: https://www.aueb.gr/ **Twitter:** https://twitter.com/aueb
Facebook: https://www.facebook.com/auebgreece **Email:** webmaster@aueb.gr

AUEB Administration

Rector: Professor Vasileios Vasdekis

Vice Rector for Academic Affairs and Staff: Professor Leonidas Doukakis

Vice Rector of Research and Lifelong Learning: Professor Georgia Siougle

Vice Rector of Financial Planning and Infrastructure: Associate Professor Anna Elena Galanaki

Vice Rector of International Cooperation and Development: Professor Athanasia (Nancy) Pouloudi

School of Information Sciences and Technology Administration

Dean: Professor Vasiliki Kalogeraki

School Secretary: Christos Sakellariou

Department of Informatics Administration

Department Chair: Professor Ioannis (Ion) Androutsopoulos

Director of Computer Systems and Communications Division: Professor George Papaioannou

Director of Information Systems and Database Systems Division:

Director of Applied Mathematics, Information System Economics and Operations Research Division: Professor Paraskevas Vassalos

Department Secretary: Christos Sakellariou

Academic Calendar

- **Winter semester:** October 5th, 2026, to January 15th, 2027
- **Christmas break:** December 24th, 2026, to January 6th, 2027
- **Winter semester examination period:** January 18th, 2027, to February 12th, 2027
- **Spring semester:** February 15th, 2027, to May 28th, 2027
- **Easter break:** April 26th, 2027, to May 9th, 2027
- **Spring semester examination period:** May 31st, 2027, to June 25th, 2027.

Official Holidays

- October 28th, 2026 (Celebration of the 28th of October 1940)
- November 17th, 2026 (Anniversary of 17th November uprising)
- January 6th, 2027 (Epiphany)
- March 15th, 2027 (Orthodox Ash Monday)
- March 25th, 2027 (Independence Day Celebration)
- May 1st, 2027 (Labor Day)
- June 21th, 2027 (Holy Spirit Monday, i.e., Orthodox Pentecost Monday)

Table of Contents

I. ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

The Athens University of Economics and Business (AUEB), as with all Greek higher education institutions, is a public entity overseen by the Ministry of Education, Research, and Religious Affairs. The organization and operation of AUEB follows applicable law, notably Law 4485/2017 (Greek Government Gazette 114/4-8-2017, Part A).

AUEB is the third oldest Greek university, and the first in the areas of economics and business administration. It was established in 1920 as the Grand School of Commerce Studies (Ανωτάτη Σχολή Εμπορικών Σπουδών), with the aim of providing university-level education in the fields of economics and business administration. It was renamed the Grand School of Economic and Commerce Studies (Ανωτάτη Σχολή Οικονομικών και Εμπορικών Επιστημών (Α.Σ.Ο.Ε.Ε.)) in 1926. Until 1955, the school was operating with a single-class, three-year curriculum. In 1955 the school converted to a four-year curriculum, with the fourth year's student body being divided into two departments, the Department of Economic Studies and the Department of Commercial Studies. In 1970 the division of the student body started to take place in the second year. In 1984, the school was divided in three Departments, the Department of Economic Studies, the Department of Business Organization and Administration, and the Department of Statistics and Informatics. In 1979 the first graduate program was inaugurated, in Economic Studies, while a corresponding program was initiated by the Department of Business Organization and Administration in 1985.

AUEB is a center of excellence in academic research and teaching and is being consistently ranked at the top, nationwide, and very highly, globally, in the areas it is active. Its reputation reflects, on one side, the high quality of its scientific personnel, the quality of its research and teaching activities, and its modern programs of studies, and, on the other hand, its outstanding graduates that are professionally active in Greece as well as abroad.

The organization and operation of the University is governed by current legislation. AUEB is under the supervision of the Ministry of Education, Religious Affairs and Sports. Its administrative bodies are, according to the current provisions of the law,

- the University Council,
- the Senate,
- the Rector,
- the Vice-Rectors, and
- the Executive Director.

Until the formation of the University Council, its powers are exercised by the Rector's Council.

AUEB is structured by academic units of two (2) levels: a) the Schools and b) the Departments

Schools

Each School is comprised of at least two departments, spans an area of related scientific disciplines and ensures the interdisciplinary approach to teaching and research between its departments. Each School is responsible for supervising and coordinating the operation of its departments and the educational and research work produced by them, in accordance with the Internal Operating Regulation.

AUEB is comprised of three Schools:

- The School of Economics, which supervises and coordinates the operation of the Department of International & European Economic Studies and the Department of Economics,
- The School of Business, which supervises and coordinates the operation of the Department of Management Science and Technology, the Department of Business Administration, the Department of Accounting and Finance, and the Department of Marketing and Communication.
- The School of Information Sciences and Technology, which supervises and coordinates the operation of the Department of Informatics and the Department of Statistics.

The governing bodies of each School, according to Law 4957/2022 (Government Gazette 141/21-7-2022 section A) are: a) the Dean and b) the Dean's Council.

Departments

Departments are the primary educational and academic units of the University. They are tasked with advancing science and technology in their respective fields and administer a curriculum that continuously keeps up with the latest developments. Department personnel comprises the faculty, the technical staff and the administrative staff.

The Departments of AUEB are the following:

- Department of International & European Economic Studies
- Department of Economics
- Department of Management Science and Technology
- Department of Business Administration
- Department of Accounting and Finance
- Department of Marketing and Communication
- Department of Informatics
- Department of Statistics

Each department's administration is conducted by a) the Department Assembly, b) the Department Board of Directors, c) the Department Chair, and d) The Department Vice-Chair.

Curricula and Focus Areas

Each department offers a corresponding curriculum, with includes a number of focus areas that provide specialization, as follows:

Department	**Focus Areas**
International and European Economic Studies	1) International Economics and Finance 2) International and European Political Economy
Economics	1) Economic Theory and Policy 2) Business Economics and Finance 3) International and European Economics
Management Science and Technology	1) Operations Research and Business Analytics 2) Operations and Supply Chain Management 3) Software and Data Analysis Technologies 4) Information Systems and Electronic Business 5) Strategy, Entrepreneurship, and Human Resources
Business Administration	1) Business Administration 2) Information Systems Administration 3) Accounting and Finance Administration 4) Marketing
Accounting and Finance	1) Accounting 2) Finance
Marketing and Communication	1) International Management, Innovation and Entrepreneurship 2) Human Resource Management 3) Business Analytics 4) Digital Marketing
Informatics	1) Data Science and Machine Learning 2) Operations Research 3) Applied Mathematics 4) Theoretical Computer Science

	5) Systems and Networks 6) Software Systems 7) Data and Knowledge Management 8) Cybersecurity
Statistics (jointly with the Department of Informatics)	1) Data Science 2) Operations Research 3) Applied Mathematics

Exceptionally, the Department of Statistics and the Department of Informatics offer, instead of Focus Areas, the optional Course Modules listed above. Detailed information on the study programs of the Departments is provided in the respective study guides and websites.

Personnel

AUEB personnel is divided in academic personnel and administrative personnel.

The **academic personnel** is comprised of the following categories:

- Members of the Teaching and Research Staff (Μέλη ΔΕΠ), who have the primary responsibility for the courses and research activities of the University, and include: (a) First-level Professors, (b) Associate Professors, and (c) Assistant Professors.
- Professors Emeriti
- Visiting Professors, who help fulfill the educational and research needs of the Department, are Greek or foreign scientists and hold a Professorship or a Researcher position in a foreign institution or possess the minimum qualifications required for election to the position of Assistant Professor or Third-level Researcher.
- Special Educational Personnel (Μέλη Ε.Ε.Π.)
- Members of Laboratory Teaching Staff (Μέλη Ε.Δ.Ι.Π.), who carry out laboratory/applied teaching work.
- Members of the Special Technical Laboratory Staff (Μέλη Ε.Τ.Ε.Π.), who support the infrastructure needed to the general operation of the Department and offer specialized technical laboratory services for the better execution of the Department's educational, research, and applied work.
- Scientific Associates
- University Scholars
- Scientific staff
- Contracted Lecturers, with a fixed-term contract, who cover the teaching needs of one or more undergraduate study programs of the Department in a specific subject.
- Lecturers on temporary leave from Secondary Education.
- Doctoral Candidates (Ph.D. Candidates), who are doing doctoral studies with the aim of obtaining a Doctoral Diploma and offer auxiliary research, laboratory, and teaching work.

The **administrative personnel** supports the faculty and the students by providing administrative support to students and the rest of the personnel as well as a variety of services (housing, library and sports facilities, etc.)

Services

AUEB provides both administrative and other services (provisioning of food and housing, library services, sports facilities, etc.) with the aim of serving its students as well as the staff. More information about the organization and operation of the institution's services can be found on the institution's main website (http://www.aueb.gr).

Structure of Studies

Undergraduate studies in the departments of AUEB are organized in a system of semester-long courses, according to the Undergraduate Curriculum drawn up by the Department Assembly of each department. The academic year starts on the 1st of September and ends on the 31st of the following August. Academic activities are organized in two semesters, the winter semester and the spring semester. The duration of undergraduate studies is four years (eight semesters). Semesters last 13 weeks each, and are interrupted by the Christmas and Easter breaks. At the end of each semester there is an examination period lasting 4 weeks. At the completion of the June examination period and until the end of the academic year, no classes take place. There is also a summer

examination period, starting at the last week of August and finishing right before the start of the winter semester. Precise dates for the start and end of semesters and examination periods are drafted by the Studies Unit, ratified by the Senate, and announced in the academic calendar of the university.

Enrollment Process

Entrance in the department is achieved primarily though the Panhellenic entrance examinations. The enrollment of persons that have succeeded in these examinations takes place each September through the electronic enrollment information system of the Ministry of Education, Research, and Religious Affairs.

Primary Regulations

The operations of AUEB are governed by numerous regulations, the most important of which are (all currently available only in Greek):

- Internal Regulation of AUEB
- Postgraduate and Doctoral Studies Guide.
- Internal Control Unit Regulation
- Model Internal Regulation for University Laboratories.
- Internal Regulation of the Vocational Studies and Lifelong Learning Center of AUEB
- Internal Regulation of the Teaching and Learning Support Center of AUEB
- Internships Regulation of AUEB
- Internal Regulation of the Technology Transfer and Innovation Center of AUEB
- Summer Schools Regulation of AUEB

University ECTS Coordinator

The ECTS Coordinator of the University is, ex officio, the chair of the Quality Assurance Unit (Μονάδας Διασφάλισης Ποιότητας - ΜΟΔΙΠ). The Coordinator ensures the compliance of the University with the principles and rules of the European Credit Transfer and Accumulation System (ECTS), oversees the adherence to and application of these principles and rules, and is responsible for ensuring the smooth process of ECTS unit transfer and accumulation.

II. SCHOOL OF INFORMATION SCIENCES AND TECHNOLOGY

The Department of Informatics, along with the Department of Statistics, belongs to the School of Information Sciences and Technology, which was founded in 2013. Following the trend of convergence seen in major universities in the USA and Europe, the School brings together these two Departments with the aim of promoting their interaction and collaboration, offering the greatest possible benefits to students in a dynamic research environment. The activities of the School focus on the triptych: education, research, and contribution to society.

In terms of education, the goal is to create professionals in Information Technology and Statistics with full professional competence and training that enables them to keep up with the ongoing rapid technological advancements. The undergraduate programs combine a solid knowledge background with personalized specialization options. The graduate programs offer in-depth study in selected high-demand areas. Regular updates of the study programs every two to three years ensure the relevance of the scientific knowledge provided, while the selection of general thematic areas based on their timeless value and methodological depth provides durability to the degrees over time.

Graduates are quickly absorbed into the job market, both in Greece and abroad, often as high-ranking executives in companies, banks, and organizations, while many have established their own businesses. The dynamism in education is linked to the research carried out at the School in cutting-edge fields, with extensive international collaborations, competitive funding, a high degree of international recognition, awards, distinctions, and patents.

Aiming to continuously participate in international developments and to distinguish the academic staff, students, and graduates, the School of Information Sciences and Technology aims for multidimensional excellence that significantly contributes to progress in general.

III. DEPARTMENT OF INFORMATICS

Informatics, or Computer Science, is the science of information processing via the use of computers. The Department of Informatics is one of the most dynamic departments within Greece and offers a four-year program of study covering the full spectrum of Informatics, according to the standards set by international scientific associations of Informatics, as well as its applications and extensions in Economics and Business Administration. For this reason, the Department trains scientists capable of contributing substantially and having leadership roles (as shown also by the track record of our graduates) in the development of Information and Communication Technologies and their applications in various sectors of economic and social activity.

Information technologies are already applied extensively to economic and commercial activities, to the successful operation of banks, industries, transportation, mobile communications, medicine, education, to the creation and distribution of films, video games, and other services via the Web, and to various other technology areas. Immediately after completing their studies, our graduates face several opportunities for a successful career, including, among others, in the Greek and international IT industry, in the IT departments of corporations, in consulting firms, in the management and finance sectors, in education, etc. Finally, our graduates often pursue postgraduate or doctoral studies in Greece or abroad, followed by a research or academic career.

The Department of Informatics places emphasis, on the one hand, on teaching the fundamentals, so that students are able to follow the rapid technological and scientific developments of the field, and, on the other hand, on familiarizing students with the cutting edge of the various applied fields of Informatics. In addition, through the coursework and the intensive practice through assignments and lab sessions, the students develop practical skills and the ability to cope with complex problems on a real scale. The curriculum, which is being updated on a permanent basis, includes five groups of courses:

- Courses on the core of Informatics, with basic courses that cover all its major areas (programming, algorithms, computer organization, databases, networks, software Engineering, etc).
- Courses on mathematical background.
- Courses on economics and management science.
- Specialization courses on areas of intense scientific activity, and of high value in the job market, organized in eight modules
- Free Electives, mostly from other departments of the university.

Additionally, part of the degree requirements is the knowledge of a foreign language at an excellent level. Apart from the courses, the curriculum also includes optionally carrying out a senior thesis, as well as an internship in a relevant company or organization. Therefore, each student has the opportunity to create a personalized, to a certain extent, course profile.

The Department of Informatics owes its dynamism and prestige to the capabilities, scientific standing and international recognition of its faculty, many of whom have worked as professors or researchers at universities and research centers in the US and Europe. The department forms a center of research activity with significant contributions, according to international standards, in many scientific areas. Numerous funded research projects, as well as developmental projects and projects aimed at the transfer of expertise, are being run, resulting in large numbers of scientific publications. These activities involve, in an active and decisive role, the Ph.D. candidates of the department.

Finally, the department offers five M.Sc. programs of high demand in cutting-edge sectors: the M.Sc. program in Information Systems, the M.Sc. program in Computer Science, the M.Sc. program in Data Science, the M.Sc. program in Digital Methods for Humanities and the M.Sc. program (jointly with the National and Kapodistrian University of Athens) in Business Mathematics.

With these features, the Department of Informatics at AUEB is one of the best choices for studies within the dynamically evolving field of information sciences and technology.

IV. INFRASTRUCTURE AND SERVICES

Computer Center

The Computer Center of AUEB is responsible for providing infrastructure computing across the university for educational and research purposes.

The main information systems of the Computer Center are based on a cluster of servers with hard disks of sufficient and continuously increasing capacity. These servers, among other things, perform user identification, so as to ensure controlled access to the resources of the Center, are used as file servers for users to store their files, help in the automated reinstallation of software on the computers of the Center's Laboratories, and also control and prevent infestation with malware. All servers are connected to a high-speed network and are accessible from anywhere in the University.

The Computer Center has three classrooms for teaching and practice purposes, available to all students from all departments. These computers work in a Windows environment with a centralized management of users' accounts and resources. The computers have access to the main systems of the computer center, the university's e-mail system, and the Internet. To cater to the students' printing needs, the Computer Center has two main high-speed laser printers, as well as three more laser printers (one in each room).

All members of the academic community of the university, i.e., undergraduate and graduate students, faculty members, and university employees, can have access to the resources of the Computer Center. Interested parties are enrolled electronically in the services of the Computer Center and the University via the URegister service. Students can request password reminders electronically without having physical access to the Computer Center. For students who have a laptop and are located close to the Computer Center, access is possible via the private wireless network hosted by the Center. In addition to the direct access to the resources of the Computer Center, through the classrooms, it is also possible to use the central systems and the e-mail service via the Internet, 24 hours a day.

Network Operations Center

The Network Operations Center (NOC) of AUEB is responsible for the network infrastructure of the entire university, regarding both voice and data services. NOC monitors, maintains, and coordinates all university networks. It also hosts the servers of most university services and the network security software.

A backbone fiber optic network of Gigabit Ethernet technology operates in all university buildings. The main buildings of the university are connected to the backbone network through the university's fiber optic ring, while some auxiliary buildings are connected via a wireless link. In all university buildings, there is horizontal (in-floor) and vertical (inter-floor) structured voice and data cabling that connects offices and Laboratories with the backbone network at speeds of 100 or 1000 Mbps. The University provides wireless broadband access to the network from the classrooms and common areas of all buildings.

The university is connected to the Internet through the Greek Research Network with Gigabit Ethernet optical fibers. Through the access and backbone network, all users have access to the Internet at extremely high speeds.

Finally, through the international Eduroam system, all university users can connect to the wireless networks of hundreds of educational and research institutions around the world. Vice versa, users from these institutions can connect to the university's wireless network.

Informatics Training Laboratories

Apart from the computing support provided by the Computing Center and the Network Operation Center to the entire University, the Department of Informatics provides additional computing infrastructure to its members, due to their increased needs in teaching, practical training, and research. The Department has four Informatics Training Laboratories: CSLAB I, on the second floor of the Derigny wing, CSLAB II, on the third floor of the Derigny wing, and GradCSLAB, on the second floor of the Evelpidon building. Access to CSLAB I and II is restricted to the undergraduate students, instructors, and laboratory staff of the Department of Informatics. GradCSLAB is used by the students and instructors of the MSc programs of the Department of Informatics.

CSLaboratories I and II provide 57 and 43 workstations, respectively, while GradCSLAB provides 24 workstations. The workstations are supported by a cluster of servers with multiple processors, and disks in RAID arrays. The servers provide central file storage, printing services, access to software development applications and database management systems, as well as centralized

management of accounts and resources. The servers and workstations run Windows and/or Linux. They are connected to each other and with the University's backbone via a Gigabit Ethernet network. All the Laboratories are equipped with laser printers for the use of the Department's students.

The users of the Informatics Training Laboratories have access to all the services provided by the University, as well as to the more specialized services provided locally by the servers of the Laboratories. To gain access to the Laboratories, students simply need to confirm their identities and their affiliations with the Department of Informatics. The same credentials are used to access all the workstations and servers of the Informatics Training Laboratories.

Research Laboratories of the Department of Informatics

Apart from the Informatics Training Laboratories, the Department of Informatics also has the following five Research Laboratories, which support the Department's research:

- Computer and Communications Systems Laboratory,
- Information Systems and Databases Laboratory,
- Theory, Economics and Systems Laboratory,
- Information Processing Laboratory,
- Mobile Multimedia Laboratory.

The five Research Laboratories cover most of the Department's research areas that require specialized infrastructure. Access to these Laboratories is granted to graduate and undergraduate students working on research projects related to the fields of the corresponding Laboratories.

Each Research Lab is directed by a faculty member of the Department of Informatics and is staffed by faculty members, specialized technical personnel, PhD students, MSc students and undergraduates, all involved in the research of the lab. For undergraduate students, the Research Laboratories provide an opportunity to get involved in research, either in the context of advanced courses or during their senior theses. The Research Laboratories are mainly funded by Greek and international research programs they participate in.

e-Learning and Lifelong Learning

Following an initiative of the Department of Informatics, and in cooperation with the Network Operation Center, the asynchronous e-Learning system e-Class (https://eclass.aueb.gr) is in operation at the University. Using e-Class, instructors distribute to students material related to their courses, such as notes, presentations, exercises, and announcements, while students can submit their assignments in electronic form. e-Class is used in almost all of the courses of the Department of Informatics to facilitate the communication between students and instructors.

AUEB has a distant teaching and teleconferences classroom, which can be used to record and broadcast video and sound over the Internet. This functionality is being extended to other classrooms of the University, to enable recording and live broadcasting of lectures and other events via Internet.

Members of the Department of Informatics also participate in e-Learning and lifelong learning programs organized by the University's Center for Continuing Education and Lifelong Learning (see https://elearning.aueb.gr/ and http://dz.aueb.gr/).

AUEB Research Center

The Research Center of AUEB (http://www.rc.aueb.gr/), one of the oldest of its kind in Greece, promotes the University's research and connects it to the Greek and international research and professional communities. Under the scientific guidance of the University's faculty members, the Center carries out research projects, both purely scientific and applied, funded by national and international sources, such as the European Union. Graduate and undergraduate students may also participate in the Center's projects. The Center also supports the faculty's research and organizes seminars and conferences. Through the Research Center, the members of the Department of Informatics participate in numerous national and international projects, which promote the Department's research and disseminate its results.

All forms of external funding towards the University are managed by the Research Center, which is accountable to the Senate. The Research Center retains part of the cost of the projects it manages, to cover its operational costs and support the University.

Careers Office

The main goal of the Careers Office (https://www.career.aueb.gr/) is to help the students and alumni of AUEB find jobs and offer them guidance for graduate studies.

The Careers Office assists the students and alumni in their first steps towards finding jobs by (a) informing them about job openings and forwarding resumes to cooperating companies and organizations, (b) organizing Career Days, where interested students and alumni have the opportunity to meet and discuss employment opportunities with representatives of companies and other organizations, (c) organizing seminars about the process of job interviews, as well as presentations of job market trends, (d) providing printed and electronic material with guidelines about writing resumes and cover letters, as well as advice for job interviews, (e) offering to students and alumni the opportunity to discuss with expert advisors issues related to their careers or education, and to use specialized psychometric tests.

The Office also provides extensive information about AUEB's undergraduate and graduate programs of studies, other graduate programs in Greece and abroad, scholarships and endowments, as well as companies active in Greece. It publishes informative leaflets, it organizes informative events as well as regular visits of high school students to the premises of the University, and it maintains a database with information about alumni employment and job openings, which provides a view of supply and demand in the job markets. The Office also cooperates with AUEB's Center for Entrepreneurship and Innovation (https://acein.aueb.gr/).

V. DEPARTMENT PERSONNEL

V.1. Faculty[1]

George Amanatidis, Assistant Professor

Diploma in Applied Mathematics and Natural Sciences, NTUA.
MSc in Mathematics, Georgia Institute of Technology.
PhD in Informatics, University of Edinburgh, UK.

Ioannis (Ion) Androutsopoulos, Full Professor

Diploma in Electrical Engineering, National Technical University of Athens.
MSc in Information Technology / Knowledge - Based Systems, University of Edinburgh, UK.
PhD in Artificial Intelligence, University of Edinburgh, UK.

Vasileios Apidopoulos, Assistant Professor

B.Sc. in Mathematics, Aristotle University of Thessaloniki
MSc in Theoretical and Applied Mathematics, Universit´e-Claude Bernard Lyon 1-Ecole Normale Sup´erieure de Lyon, France
PhD in Applied Mathematics, Institut de Math´ematiques de Bordeaux, Universit´e de Bordeaux, France

Andreas Alexandros Vassilakis, Assistant Professor

B.Sc. in Informatics, University of Ioannina.
M.Sc. in Informatics, University of Ioannina.
Ph.D. in Informatics, University of Ioannina.

Vasilios Vassalos, Full Professor (in leave of absence)

Diploma in Electrical Engineering, National Technical University of Athens.
MSc in Computer Science, Stanford University, USA.
PhD in Computer Science, Stanford University, USA.

Paraskevas Vassalos, Full Professor

B.Sc. in Mathematics, University of Ioannina.
M.Sc. in Computational Mathematics and Informatics, University of Ioannina
Ph.D. in Mathematics, University of Ioannina.

Spyridon Voulgaris, Assistant Professor

Diploma in Computer Engineering and Informatics, University of Patras
M.Sc. in Computer Science, University of Michigan, USA.
Ph.D. in Computer Science, Vrije Universiteit Amsterdam, Netherlands

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[1] Acronyms:
BA: Bachelor of Arts, BSc: Bachelor of Science, MA: Master of Arts. MBA: Master in Business Administration
MPhil: Master of Philosophy MSc: Master of Science PhD: Doctor of Philosophy ScD: Doctor of Science

Antonios Dimakis, Assistant Professor

B.Sc. in Computer Science, University of Crete.
MSc in Computer Science, University of Crete.
PhD in Electrical Engineering and Computer Sciences, University of California, Berkeley, USA.

Vasiliki Kalogeraki, Full Professor

B.Sc. in Computer Science, University of Crete.
M.Sc.in Computer Science, University of Crete.
PhD in Electrical and Computer Engineering, University of California, Santa Barbara, USA.

Iordanis Koutsopoulos, Full Professor

Diploma in Electrical and Computer Engineering, National Technical University of Athens.
MSc in Electrical and Computer Engineering, University of Maryland, USA.
PhD in Electrical and Computer Engineering, University of Maryland, USA.

Ioannis Kotidis, Full Professor

Diploma in Electrical and Computer Engineering, National Technical University of Athens.
MSc in Computer Science, University of Maryland, USA.
PhD in Computer Science, University of Maryland, USA.

Ioannis Marias, Assistant Professor (in leave of absence)

Diploma in Computer Engineering and Informatics, University of Patras.
Ph.D. in Informatics and Telecommunications, National and Kapodistrian University of Athens.

Evangelos Markakis, Full Professor

Diploma in Electrical Engineering, National Technical University of Athens.
MSc in Computer Science, Georgia Institute of Technology, USA.
PhD in Computer Science, Georgia Institute of Technology, USA.

Georgios Xylomenos, Full Professor

B.Sc. in Applied Informatics, AUEB.
MSc in Computer Science, University of California, San Diego (UCSD), USA.
PhD in Computer Science, University of California, San Diego (UCSD), USA.

Georgios Papaioannou, Full Professor

B.Sc. in Informatics, National and Kapodistrian University of Athens.
Ph.D. in Informatics, National and Kapodistrian University of Athens.

Ioannis (John) Pavlopoulos, Assistant Professor

Diploma in Applied Mathematics and Natural Sciences, NTUA.
MSc in Artificial Intelligence, University of Edinburgh
Ph.D. in Informatics, AUEB.

Alkmini Sgouritsa, Assistant Professor

Diploma in Electrical Engineering, National Technical University of Athens.
MSc in Computer Science, University of Edinburgh, UK.
PhD in Computer Science, University of Liverpool, UK.

Georgios Stamoulis, Full Professor

Diploma in Electrical Engineering, National Technical University of Athens.
MSc in Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT), USA.
PhD in Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT), USA.

Stafylakis Themos, Associate Professor

Diploma in Electrical Engineering, National Technical University of Athens.
M.Sc. in Communications and Signal Processing, Imperial College London, U.K.
PhD in Electrical and Computer Engineering, National Technical University of Athens

Vasilios Siris, Full Professor

B.Sc. in Physics, National and Kapodistrian University of Athens.
MSc in Computer Science, Northeastern University, USA.
Ph.D. in Computer Science, University of Crete.

George Stergiopoulos, Assistant Professor

B.Sc. in Computer Science, University of Piraeus
M.Sc. in Information Systems, AUEB
Ph.D. in Informatics, AUEB

Stavros Toumpis, Associate Professor

Diploma in Electrical Engineering, National Technical University of Athens
MSc in Mathematics, Stanford University, USA.
MSc in Electrical Engineering, Stanford University, USA.
PhD in Electrical Engineering, Stanford University, USA.

Evgenia Foustoukou, Assistant Professor

Maîtrise de Mathématiques, Université Paris 7, France.
Etudes de Philosophie, niveau licence, Université Paris 1 (Sorbonne), France.
DEA d'Informatique Fondamentale, Université Paris 7, France.
Doctorat en Informatique, Université Paris 11 (Orsay), France.

V.2. Professors Emeriti

- Theodoros Apostolopoulos
- Emmanuel Yannakoudakis
- Sofia Dimeli
- Theodoros Kalamboukis
- Evangelos Kiountouzis
- Panagiotis Konstantopoulos
- Elias Lipitakis
- Evangelos Mageirou
- Panagiotis Papakiriazis
- Elias Flytzanis

V.3. Retired/Resigned Faculty Members

- Michael Vazirgiannis
- Andreas Veneris
- Emmanouil Giakoumakis
- Dimitrios Gkritzalis
- Panagiotis Katerinis
- Ioannis Kontogiannis
- Constantinos Courcoubetis
- Malevris Nikolaos
- George Polyzos
- Martha Sideri
- Michail Titsias

V.4. Departed Faculty Members

- Dimopoulou Maria
- Cavouras Ioannis
- Milis Ioannis
- Mytilineos Michail

V.5. Laboratory Teaching Staff

Athanasios Androutsos

B.Sc. in Informatics, AUEB.
M.Sc. in Information Systems, AUEB.
Ph.D. in Informatics, AUEB.

Iordanis Evaggelou

B.Sc. in Informatics, AUEB.
M.Sc. in Computer Science, AUEB.
Ph.D. in Informatics, AUEB.

Christos Kallergis

B.Sc. in Informatics, AUEB.

Chrysostomos Kapetis

B.Sc. in Informatics, AUEB.
Ph.D. in Informatics, AUEB.

Anna Kefala

B.Sc. in Informatics, AUEB.

M.Sc. in Information Systems, AUEB.
Ph.D. in Informatics, AUEB.

Aggeliki Koutsimpela

Diploma in Applied Mathematics and Natural Sciences, NTUA

M.Sc. in Data Science, AUEB.
Ph.D. in Mathematics, NTUA.

Antonia Kyriakopoulou

B.Sc. in Informatics, AUEB.
M.Sc. in Information Systems, AUEB.
Ph.D. in Informatics, AUEB.

Vasiliki Brinia

B.Sc. in Business Administration, Technological Educational Institute of Athens.
B.Sc. in Business Administration, AUEB.
M.B.A. in Business Administration, AUEB.
Ph.D. in Education, National and Kapodistrian University of Athens.

Aikaterini Papakonstantinopoulou

B.Sc. in Informatics and Telecommunications, National and Kapodistrian University of Athens.
M.Sc. in Advanced Information Systems, National and Kapodistrian University of Athens.
Ph.D. in Computer Science, National and Kapodistrian University of Athens.

Spilios Spiliopoulos

B.Sc. in Informatics, AUEB.
M.Sc. in Decision Sciences, AUEB.

Maria Togatzi

B.Sc. in Mathematics, National and Kapodistrian University of Athens.

V.6. Special Technical Laboratory Staff

Konstantinos Vitsios

B.Sc. in Informatics, AUEB

Adamantios Dontas

B.Sc. in Informatics, University of Piraeus.

Panagiotis Pantouvanos

B.Sc. in Electrical Engineering, Patras University of Applied Sciences.

Irene Ramoundou

BSc in Applied Informatics and Multimedia Engineering, Technical Technology Institute of Crete

Ioannis Sazonof

B.Sc. in Informatics, National and Kapodistrian University of Athens.

V.7. Administrative Personnel

Markos Gad (Deputy Department Secretary)

Maîtrise in Modern Letters (French Literature) Rennes University II (Haute Bretagne).

Evangelos Kotrozos

Computer Programming School graduate
Sound Engineer (Panavision) studies

Vasiliki Milonaki

BSc in German Literature and Language, University of Athens
MSc in international and European Studies, University of Piraeus
MA, Film Studies, Queen Mary University of London

Christos Sakellariou (Department and School Secretary)

B.Sc. in Modern Foreign Languages and Literatures, La Sapienza University, Rome.

VI. DEPARTMENT DIVISIONS

Since 2003, the Department of Informatics is organized in three Divisions. Each member of the personnel and each Research Laboratory belongs to one of these Divisions. Divisions bring together members of the faculty that are active in a group of related scientific areas. The organization of the Department in Divisions is primarily of an administrative nature and is not reflected in a strict partition of the scientific areas of the Department or the curriculum. In the following, the scientific areas of the Divisions as well as their personnel and Research Laboratories are described in detail.

VI.1. Computer Systems and Communications Division

Personnel

Andreas A. Vasilakis, Assistant Professor

Spyridon Voulgaris, Assistant Professor

Vasiliki Kalogeraki, Full Professor

Iordanis Koutsopoulos, Full Professor

Evangelos Markakis, Professor

Georgios Xylomenos, Full Professor

George Papaioannou, Associate Professor

Alkmini Sgouritsa, Assistant Professor

Georgios Stamoulis, Full Professor

Vasilios Siris, Full Professor

Athanasios Androutsos, Laboratory Teaching Staff

Christos Kalergis, Laboratory Teaching Staff

Anna Kefala, Laboratory Teaching Staff

Katia Papakonstantinopoulou, Laboratory Teaching Staff

Spilios Spiliopoulos, Laboratory Teaching Staff

Maria Togatzi, Member of the Laboratory Teaching Staff

Panagiotis Pantouvanos, Special Technical Laboratory Staff

Ioannis Sazonof, Special Technical Laboratory Staff

Konstantinos Vitsios, Special Technical Laboratory Staff

Adamantios Dontas, Special Technical Laboratory Staff

Irene Ramoundou, Special Technical Laboratory Staff

Laboratories

Computer and Communication Systems Laboratory

Mobile Multimedia Laboratory

Scientific Areas

Foundations of Computer Science, Data Structures, Algorithm Design and Analysis, Computational Complexity, Theory of Computation and Programming Languages, Programming Languages, Compilers.

Operating Systems, Distributed Systems, Computer System Architectures, Parallel Processing Technology, Graphics and Computer Interfaces.

Computer Networks and the Internet, Data Transmission, Telecommunications, Mobile Communications, Multimedia Systems, System Administration, Quality of Service, Performance Evaluation of Networks and Systems, Business Models, Ubiquitous Computing.

VI.2. Information Systems and Database Systems Division

Personnel

Ion (Ioannis) Androutsopoulos, Full Professor

Vassalos Vasilios, Full Professor

Ioannis Kotidis, Full Professor

Ioannis Marias, Assistant Professor

Ioannis (John) Pavlopoulos, Assistant Professor

Themos Stafylakis, Associate Professor

Georgios Stergiopoulos, Assistant Professor

Chrysostomos Kapetis, Laboratory Teaching Staff

Antonia Kiriakopoulou, Laboratory Teaching Staff

Research Laboratories

Information Systems and Databases Laboratory

Information Processing Laboratory

Scientific Areas

Analysis and Design of Information Systems, Information Systems Applications Development, Security of Information and Communication Systems, Open and Agile Automation, Tools for implementing Information Systems.

Software Engineering, Testing, and Software Reliability.

Databases, Database languages, Conceptual, Logical and Physical Database Modeling, Normalization, View Management, Database Design, Document Coding, Multilingual Models and Interfaces.

Processing of Semi-structured Data, Processing of Information and Data from the Web, Peer-to-Peer Systems, Web Services. Representation and organization of knowledge, conceptual modeling.

Data Mining from Databases, Ambiguity Resolution, Non-traditional Databases (Multimedia, Spatiotemporal), Pattern Bases.

Human-Computer Interaction Systems, Artificial Intelligence, Natural Language Processing, Storage and Retrieval of Information, Ubiquitous Computing.

Education and Distance-Learning Technologies, Application Development in Multimedia and Virtual Reality Environments in Education and Vocational Education, Development of Educational Material and IT applications for Specialized User Groups, Multimedia Synchronization, Interactivity and Virtual Reality Scenarios.

VI.3. Applied Mathematics, Information System Economics and Operations Research Division

Personnel

George Amanatidis, Assistant Professor

Vasilios Apidopoulos, Assistant Professor

Paraskevas Vassalos, Full Professor

Antonios Dimakis, Assistant Professor

Stavros Toumpis, Associate Professor

Evgenia Foustoukou, Assistant Professor

Maria Papatheodorou, Member of the Special Technical Laboratory Staff

Research Laboratories

Theory, Economics and Systems Laboratory

Scientific Areas

Applied Mathematics (especially Analysis, Algebra, and Probability Theory), Logic, Discrete Mathematics (especially Combinatorics and Graph Theory), Mathematical Theory of Algorithms and Complexity, Mathematical Theory of Information.

Computational Mathematics (especially Numerical Analysis, numerical methods and algorithmic techniques) Parallel Algorithms, Mathematical Software, Scientific Calculations and Implementations, High-Performance Computing and applications.

Mathematics of Financial, Commercial, and Actuarial applications.

Economics of Informatics (especially the financial and commercial evaluation of IT projects). Social, administrative, and financial effects of Informatics projects

Operations Research (especially Optimization in Deterministic and Probabilistic Systems), Decision Theory and Games, System Simulation.

Econometric models, Projections, implementations and applications.

VII. UNDERGRADUATE STUDIES

VII.1. Introduction and General Information

Basic Principles of the Curriculum

The aim of the undergraduate studies at the Department of Informatics is to produce computer scientists with the skills necessary for enabling them to make significant contributions to the development of computing technologies and to become active in all areas of economic and social activity and capable of coping with the rapid technological and scientific developments in the field.

The basic principle of the program is the belief that in order to achieve significant contributions in the field of Informatics it is necessary both to obtain an in-depth knowledge of its core theory and learn also about its various application domains. Thus, a student of the Department must attend, besides courses in Computer Science, also courses in Economics, Administrative Science and Operations Research. This variety of courses gives a special character to the studies provided by the Department.

Learning Outcomes of the Undergraduate Study Program

The curriculum was developed considering similar curricula of Greek and foreign universities, as well as the curricula advocated by pertinent scientific bodies, such as the Association for Computing Machinery (ACM), the British Computer Society, and the Institute for Electrical and Electronic Engineers (IEEE). Besides a thorough education in Informatics, the curriculum of the Department also aims at familiarizing students with Informatics applications to other sciences and fields.

Therefore, upon graduating, students of the Department will be able to:

- Apply suitable, scientifically sound algorithmic, mathematical, and scientific processes and methods in order to solve problems arising in Informatics
- Analyze and compare alternative ways of handling scientific or technical problems.
- Solve problems requiring specialized technical knowledge in at least two of the following areas:
    - Theoretical Computer Science
    - Computer Systems and Networks
    - Information Systems and Information Security
    - Databases and Knowledge Management
    - Operations Research and Economics of Information Technology
    - Computational Mathematics και Scientific Calculations
- Function effectively as members of teams working towards the analysis, design and implementation of IT projects.
- Understand the broader applications of Computer Science in other disciplines studied in the AUEB (Administration, Economics, Accounting, Statistics, Marketing and Communication, etc.).
- Understand the social, ethical and cultural implications stemming from computer technology and its widespread use.
- Understand the current open scientific, technological, and research issues of Information Technology and be able to partake in the ongoing scientific research addressing them.
- Be able to present concepts and results of IT methods to a specialized scientific or technically trained audience, either orally or in writing.

Duration of Studies and Distribution of Courses in Semesters

The normal duration of studies is 8 semesters, and each course is included in one of them. Although the distribution of courses in semesters is indicative, it corresponds to the conditions of normal study, as well as to the sequence of knowledge obtained in various courses. It is recommended that students take the courses by following the suggested sequence. In this manner, burden is equally distributed over the semesters and conflicts between courses in the timetable are avoided. Each of the offered courses corresponds to a number of ECTS (European Credit Transfer) units. The ECTS units awarded upon the completion of a course that is offered by another department are those allocated to the course by that department.

Course Levels

The undergraduate program courses are organized in 4 **course levels**.

All students must first complete 22 **compulsory core courses** (Level 1) that cover an extensive, but necessary, background, common for all students. Compulsory core courses are divided in 12 Informatics courses, 5 Mathematics courses, and 2 courses in Economics and Business Administration. Compulsory core courses comprise all first- and second-year courses as well as 4 out of the 8 courses of the third year (5th and 6th semesters). Those courses appear in the table of the following pages colored in cyan, and denoted with "CC".

During the third year of their studies, students elect a minimum of 4 out of 10 **elective core** courses. Each of these courses has 7 ECTS units. These courses appear in the table of the following pages in yellow, and denoted with "EC".

During the fourth year of their studies, students elect a number of **elective courses** (Level 3). Elective courses are those that appear in the table of the following pages in green and denoted by "E", as well as canceled department courses that were part of the program curriculum in the past; the latter courses do not appear in the table. Apart from courses offered regularly, the Department offers, on occasion, "Special Topics" courses in areas of ongoing scientific interest. Such courses are classified as elective courses.

Finally, in the fourth year of their studies, students may elect up to 24 ECTS units of **free elective courses** (level 4).

The aforementioned years for course selection are not mandatory. Each course can be taken in any semester of study, as long as the prerequisites are met. Detailed information about the department's courses is provided in the subsequent sections of the study guide. In particular, more information on free elective courses can be found in Section VII.2, on graduate requirements in Chapter VIII, and on the descriptions of individual courses in Chapter IX.

Prerequisite Courses

All students, regardless of their year of admission, must have successfully completed one of the prerequisite courses listed for each course in the course table on the following pages in a previous semester to enroll in a course. First-year courses, some courses offered by other departments, and the courses "Logic" and "Investment Evaluation with Applications in Informatics" have no prerequisite courses.

Course Modules

Elective core courses and elective courses are organized in **course modules**. Provided a student completes a sufficient number of courses of a module, that module is **completed** and noted in the student's transcripts and diploma supplement awarded at graduation. Completing a module is not required for graduation. The modules are as follows:

1. **Data Science and Machine Learning**
2. **Operations Research**
3. **Applied Mathematics**
4. **Theoretical Computer Science**
5. **Systems and Networks**
6. **Software Systems**
7. **Data and Knowledge Management**
8. **Cybersecurity**

The following rules apply to modules:

Number of courses: Each module comprises 7 to 9 courses.

Module completion: To complete a module, a student must take at least 5 of the courses in that module. A course cannot be used for completing more that one module.

Optional completion: Completing a module is optional; students may enroll to as many courses, and complete as many modules, as they wish. Provided a student completes a module, the module is noted in his transcripts.

Special Topics: Special Topics courses are placed in modules by a decision of the Department Assembly. The thesis course is placed on a module by a decision of the thesis advisor.

TABLE OF LEVEL 1,2,3 COURSES

Semester	Code	Course title [abbreviation, if used in prerequisites]	LEVEL	ECTS	1. Data Science and ML	2. EOperations Research	3. Applied Mathematics	4. Theoretical Computer Science	5. Systems and Networks	6. Software Systems	Data and Knowledge Managem.	8. Cybersecurity	Prerequisite Courses
1	3117	Discrete Mathematics	CC	6									
1	3135	Introduction to Computer Science [ICS]	CC	6									
1	3151	Introduction to Economics	CC	6									
1	3125	Introduction to Computer Programming [PYTHON]	CC	6									
1	3119	Mathematics I	CC	6									
2	3254	Introduction to Management	CC	6									
2	3214	Mathematics II	CC	6									
2	3311	Probability	CC	6									
2	3222	Computer Programming in JAVA [JAVA]	CC	6									
2	3262	Digital System Design	CC	6									
3	3335	Data Structures [ΔΔ]	CC	7									PYTHON, JAVA
3	3365	Computer Systems Organization [CSO]	CC	7									ICS, Digital Systems Design
3	3321	Computer Programming in C++ [C++]	CC	8									PYTHON, JAVA
3	3230	Computational Mathematics	CC	8									Mathematics I, PYTHON
4	3432	Algorithms	CC	7									PYTHON, JAVA, Discrete Math
4	3434	Theory of Computation	CC	7									Discrete Math
4	3436	Databases [ΒΔ]	CC	8									PYTHON, JAVA
4	3464	Operating Systems [ΛΣ]	CC	8									PYTHON, JAVA
6	3648	Software Engineering	CC	8									JAVA, Data structures
5	3571	Communication Networks	CC	8									CSO, Operating Systems
5	3531	Artificial Intelligence	CC	8									Mathematics II, Algorithms
5	3515	Logic	EC	7				X			X		
5	3155	Statistics in Informatics	EC	7	X		X						Probability, Mathematics II
6	3664	Distributed Systems	CC	8									JAVA, Operating Systems

Semester	Code	Course title [abbreviation, if used in prerequisites]	LEVEL	ECTS	1. Data Science and ML	2. EOperations Research	3. Applied Mathematics	4. Theoretical Computer Science	5. Systems and Networks	6. Software Systems	7. Data and Know. Managem.	8. Cybersecurity	Prerequisite Courses
5	3541	Information Systems Analysis and Design	EC	8						X	X		PYTHON, JAVA
6	3513	Numerical Linear Algebra	EC	7	X		X						Mathematics II, Computational Mathematics
6	3662	Cybersecurity	EC	7								X	Operating Systems, Software Technology
6	3672	Computer Networks	EC	7					X	X		X	ICS, Operating Systems
6	3642	Software Verification, Validation, and Maintenance	EC	7						X		X	PYTHON, JAVA
6	3511	Optimization Theory and Models	EC	7		X	X						Mathematics I, Mathematics II
6	3745	Machine Learning	EC	7	X						X	X	Mathematics II, Artificial Intelligence
6	3543	Data Management and Analysis Systems	EC	7	X					X	X		Data Structures, DB
7	3761	Network Security	E	6					X			X	Communication Networks, Computer Networks
7	3771	Wireless Networks and Mobile Communications	E	6					X				Communication Networks, Computer Networks
7	3781	Computer Graphics (offered in English)	E	6						X			Mathematics I, C++
7	3632	Special Topics on Algorithms	E	6		X		X					Data Structures, Algorithms
7	3612	Topics in Discrete Mathematics	E	6			X	X					Discrete Mathematics
7	3614	Applied Probability and Randomized Algorithms	E	6		X	X	X					Probability, Mathematics II
7	6127	Statistical and Machine Learning Methods (STAT)	E	8	X								Statistics in Informatics
7	7116	Accounting Information Systems using the Internet	E	6									
7	3634	Compilers	E	6					X	X			DS, Theory of Computation
7	3818	Network Economics	E	6		X			X				ICS, Communication Networks
7	3573	Signals, Systems, and Digital Signal Processing	E	6	X		X		X				Mathematics I
7	8143	Combinatorial Optimization (MST)	E	6		X		X					
7	3644	Information Retrieval Systems	E	6	X						X		AI, Data Management and Analysis Systems
7	3747	Technologies and Programming of Web Applications	E	6						X			PYTHON, JAVA, Artificial Intelligence.
8	3783	Human-Computer Interaction	E	6						X	X		PYTHON, JAVA
8	6005	Data Analysis (STAT)	E	8	X								Statistics in Informatics

Semester	Code	Course title [abbreviation, if used in prerequisites]	LEVEL	ECTS	1. Data Science and ML	2. EOperations Research	3. Applied Mathematics	4. Theoretical Computer Science	5. Systems and Networks	6. Software Systems	Data and Knowledge Managem.	8. Cybersecurity	Prerequisite Courses
8	3862	Performance Evaluation of Complex Networked Systems	E	6		X			X				Probability, Communication Networks
8	3842	Information Systems Applications Development	E	6							X		DB, Software Engineering
8	3561	Computer Architecture (offered in English)	E	6					X				Computer Systems Organization
8	6082	Linear Algebra II (STAT)	E	7,5			X						Mathematics II
8	3741	Conceptual System Modelling	E	6						X	X		
8	3743	Data Mining and Data Science	E	6	X						X		Databases, Artificial Intelligence
8	2610	Business Policy and Strategy (BA)	E	6									
8	3713	Decision and Game Theory	E	6		X		X					Mathematics I, Probability
8	3814	Information Theory	E	6			X						Probability
8	8116	Mathematical Optimization (MST)	E	6		X							
8	3822	Parallel Programming	E	6					X	X			Computer Programming with C++
8	6142	Probability II (STAT)	E	7,5			X						Probability
8	6125	Simulation (STAT)	E	7			X						Probability
8	3791	Elements of Information Law	E	6								X	ICS, PYTHON
8	3882	Multimedia Technology (offered in English)	E	6					X				Communication Networks, C++
8	3584	Technological Innovation and Entrepreneurship	E	6									
8	3517	Computability and Complexity	E	6				X					Theory of Computation, Algorithms
7,8	6023	Linear Models	E	8	X								Statistics in Informatics
7,8		Special Topics courses offered on occasion	E	6									
7,8	3802	Senior Thesis	E	6									
7,8	3850	Research Project											Senior Thesis

Admission and Placement Examinations

The right to participate in the department's entrance qualifying examinations is granted to graduates of Universities, Technological Educational Institutes (T.E.I.), or institutions equivalent to them, as well as A.S.PAI.T.E., in Greece or abroad (recognized by DOATAP); holders of degrees from higher schools offering programs of more than two years or of two years' duration under the jurisdiction of the Ministry of Education and Religious Affairs or other Ministries; and graduates of Schools of Higher Vocational Training (S.A.E.K. – formerly I.E.K.), Institutes of Vocational Training (I.E.K.), as well as those who have completed the Post-Secondary Apprenticeship Class Year, who, after successfully passing the initial vocational training certification exam, hold a Vocational Education and Training Specialty Diploma of level five (5) of the National Qualifications Framework or an equivalent qualification. The courses examined in these examinations are the following first-semester courses:

- Mathematics I
- Introduction to Computer Programming
- Introduction to Computer Science

All applicants who have succeeded in the examinations can apply to be exempted from completing courses successfully passed in their department of origin, and, in any case, the three courses examined in the admission & placement examination count towards the degree requirements. More information is available on the Department's website:

https://www.dept.aueb.gr/el/cs/news/katataktiries25-26

Course Waivers

Students admitted through entrance & placement examinations, transfer, or position transfer, can apply to the Department Assembly for a course waiver, i.e., to be exempted from completing a course. Any number of courses amounting up to a total of 80 ECTS units can be waived, provided the student has successfully passed similar courses in his or her department of origin. For each waived course, the final examination is waived, the course is considered as successfully passed, no grade is given, and the course does not affect the degree grade. The ECTS units awarded for a waived course are equal to the ECTS units awarded for that course from the department of origin, provided they do not exceed the ECTS units awarded by the AUEB equivalent course. In the latter case, the ECTS units of the AUEB equivalent course are awarded. If the department of origin has not specified the ECTS units of that course, or it is equivalent to a free elective course of AUEB, the awarded ECTS units are determined according to a proposal made by the Studies Committee of the Department.

VII.2. Elective Courses

Elective courses include the following:

- The Practical Training course and the course "Digital Education Material", which are offered by the Department of Informatics
- The foreign language courses offered at the 5th and 6th semester
- The set of courses leading to the Pedagogical and Teaching Certificate, which are offered centrally by the university for all its departments. The coordination of the corresponding program is performed by the Department of Informatics.
- Course 3252 "Accounting", which is no longer offered.
- Selected courses offered by other departments at AUEB, as shown in the following table

	Department of Economics
1131	General Economic History
1193	Principles of Sociology
1225	Economic History of Greece
1705	Games and Uncertainty
	Department of Business Administration
2117	Civil Law (Civil Law I)
2317	Management

2608	Supply Chain Management (logistics)
2836	Strategic e-Marketing
	Department of International and European Economic Studies
4126	International Economic Law
	Department of Marketing and Communication
5414	Human Resources Management
5428	Leadership and Personal Skills Development
5622	Introduction to Marketing
5623	Consumer Behavior
5624	Product Policy
5636	Adveritising and Communication
5657	Retail and Wholesale Marketing
5668	Marketing of Agricultural Products and Food
5678	Marketing of Social Entrerprises and Non-Profit Organizations
5689	Web Analytics
5718	Cross Cultural Communication and Management
5721	Psychology
	Department of Statistics
6115	Numerical Methods in Statistics
	ΤΜΗΜΑ ΔΕΤ
8111	Decision Making
8115	Organizational Behavior and Leadership
8134	Production & Operations Management
8154	Entrepreneurship
8159	Enterprise Resource Planning Systems
8170	Big Data Management Systems
8182	Ethics, Responsibility and Governance

Attention: Due to the large number of elective options, the examination times for some electives may coincide with the examination times of other electives or other department courses, necessitating the compulsory use of the September retake exams.

Courses Offered by other Departments

Courses from other departments that students from the Department of Informatics can choose as elective courses are announced by the Department's Secretariat at the beginning of each semester. A student may submit an application to enroll in a course offered by another department which is not included in the list, which must be accepted by the Department's General Assembly. The student must ensure that he has all the prerequisites to enroll in a course from another department. The student must also consider any conflict in the lecture hours of the courses during each semester.

Practical Training (Internship)

The practical training course is elective for students and may be undertaken in any semester after the sixth and subject to the requirement that the student has successfully completed all compulsory courses except at most two. For the practical training to start, a written approval of a faculty member of the Department of Informatics is required. That faculty member will oversee and grade the training, having at first determined the object of the training together with the entity where the practical training will take place. The successful completion of the practical training is equivalent to a free elective course of 6 ECTS units. More information about practical training may be found in http://www.internship.aueb.gr

Pedagogical and Teaching Certificate Study Program

The Athens University of Economics and Business (AUEB) offers students in the final semesters of their undergraduate studies (7th and 8th semesters) an innovative and fully accredited Program of Studies in the Sciences of Education and Teaching. The Program leads to the award of a Certificate of Pedagogical and Teaching Competence, officially recognized by the Hellenic Ministry of Education, Research and Religious Affairs (Government Gazette 689/Issue B/26-03-2023).

Since the academic year 2011–2012, the Program has constituted a pioneering option for university students who wish to strengthen their pedagogical and teaching skills, whether they intend to work in primary and secondary education, or to continue their educational pathway in adult education through certification procedures by the National Organization for the Certification of Qualifications and Vocational Guidance (EOPPEP), enabling professional employment in Institutes of Vocational Training (IEK), Second Chance Schools (SDE), Vocational Training Centers (KEK), and Lifelong Learning Centers.

The Program has a one-year duration and is structured around two core components:

- Pedagogical Competence: This component consists of eight courses in the Sciences of Education, covering contemporary learning theories, educational psychology, educational technology, differentiated instruction, and pedagogical assessment. Regular attendance and active participation are essential for the successful completion of the courses and for the development of core pedagogical competencies.
- Teaching Competence: This component includes the two courses “Teaching Practicum I & II”, through which students implement teaching activities in authentic school environments. In this context, theoretical knowledge is transferred into practice, and contemporary teaching approaches are applied.

The teaching practicum functions as a bridge between academic training and real classroom practice, offering participants valuable hands-on teaching experience, supported by systematic feedback and guidance from experienced educators.

The Programme is characterised by a wide range of innovative educational actions, which promote experiential learning, critical thinking, communication, and collaboration. Among the key innovative initiatives implemented within the Programme are the following:

- “Educating Teachers through Art – TEPArt AUEB”: An initiative that connects education with art, fostering creativity and artistic expression as integral elements of educational practice. It emphasises the integration of social and cultural issues into the educational process, enhancing awareness and critical reflection on everyday life.
- “Education, Entrepreneurship and Culture”: An action aimed at cultivating entrepreneurial thinking and cultural awareness within educational practices, contributing to the development of innovative business plans for archaeological sites in Greece.
- Freinet Pedagogy: An alternative pedagogical approach centered on student-centered and collaborative learning, implemented through experiential workshops, group activities, and the cultivation of a productive and participatory school culture.
- “Life Skills at School I & II”: Actions focusing on education and the development of social and emotional skills, contributing to the psycho-pedagogical development of students.

Beyond the acquisition of academic knowledge, these actions aim to foster critical thinking, creativity, and innovation, values that are essential for the contemporary educator.

The primary objective of the Program is the development of a holistic pedagogical profile for students, with an emphasis on emotional intelligence, leadership, self-awareness, and an interdisciplinary approach to teaching. Graduates acquire the knowledge and skills required to respond effectively to the contemporary challenges of the teaching profession, while simultaneously strengthening their personal and professional development.

The philosophy of the Program goes beyond the mere transmission of knowledge. It promotes a human-centered, creative, and critically reflective approach, focusing not only on teaching practices but also on the cultivation of emotional intelligence, human-centered values, cooperation, and social awareness and responsibility.

VII.3. Course Enrollment and Examination

In order to attend and be graded in courses, in the beginning of each semester students must complete an online course enrollment, which they must submit to the Department’s Electronic Secretariat. Course enrollment is mandatory and must be completed at the dates and times announced by the University at the beginning of each semester. Following their enrollment in courses, students are required to submit an electronic textbook selection form through the EYDOXOS platform. It is stressed that course enrollment and textbook selection are distinct, and one does not substitute the other.

The maximum number of ECTS units that students may select and be examined about in each semester is as follows:

Matriculation year	Maximum number of ECTS units
1st year	38 ECTS
2nd year	46 ECTS
3rd year	54 ECTS
4th and subsequent years	60 ECTS

Students are strongly advised, however, not to enroll in more than 6 courses per semester, as the requirements of the Department are high for all courses. An effort is made by the Department so that the weekly schedules of courses in the same year are not in conflict. Part-time students may only register for half the above limits.

Most courses involve 4 hour weekly lectures, spanning 13 weeks. Most courses also include recitations, where exercises are solved and student questions are discussed. Moreover, many courses also include laboratory exercises, which involve practical training of students on the course's subject, under the supervision of the instructors.

The grade in each course is expressed on the scale 0-10, and can include half integers (0.5). Grades above five (5) are passing. The overall Grade Point Average (GPA) upon graduation is calculated as the average grade of the courses that satisfy the conditions for obtaining the degree and the selected modules, as declared by a student at the completion of his studies, excluding the English IV course. The GPA is accompanied by a qualitative rating: grades from 8.51 to 10 receive the rating "Excellent", grades from 6.51 to 8.50 receive the rating "Very Good", and grades from 5.00 to 6.50 receive the rating "Good".

The examination of courses in the winter semester take place from January to early February. The examination of courses in the spring semester take place in June. Finally, a second examination for courses of both semesters takes place in September. If a student fails in a course that he enrolled in during the winter or spring semester, he may repeat the examination of the course during the September examination period.

Grade Cancellation

Students who have received a passing grade in a course but wish to be re-examined in it must submit an application to the Department's Secretariat following a relevant announcement by the Rectorate. The following restrictions apply:

- The maximum number of times a student can request a re-examination is equal to the 10% of the courses required to obtain a degree (i.e., 4, in the case of the Department of Informatics).
- The student may make use of the above provision for up to two years after successfully passing the course in which they wish to be re-examined. Specifically, the application must be submitted within the relevant deadline announced by the University's Directorate of Education and no later than two years after the examination period during which the student obtained a passing grade in the course. An application for re-examination cannot be withdrawn and results in the cancellation of the student's previously awarded grade.

Oral Examination

Students with disabilities that make a written examination problematic or impossible may submit an application to the Department's Secretariat requesting to be examined orally, according to a procedure established by the Department. The application must necessarily be accompanied by an appropriate medical assessment from a competent governmental body. Students can contact the Secretariat for details about the oral examination procedure.

Provided their application was accepted, students that intent to be examined orally should inform the examiner at least two days in advance, and not during the examination, in order to facilitate its efficient conclusion.

VII.4. Scholarships and Awards

The State Scholarships Foundations (Ίδρυμα Κρατικών Υποτροφιών - ΙΚΥ) grants annually scholarships for excellent performance as well as scholarships and grant loans to students who had outstanding performance in the entrance examination and the examinations of universities. The Secretariats of the Departments announce the names of the candidates and set the deadlines for

submitting their supporting documents. According to a decision of the Department Assembly, the conditions for granting a scholarship from IKY are defined as follows:

- For new students, the entrance ranking in the Department is considered according to the General Examinations for admission to universities. To get a scholarship, the candidate for a scholarship should be participating for the first time in the General Examinations.
- For students who have completed their first year of studies, success in the ten (10) core courses of the 1st year is required. The average grade, which should not be less than 6.51, is calculated based on these ten core courses. In the event of a tie, the highest grades obtained by each of the tied students in the other courses are compared, if a tie again occurs the second highest grades are considered, and so on.
- For students who have completed their second year of studies, success is required in the eight (8) core courses of the 2nd year. The average score, which should not be less than 6.51, is calculated based on these eight core courses. In the event of a tie, the highest grades obtained by each of the tied students in the other courses are compared, if a tie again occurs, the second highest grades are considered, and so on.
- For students who have completed their third year of studies, success is required in the four (4) core courses of the 3rd year as well as in at least six (6) module courses chosen by the student. The average score, which should not be less than 6.51, is calculated based on the four core courses and the six best, based on the grade, of the student's module courses. In the event of a tie, the highest grades received by each of the tied students in the rest of the module courses are compared, a tie again occurs, the second higher grades in module courses are considered, and so on, and finally the grades of the elective courses are taken into account, and so on.
- For students who have completed their fourth year of studies, a scholarship is awarded to the best graduate who has earned the highest overall total grade, if he/she has not exceeded the eight semesters required to obtain the degree.

The **Georgios Halkiopoulos Foundation**, which grants scholarships to students with limited financial resources based on their academic performance, also operates at AUEB. In October of each academic year, the Foundation announces the amount of the scholarship, as well as the manner and time of submission of the applications of interested students. Other awards and scholarships are granted to students of the Department and the University from various institutions, organizations and businesses. Information on all these awards and scholarships is provided by the University's Careers Office.

In order to honor its past members who have passed away, the Department of Informatics has established three special monetary awards awarded each year to students who are not holders of a university degree and have displayed excellent performance in certain of the department courses, as follows:

- The **Maria Dimopoulou Prize** is awarded to the first-year student with the highest performance in the first-year Mathematics courses.
- The **Ioannis Kavouras Prize** is awarded to the second-year student with the highest performance in the courses «Computer Systems Organization» and «Operating Systems».
- The **Michalis Mytilinaios Prize** is awarded to the student with the highest performance in the courses «Logic», «Theory of Computation» and «Computability and Complexity».
- The **Ioannis Milis Prize** is awarded to the student with the highest performance in the courses “Algorithms” and “Data Structures”

VIII. DEGREE REQUIREMENTS

To be awarded the B.Sc. degree, a student should satisfy the degree requirements that hold at the time of the application for graduation, considering any transitional provisions that may apply.

VIII.1. Current degree requirements

The current degree requirements are the following:

- **Enrollment in 8 semesters**
- **Level 1: Successful completion of the 22 compulsory core courses**
- **Level 2: Successful completion of at least 4 of the 8 elective core courses**
- **Level 3: Successful completion of at least 64 ECTS units from elective core courses and elective courses.**
- **Level 4: Successful completion of at least 240 ECTS units from all four course levels of the program**
- **The student must hold a level C2 language certificate in English, German, or French, or must have successfully completed any of the courses "English IV", "German IV", or "French IV".**

VIII.2. Other Provisions (Applicable to All Students)

Enrolling to more courses than necessary for graduating

Students have the option to enhance their knowledge by enrolling to and successfully completing more module and elective courses than strictly necessary for them to satisfy their degree requirements. Any such extra courses will be duly reported in their transcripts.

Inclusion of completed modules in student transcripts

If a student completes one or more modules, the modules are specified in that student's transcripts. Students are not obliged to declare their chosen modules beforehand; it is enough for them to declare the module at the time of their graduation application.

Language Requirement

The C2-level language certificated that are accepted are those specified by the Supreme Council for Civil Personnel Selection (ΑΣΕΠ). Diploma copies should be certified by the relevant authority. Students not in possession of a C2 certificate must select a 4th-semester language course. Their degree in that course will not count in their Grade Point Average (GPA)

Computing the Grade Point Average

The Grade Point Average (GPA) is calculated as the unweighted average of the grades for all the courses in which the student has passed. If the conditions for obtaining the degree and completing the modules (as stated by the student during their graduation application) are satisfied by strict subsets of the aforementioned set of courses, the degree grade is calculated based on such a subset (determined by the student) from which, if any course is removed, the conditions for obtaining the degree and completing the modules are not met. The degree grade is accompanied by a verbal classification depending on its value: grades from 8.51 to 10 are referred to as Excellent, grades from 6.51 to 8.50 as Very Good, and grades from 5.00 to 6.50 as Good. It is clarified that any additional courses and ECTS credits (beyond those corresponding to the aforementioned genuine subset) that the student may accumulate will be reflected in their academic transcripts..

Courses whose ECTS units have changed

The ECTS units awarded to a student upon his successfully completing a course are those specified for that course at the moment the student completed that course.

Provisions for courses that have been replaced

- Until the end of the Academic Year 2027-2028, for students who have applied for graduation and have successfully completed the course “3541 Analysis and Design of Information Systems” until the end of the Academic Year 2024-2025, that course may be counted as compulsory, instead of the course “Artificial Intelligence”, in which case the latter course is counted as an elective core course.
- Until the end of the Academic Year 2026–2027, for students who have not successfully passed the course “Introduction to Business Administration” but have successfully passed course 3252 “Accounting” no later than the final examination period of the academic year 2020–21, course 3252 “Accounting” may be used as a compulsory course in place of “Introduction to Business Administration.” In this case, course 3252 “Accounting” will not be counted as an elective.

Special student requests

Under exceptional circumstances, special student requests, pertaining to the above transitional provisions, will be examined by the General Assembly.

IX. COURSE DESCRIPTIONS

3117 Discrete Mathematics

Compulsory Core Course, 1st semester, 6 ECTS units

Instructor:

URL: https://eclass.aueb.gr/courses/INF117/

Course Description

Sets. Relations. Functions. Natural Numbers. Mathematical Induction. Equivalence of Sets. Countability of sets. Propositional calculus. Set operations and logical connectives. Boolean algebra. Theorems and proofs. Types of proofs. Basic counting principles. Permutations. Combinations. The inclusion-exclusion principle. Graphs. Isomorphic graphs. Paths, cycles and connectivity in graphs. Matrices of graphs. Directed graphs. Trees. The optimal spanning tree problem. Rooted trees. Eulerian trails and Hamilton cycles. Planar graphs and graph coloring. Linear recurrence relations with constant coefficients.

Learning Outcomes

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

- Describe and manipulate the fundamental concepts and theorems of basic areas of Discrete Mathematics (Logic, Combinatorial Analysis, Set Theory, Difference Equations, and Graph Theory).
- Combine the basic ingredients of the above areas in order to solve complex mathematical problems, for example problems of Set Theory, using tools from Combinatorial Analysis.
- Model and solve problems appearing in Informatics using tools of Discrete Mathematics.

Prerequisite Courses

There are no required prerequisite courses. However, a good working knowledge of all Mathematics taught in high school is required.

Bibliography

- Elements of Discrete Mathematics, C. L. Liu, McGraw-Hill, 1977.
- Discrete Mathematics, S. Lipschutz, M. Lipson, 3rd edition, Shaum's Outlines, 2009.
- Discrete Mathematics and its Applications, K. Rosen, 4th edition, McGraw Hill, 1998.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly) and recitations (1 recitation of 2 hours weekly).

Assessment Criteria

The final grade is set to the grade of the final written examination.

3135 Introduction to Computer Science

Compulsory Core Course, 1st semester, 6 ECTS units

Instructor: Assistant Professor Vasileios Apidopoulos

URL: https://eclass.aueb.gr/courses/INF511/

*Course Description **

Algorithms and computer programming principles (basic logic, modularity, sequencing, iteration, recursion, algorithm efficiency). Data structures (arrays, lists, stacks, trees). Theory of computation (computability and complexity, classes P and NP), Computer architecture (logic gates, instruction execution, memory, machine architecture, machine language, parameter passing, input/output devices). Programming languages (grammars, syntactic analysis, compilers). Operating systems (processes, scheduling). File and database systems. Computer networks and the Internet (basic internet protocols, HTML, TCP, WiFi).

*Learning Outcomes **

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

- Understand and distinguish the basic systems of information representation at the bit level of the binary arithmetic system but also at the file and database levels.
- Describe the basic architecture of a computing system and explain the basic structures of a computer instruction.
- Describe the basic concepts of process management in an operating system and compute the computation latency of different scheduling policies.
- Understand and compare different multiple access protocols in networks and describe and analyze the TCP protocol and the basic procedure of information routing in the internet.
- Understand basic concepts of algorithms (loops, conditions), be able to distinguish and compute the complexity of basic search and sort algorithms, and also design the representation of information with data structures (e.g. trees, linked lists).
- Distinguish the different stages of compilation of a program and distinguish syntactically correct and non-ambiguous syntaxes.
- Describe basic concepts of computability and the distinction of classes of complexity for problems.

Prerequisite Courses

There are no required prerequisite courses. However, a good working knowledge of all high school Informatics courses is required.

*Bibliography **

- "Computer science: an overview," J. G. Brookshear, D. Smith, and D. Brylow, Pearson; 12th edition, 2014
- “Computer Science Illuminated,” N. Dale, J. Lewis, Jones & Bartlett Learning; 7th edition, 2019.
- “Foundations of Computer Science”, B. A. Forouzan, F. Mosharraf, 2nd edition, 2007.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), lab lectures (1 lecture of 2 hours weekly), lab exercises, and elective group homework assignments.

Assessment Criteria

The final grade is a weighted average of the final written examination (with a 70% weight) and the grade of the oral lab examination (with a 30% weight).

3151 Introduction to Economics

Compulsory Core Course, 1st semester, 6 ECTS units

Instructor: Dr Stylianos Giannoulakis, Adjunct Lecturer, Department of International and European Economic Studies

URL: https://eclass.aueb.gr/courses/INF140/

Course Description

Introduction to the content and methodology of the science of Economics. Mechanisms of the market functioning. Consumer behavior and demand and supply theory. Firm behavior and the organization of industry. Production and cost theories. Analysis of markets' structure (competitive markets, monopolies, oligopolies). Introduction to macroeconomic analysis. Measurement of basic macroeconomic aggregates. Stylized facts of economic growth and business cycles. A presentation and analysis of the main macroeconomic facts of the economy of Greece and other countries of the European Union. Emphasis is given on the macroeconomic policy issues related to public finance, productivity and competitiveness of the Greek economy.

Learning Outcomes

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

- Achieve a better understanding of economic life by combining the principles of economic thought, acquired during the course, with the real economic events.
- Explain the measures of economic policy undertaken by economic agents.
- Compute the main economic indicators and other economic measures that may be needed for other applications.
- Draw information from basic economic aggregates about the economic performance of markets.
- Evaluate the position of the Greek economy within the European Union and worldwide.

Prerequisite Courses

There are no required prerequisite courses.

Bibliography

- Economics, D. Begg, G. Vernasca, S. Fischer, R. Dornbusch, McGraw Hill, 2014.
- Economics, N. G. Mankiw, M. P. Taylor, Cengage Learning, 2011.
- Economics for Business: Competition, Macro-stability & Globalisation, D. McAleese, Financial Times Management/Prentice Hall, 3rd Edition, 2004.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), recitations (1 recitation of 2 hours weekly), individual and group homework assignments, case studies.

Assessment Criteria

The final grade is based on the final written examination. A bonus of one unit is given if there has been participation in the homework sets or the analysis of case studies.

3125 Introduction to Computer Programming.

Compulsory Core Course, 1st semester, 6 ECTS units

Instructor: Assistant Professor Antonios Dimakis

URL: https://eclass.aueb.gr/courses/INF259/

Course Description

The concept of program. Variables and constants. Conditional statements and loops: for, while, do-while, switch. Detecting and removing bugs. Fundamental built-in data types and constants, type conversions. The concept of the algorithm. Functions and methods. Algorithm design and repeated refinement. Libraries and Packages. Objects and classes. Expansion of classes and inheritance, creation functions. Introduction to polymorphism. Object-Oriented Programming. Strings and characters, basic text editing. Object-oriented graphics: shapes, groupings. Mono-dimensional and multi-dimensional arrays. Search Algorithms. Sorting algorithms. The ArrayList and HashMap collection classes. The concept of recursion, recursive functions, relationship between loops and recursions.

Learning Outcomes

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

- Know fundamental concepts of programming such as variables, assignment statements, built-in types of data, conditional statements and loops, arrays and input/output.
- Understand more advanced topics of programming in Java, such as object-oriented programming, function and methods, classes, class libraries, ArrayList and graphics.
- Design Java classes and methods and be able to write their own complete computer programs in order to solve specific problems.
- Implement more advanced programs based on recursion and know the relationship between loops and recursions.
- Apply classical algorithms for sorting and searching to perform computations in arrays and strings.

Prerequisite Courses

There are no required prerequisite courses. However, a good working knowledge of all Informatics courses taught in high school is required.

Bibliography

- The Art and Science of Java: An Introduction to Computer Science, E. Roberts, Pearson, 2014.
- Java: The Complete Reference, Tenth Edition, Herbert Schildt, Oracle, 2017.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each per week), laboratory exercises (2 hours weekly) and individual programming assignments.

Assessment Criteria

The final grade is the sum of the grade of the final written examination (which has a maximum of 6), the grade of the laboratory exercises (which has a maximum of 2), and the homework grade (which has a maximum of 2). However, the final grade can be passing only if the final written examination grade is at least 2.

3119 Mathematics I

Compulsory Core Course, 1st semester, 6 ECTS units

Instructor: Associate Professor Stavros Toumpis

URL: https://eclass.aueb.gr/courses/INF112/

Course Description

Properties of the real numbers, suprema and infima. Definition and properties of limits. Definition and properties of continuity at a point and in an interval and Lipschitz continuity. Definition, properties, and applications of the derivative. Convexity. The definitions of the integral by Darboux and Riemann and its properties. The Fundamental Theorem of Calculus and its properties. Applications of the integral: volumes of solids of revolution, lengths of curves, and areas of regions defined in polar coordinates. First-order linear and separable differential equations. other types, Euler Method. Taylor polynomials. Sequences, series, and convergence criteria for series with nonnegative terms. Elements of Analytic Geometry: vectors, equations of lines on the plane and in space, equations of planes, coordinate transformations on the plane, conic sections.

Learning Outcomes

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

- Describe and manipulate the basic concepts (function and sequence, supremum, limit, integral, derivative, and their definitions) and the basic theorems (properties of limits, derivatives and integrals, Fundamental Theorem of Calculus, etc.) of Calculus and elementary Analytic Geometry.
- Perform the basic operations of Calculus, such as calculating limits, derivatives and integrals using their definitions and properties.
- Combine the basic components of Calculus and elementary Analytic Geometry in order to solve more complex mathematical problems, such as computing improper integrals, solving differential equations, and calculating the volumes of solids of revolution and lengths of curves.
- Model and solve problems appearing in Informatics using the tools provided by Calculus and elementary Analytic Geometry.

Prerequisite Courses

There are no required prerequisite courses. However, a good working knowledge of all Mathematics taught in high school is required.

Bibliography

- Calculus, M. Spivak, 4th edition, Publish or Perish, 2008.
- Thomas' Calculus: Early Transcendentals, G. B. Thomas Jr., M. D. Weir, 13th edition, Pearson, 2013.
- Calculus, Vol.1: One-Variable Calculus, with an Introduction to Linear Algebra, T. M. Apostol, 2nd edition, Wiley, 1991.
- Calculus: Early Transcendentals, J. Stewart, 8th edition, Brooks Cole, 2015.

Teaching and Learning Activities

Lectures (3 lectures of 2 hours each per week) and weekly homework assignments solved individually. Recitations are lumped with the lectures.

Assessment Criteria

The final grade is set to the grade of the final written examination (which is up to 10), if that grade is not passing, and to the grade of the final written examination increased by at most 2, depending on the performance of the student in the homework assignments, provided the final written examination grade is passing.

3254 Introduction to Management

Compulsory Core Course, 2nd semester, 6 ECTS units

Instructor: Adjunct Professor Dr. Panagiotis Kotsios

URL: https://eclass.aueb.gr/courses/INF453/

Course Description

The course presents the fundamental concepts and principles of business administration, the basic factors that lead to the success of business enterprises, and the role of the leadership of corporations and businesses in this success. In particular, the course studies the main functions of businesses, the role of each and the importance of their coordination, and the challenges faced by business leaderships towards making the right decisions. In addition, the course explores the process of developing and implementing strategies through the study of test cases where structures, relations, and resources are aligned towards the achievement of the set goals. Finally, there will be an introduction in particular topics such as accounting documents and business plans

Learning Outcomes

At the successful conclusion of the course, students will be able to:

- Describe the basic concepts, principles, and aims of business administration and understand their role in successfully running a business.
- Understand the basic functions and structures of a business, the need for their coordination, and their interactions.
- Analyze the external environment of a business and perceive the risks and opportunities it offers and its effects on the aims of the business.
- Understand the means of developing and implementing strategies that achieve specified business objectives.
- Understand the content of ledgers and business plans.

Prerequisite Courses

There are no required prerequisite courses.

Bibliography

- Management, RICHARD L. DAFT, ALAN BENSON, Cengage Learning EMEA
- Management, 5th, Edition, Bateman, Snell, Konopaske, McGraw Hill Education, 2017.
- Σαλαβού Ε. Εισαγωγή στο Μάνατζμεντ: Εταιρικές λειτουργίες. Αθήνα: Εκδόσεις ΟΠΑ
- Μάνατζμεντ, Όλα για την οργάνωση και τη διαχείριση της επιχείρησης στην ψηφιακή εποχή**,** Michel Barabel, Olivier Meier**,** 2020

Teaching and Learning Activities

Lectures (3 lectures of 2 hours each, weekly) and weekly homework assignments solved individually. Recitations are lumped with the lectures.

Assessment Criteria

The final grade is set to the grade of the final written examination (which is up to 10).

3214 Mathematics II

Compulsory Core Course, 2nd semester, 6 ECTS units

Instructor:

URL: https://eclass.aueb.gr/courses/INF169/

Course Description

Multivariate calculus: partial derivatives, extrema, curves, double integrals, Lagrange multipliers. Linear Algebra: systems of linear equations. Gauss-Jordan Elimination. Vector spaces, subspaces, linear independence, basis and dimension, orthonormal bases, Gram-Schmidt process. Matrices and matrix operations, transpose of a matrix, row-echelon form and reduced row-echelon form, elementary row operations, row equivalent matrices, row canonical form, row space, column space, rank of a matrix, matrices and systems of linear equations. Determinants. Invertible matrices. The inverse of a matrix and systems of linear equations. Cramer's rule. Coordinates, change of bases, orthogonal matrices. Quadratic forms, symmetric matrices, eigenvalues, eigenvectors, diagonalization. Linear transformations. Applications of linear algebra.

Learning Outcomes

- Upon completion of the course, students will be able to:
- Perform basic operations of multivariate Calculus, e.g., find partial derivatives and use them to interpret the manner in which a function varies with respect to its arguments, find the gradient and the directional derivative of a function at a given location, and find the maxima and minima of a two-variable function.
- Manipulate basic concepts of Linear Algebra, such as linear systems, linear independence, bases and dimension, linear mappings, eigenvalues, eignevectors, and diagonalization.
- Model and solve problems appearing in Informatics, such as simple routing cost minimization problems, using tools from multivariate Calculus and Linear Algebra.

Prerequisite Courses

There are no required prerequisite courses. However, it is advisable that the student has successfully completed the courses "Mathematics I" and "Discrete Mathematics" in past semesters.

Bibliography

- Ανώτερα Μαθηματικά, Π. Katerinis, Η. Φλυτζάνης, Εκδόσεις Γ. Μπένου, 2012.
- Elementary Linear Algebra: Applications Version, H. Anton, C. Rorres, 10th edition, Wiley, 2010.
- Vector Calculus, J. Marsden, A. Tromba, 6th edition, W.H. Freeman and Company, 2011.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each per week) and recitations (1 recitation of 2 hours per week).

Assessment Criteria

The final grade is set to the grade in the final written examination.

3311 Probability

Compulsory Core Course, 2nd semester, 6 ECTS units

Instructor: Associate Professor Stavros Toumpis

URL: https://eclass.aueb.gr/courses/INF113/

Course Description

Introduction to probability theory. Fundamental notions: probability measure, probability space, disjoint events, independent events, equiprobable states. Random variables, mean value and variance, independence. Modeling methods and techniques for computing probabilities. Combinatorial methods: ordered and unordered arrangements, combinations. Discrete and continuous random variables, probability density functions, the distribution function. Important cases of distributions. Relations between random variables, joint distributions, correlation and covariance. Markov's inequality and Chebychev's inequality. Sampling with and without replacement. The behavior of large samples, the Law of Large Numbers, the Central Limit Theorem, and applications.

Learning Outcomes

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

- Describe and manipulate the basic concepts (probability, sample space, event, etc.), the axioms, the basic properties, and the basic tools (probability mass and density functions, the Central Limit Theorem, etc.) of Probability Theory.
- Compute the probabilities of events in non-trivial probability problems using Probability Theory, Combinatorics, and Calculus.
- Discern known probabilistic models in problems related to Informatics.
- Compose new probabilistic models, modelling problems and systems appearing in Informatics using simpler component probabilistic models.

Prerequisite Courses

There are no required prerequisite courses. However, it is recommended that, before enrolling to the course, students have successfully completed the course "Mathematics I" in a previous semester. It is also recommended that students enroll concurrently to the course "Mathematics II", due to the use, in both courses, of double integrals.

Bibliography

- A First Course in Probability, Sh. M. Ross, 9th edition, Pearson Education, 2013.
- Introduction to Probability, D. P. Bertsekas, J. N. Tsitsiklis, 2nd edition, Athena Scientific, 2008.
- Probability and Random Processes, G. R. Grimmett and D. R. Stirzaker, 3rd edition, Oxford University Press, 2001.

Teaching and Learning Activities

Lectures (3 lectures of 2 hours each, weekly) and weekly homework assignments solved individually. Recitations are lumped with the lectures.

Assessment Criteria

The final grade is set to the grade of the final written examination (which is up to 10), if that grade is not passing, and to the grade of the final written examination increased by at most 2, depending on the performance of the student in the homework assignments, provided the final written examination grade is passing.

3222 Computer Programming in Java

Compulsory Core Course, 2nd semester, 6 ECTS units

Instructor: Assistant Professor Ioannis (John) Pavlopoulos

URL: https://eclass.aueb.gr/courses/INF176/

Course Description

Structure of a Java program and control statements. Classes and objects: constructors, object variables, static variables, object references. Methods: scope, encapsulation, overloading, static methods. Packages. Inheritance and polymorphism: class hierarchy optimization and code reuse, polymorphism and dynamic method binding, abstract and final classes and methods, interfaces. Object oriented design: identification and implementation of class relations, identification of class features and functionality. Data structures and collections: recursive classes and dynamic memory allocation, linked lists, arrays, queues, stacks, lists, iterators, sets, maps. Generics. Input and output: byte/character streams, object streams, filters, interfaces and classes for input/output, serial and random file access. Exceptions.

Learning Outcomes

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

- Describe and manipulate basic concepts and principles of object-oriented programming: encapsulation (data and code), inheritance, and polymorphism.
- Develop an object-oriented program in Java including class definition, constructors, methods, object variables, static variables, etc.
- Apply object-oriented programming techniques, such as class hierarchies, code reuse and dynamic method binding, abstract and final classes and methods, and interfaces, with the aim of developing functional, compact, and extensible code.
- Select among the basic data structures and input/output methods that are available in Java.
- Utilize exceptions in Java programs.

Prerequisite Courses

There are no required prerequisite courses. However, it is recommended that students have successfully completed the course “Introduction to Computer Programming” in a previous semester.

Bibliography

- Java How To Program, H. M. Deitel, P. J. Deitel, 10th Edition, Pearson, 2015.
- Java in 21 Days, R. Cadenhead, 7th Edition, Sams publishing/Pearson, 2016.
- Java Programming, Joyce Farrell, 8th Edition, Cengage Learning, 2015.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), a progress test, individual lab exercises, and a group (possibly in two parts) programming homework assignment.

Assessment Criteria

The final grade is equal to the grade of the written final exam (which has a maximum score of 7), if that grade is less than 3.5. If the grade of the written final exam is at least 3.5, the final grade is the exam grade increased by up to 3 points, depending on performance in the progress test and the programming assignments. For the group assignment, which is assessed orally at the end of the semester, the grade is individual per student.

3262 Digital System Design

Compulsory Core Course, 2nd semester, 6 ECTS units

Instructor: Laboratory Teaching Staff Member Anna Kefala

URL: https://eclass.aueb.gr/courses/INF157/

Course Description

Binary Arithmetic. Boole Algebra. Logic gates and synthesis of simple circuits. Logic functions, circuits and don't-cares. Introduction to technologies implementing logic functions (transistors, NMOS, CMOS). Introduction to Programmable Logic Devices (PLDs), Programmable Logic Arrays (PLAs) and Field-Programmable Gate Arrays (FPGAs). Optimization of logic functions and circuits (Karnaugh maps, Quine-McCluskey algorithm). Number representations. Arithmetic circuits. Efficiency and cost issues in large circuits. Principles of digital design. Analysis and synthesis of combinational circuits (adders, multiplexers, coders and decoders) and synchronous sequential circuits (registers, counters, Mealy and Moore machines). Introduction to asynchronous sequential circuits. Bi-stable circuits (latches και flip flops). Analysis and design of microprocessor control units. Design, control and simulation of digital circuits with Intel's Design Software Quartus Prime Lite Edition. Design and programming of digital circuits (adders, multiplexers, decoders, registers, counters, Arithmetic and Logic Units, simple processors) with VHDL (Very High Speed Integrated Circuit Hardware Description Language).

Learning Outcomes

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

- Understand what is a digital circuit and how it works
- Analyse a given digital circuit
- Understand the representation of Boolean circuits through mathematical and graphical methods
- Perform arithmetic operations in various number systems and design digital circuits to implement them
- Design the optimal combinational circuit for a given logic function
- Distinguish different logic gates and other elements used in the design of logic circuits
- Design and program a combinational or synchronous sequential circuit with VHDL and Quartus Prime
- Verify the correct operation of an implemented logic circuit through functional and timing simulation on Quartus Prime.

Prerequisite Courses

There are no required prerequisite courses. However, it is recommended that students have successfully completed the course "Introduction to Computer Programming" in a previous semester.

Bibliography

- S. Brown and Z. Vranesic, Fundamentals of Digital Logic with VHDL Design, 4th edition, McGraw-Hill, 2023.
- M. Mano and M. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th edition, Pearson Education, 2018.

Teaching and Learning Activities

Lectures, Laboratory lectures, (4 lab exercises), Tutorials (weekly), Online Video Tutorials on eClass for introduction to the use of the CAD Quartus tool and VHDL.

Assessment Criteria

The final grade is obtained from the grades of a midterm, group projects on designing digital circuits with Quartus and final exam.

3335 Data Structures.

Compulsory Core Course, 3rd semester, 7 ECTS units

Instructor: Assistant Professor Alkmini Sgouritsa

URL: https://eclass.aueb.gr/courses/INF231/

Course Description

Introduction to algorithm analysis. Searching and sorting, asymptotic approximations and notations. Stacks and queues: definition, operations, array-based implementation. Linked lists: single, double, circular linking, traversal, insertion, removal. Binary trees: definitions and fundamental theorems, depth-first and breadth-first traversal, recursive and iterative traversal, Euler tours. Binary search trees: definition, search, insertion, removal, adaptive, splay and random binary search trees. Balanced search trees: AVL trees, 2-3-4 trees, red-black trees, B-trees. Priority queues. Binary heaps: definition, operations, heap-sort. Binary heap-based priority queues. Hash tables: polynomial hashing, address compression (division, multiplication, and truncation), conflict resolution (chaining, linear probing, double hashing). External searching. B-Trees and hash tables.

Learning Outcomes

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

- Describe the role and the functionality of the most important data structures in computer science, such as linked lists, FIFO and LIFO queues, priority queues, binary search trees, and their variations.
- Analyze the computational complexity of the basic methods supported by the data structures presented during the course.
- Compare algorithms based on their time and space complexity.
- Design new algorithms utilizing the data structures presented during the course.
- Select suitable data structures for solving algorithmic problems.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Programming” or the course “Computer Programming in JAVA”. However, it is recommended that students have successfully completed both these courses, before enrolling to the course.

Bibliography

- Algorithms in Java, Parts 1-4, R. Sedgewick, 3rd edition, Addison Wesley, 2008.
- Data Structures and Algorithms in Java, R. Lafore, 2nd edition, Pearson, 2003.
- Data Structures and Algorithms in Java, M. Goodrich, R. Tamassia, John Wiley and Sons, 2003.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), laboratory recitations (1 recitation of 2 hours, weekly), and 3 group programming homework assignments.

Assessment Criteria

The final grade is equal to the final written examination grade, if this grade is not passing; otherwise, the final grade is the weighted average of the final written examination grade (with a weight of 70%) and the grade of the group programming homework assignments (with a weight of 30%).

3365 Computer Systems Organization

Compulsory Core Course, 3rd semester, 7 ECTS units

Instructor: Full Professor Georgios Xylomenos

URL: https://eclass.aueb.gr/courses/INF103/

Course Description

Historical overview. Introduction to computer hardware structure and functionality. Computer performance measurement. Main memory structure and organization, data storage and representation. Machine and symbolic language programming. Symbolic computer language MIPS32. Computer instructions and memory addressing modes. Computer arithmetic (integer and floating-point). Implementation of a hardwired control unit. Pipelining and data / control hazards. Secondary storage, cache memory and memory hierarchy. Cache memory performance.

Learning Outcomes

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

- Understand and describe the structure of a computing system.
- Understand the structure of instructions in the MIPS32 language, explain the functionality of programs in MIPS32 and be able to develop their own programs.
- Understand the arithmetic representation of numbers in integer and floating-point arithmetic, and do computations in these arithmetics.
- Understand basic arithmetic operations on a hardware level.
- Describe basic structural elements of the processor, the datapath for different instructions, and the functionality of pipelining, and also to discover and correct with different means the associated hazards.
- Understand the structure and hierarchy of the memory of a computing system and the functioning of the cache memory.
- Measure the performance of a hierarchical memory system.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Science” or the course “Digital System Design”. However, it is recommended that students have successfully completed both these courses, before enrolling to the course.

Bibliography

- Computer Organization and Design: The Hardware/Software Interface – D. Hennessy and J. Patterson, 6th edition (MIPS edition).
- Structured Computer Organization, A.S. Tanenbaum, 6th edition, 2012
- Οργάνωση Συστημάτων Υπολογιστών, Ι. Κάβουρας, Εκδόσεις Κλειδάριθμος, 2009.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), individual homework assignments, group homework assignments, and individual lab assignments.

Assessment Criteria

The final grade is a weighted average of the final written examination (with an 80% weight) and the grade of all assignments (with a 20% weight). The final written examination grade is required to be 5 out of 10 or higher for the assignments grade to be counted.

3321 Computer Programming in C++

Compulsory Core Course, 3rd semester, 8 ECTS units

Instructor:

URL: https://eclass.aueb.gr/courses/INF232/

Course Description

Pointers and dynamic memory allocation. References. Argument-passing by value, reference or pointer. Functions that return pointers or references. Function overloading and function templates. Input and output streams. Multiple source code files, header files, object and executable code. Name spaces. Classes and dynamic memory allocation, copy constructors, destructors. Operator overloading. Inheritance, virtual and non-virtual methods, polymorphism, abstract classes. Class templates and implementation of simple data structures using class templates, pointers, and dynamic memory allocation. Elements of the STL library. Iterators and their implementation with pointers. Main differences between C and C++.

Learning Outcomes

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

- Map a computational problem/task to the C and C++ language constructs and structure.
- Read, write, and understand code in C/C++ and compile it into executable programs, using good programming practices.
- Understand the execution cost of the generated machine code.
- Validate and debug their C/C++ programs.
- Extend and optimize code written in C++ and propose alternative implementations using polymorphism, operators, templated classes and function templates.
- Combine their code with third-party libraries and code to build larger and more complex applications.
- Use professional-grade development tools and environments to write high-performance code.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Programming” or the course “Computer Programming in Java”. However, it is recommended that students have successfully completed both these courses, as well as the course “Introduction to Computer Science”, before enrolling to the course.

Bibliography

- C++ How to Program 10th Edition, H. M. Deitel, P. J. Deitel, Pearson, 2016.
- The C++ Programming Language, B. Stroustrup, 4th edition, Addison-Wesley Professional, 2013.
- C++ in One Hour a Day, Sams Teach Yourself, S. Rao, 8th edition, SAMS, 2017.
- Programming: Principles and Practice Using C++, B. Stroustrup, Addison-Wesley Professional; 3rd edition, 2024.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), laboratory recitations (1 recitation of 2 hours, weekly), and 1 homework assignment, submitted individually or in pairs.

Assessment Criteria

The final grade is set to the final examination grade (which is up to 6), if that grade is less than 2.5, and, otherwise, to the final examination grade, increased by at most 4, depending on the performance of the student in the homework assignment. The grading of the homework assignments involves an oral examination.

3230 Computational Mathematics.

Compulsory Core Course, 3rd semester, 8 ECTS units

Instructor: Full Professor Paraskevas Vassalos and Adjunct Lecturer (appointment pending)

URL: https://eclass.aueb.gr/courses/INF207/

Course Description

Introduction to computational methods. Errors and computer arithmetic. Algorithms and convergence. Horner's method. Finite differences and linear operators. Interpolation and polynomial approximation. Piecewise polynomial interpolation. Numerical solution of algebraic equations. Numerical differentiation and integration. Direct methods for solving linear systems. Introduction to sparse matrix methodology. Matrix computations. Numerical solution of ordinary differential equations. Mathematical software and numerical algorithms. Programming with Octave/Matlab.

Learning Outcomes

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

- Understand computer arithmetic and the source of errors in numerical algorithm.
- Understand the concepts of convergence, accuracy, operations cost and stability of a numerical algorithm.
- Apply numerical methods for various mathematical operations and tasks, such as solving nonlinear equations, polynomial interpolation, numerical quadrature, solving linear systems, and solving numerically Initial-Boundary Value Problems.
- Combine numerical methods to obtain approximate solutions to mathematical problems.
- Write efficient, well-documented code and present numerical results in an informative way.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course "Mathematics I" or the course "Introduction to Computer Programming". However, it is recommended that students have successfully completed both these courses, as well as the course "introduction to Computer Programming" before enrolling to the course.

Bibliography

- Numerical Analysis, R. Burden, D. Faires, Brooks/Cole, Cengage Learning, 2011.
- Numerical Analysis, T. Sauer, Pearson, 2012.
- Numerical Mathematics and Computing, W. Cheney, D.Kincaid, Thomson Brooks/Cole, 2008.
- Numerical Mathematics, A. Quarteroni, R. Sacco, F. Saleri, Springer,2000.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), laboratory recitations (1 recitation of 2 hours, weekly), laboratory exercises (a total of 10 hours), computational group homework assignments and theory individual homework assignments.

Assessment Criteria

The final written examination awards at most 8 units. If this examination is passing (i.e., at least 4/8), then the group homework assignments award at most another 2 units. Furthermore, a bonus unit is awarded for thoroughly solving the theory individual homework assignments.

3432 Algorithms

Compulsory Core Course, 4th semester, 7 ECTS units

Instructor: Full Professor Evangelos Markakis

URL: https://eclass.aueb.gr/courses/INF161/

Course Description

Problems and algorithms, correctness and complexity, examples. Analysis of algorithms: growth of functions and asymptotic notation, O, Ω, Θ, examples. Divide and conquer: integer multiplication, matrix multiplication (Strassen's algorithm), sorting (mergesort, quicksort), selection (median and order statistics), solving recurrence equations, Master theorem. Basic graph algorithms: graph traversal, connected components, directed acyclic graphs, cycle detection, topological sorting, strongly connected components. Greedy algorithms: shortest paths (Dijkstra's algorithm),minimum spanning trees (algorithms of Prim and Kruskal), satisfiability of Horn clauses, Huffman coding, fractional knapsack. Dynamic programming: shortest paths (algorithms of Bellman-Ford and Floyd-Warsall), matrix multiplication, dynamic optimal binary tree algorithm, longest increasing subsequence, integer knapsack, traveling salesman problem. Introduction to NP-completeness: the classes P and NP, NP-complete problems, polynomial time reductions, basic examples.

Learning Outcomes

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

- Analyze the time complexity of algorithms using asymptotic notation.
- Design algorithms using the 3 basic algorithmic techniques: divide and conquer, dynamic programming and greedy algorithms.
- Evaluate the previously mentioned techniques with respect to solving algorithmic problems.
- Compare algorithms according to their time and space complexity.
- Describe the complexity classes P and NP.
- Describe NP-completeness reductions among problems.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, any of the three courses "Introduction to Computer Programming", "Computer Programming in JAVA", or "Discrete Mathematics". It is recommended that students have successfully completed all three courses in a previous semester.

Bibliography

- Introduction to Algorithms, T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, 3rd edition, MIT Press, 2012.
- Algorithms, S. Dasgupta, C. H. Papadimitriou, U. V. Vazirani, McGraw-Hill, 2006.
- Algorithm Design, J. Kleinberg, E. Tardos, Pearson, 2005.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 weekly recitation of 2 hours), a written intermediate examination, and 2 individual homework assignments.

Assessment Criteria

The final grade equals the grade of the final written examination, if that grade is not passing; otherwise, it is equal to the weighted average of the final written examination grade (with a weight of 70%), the intermediate written examination grade (with a weight of 20%), and the individual homework assignments grade (with a weight of 10%).

3434 Theory of Computation (formerly "Automata and Complexity")

Compulsory Core Course, 4th semester, 7 ECTS units

Instructor: Assistant Professor George Amanatidis

URL: https://eclass.aueb.gr/courses/INF148/

Course Description

Fundamental proof techniques (proofs by induction, pigeonhole principle, diagonalization). Alphabets, strings, languages and problems. Regular languages. Regular expressions. Finite automata (deterministic, non-deterministic and their equivalence). Convertion of regular expressions to finite automata and vice versa. Complexity of decision problems concernng finite automata. Pumping lemma for regular languages. Examples of context-free languages, stack automata and context-free grammars. Turing machines (deterministic, non-deterministic and their equivalence). Turing-decidable languages (recursive languages). Turing-recognizable languages (recursively enumerable languages). Decidability, reductions, undecidable problems (halting problem for Turing machines, etc.). Complexity, classes P and NP, polynomial time reductions, NP-complete problems (3-satisfiability problem, clique problem, etc.).

Learning Outcomes

Upon completion of the course, students will be able:

- To understand and manipulate fundamental concepts of Formal Languages Theory and Computability Theory (such as computation, finite state machine, determinism, nondeterminism) and basic theorems (Pumping Lemma for finite automata, undecidability of the halting problem for Turing machines etc.).
- To understand and manipulate the basic computational models, i.e. finite automata, stack automata, Turing machines, starting from the less expressive ones.
- To model and classify solvable decision problems as languages (regular ones, context-free ones, Turing-decidable ones, Turing-recognizable ones) w.r.t. the computational model that is sufficient to resolve them.
- To prove the unsolvability of some known decision problems using diagonalization and reductions.
- To classify solvable decision problems w.r.t. the time resources they need and depending on the deterministic or not nature of the underlying Turing machine (complexity classes P and NP, NP-complete problems, polynomial-time reductions).

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, the course "Discrete Mathematics".

Bibliography

- Elements of the Theory of Computation, H. Lewis and Ch. Papadimitriou, 2nd edition, Prentice-Hall, 1998.
- Introduction to the Theory of Computation, Michael Sipser, Cengage Learning, 3rd edition, 2013.
- Automata and Computability, Dexter Kozen, Undergraduate Texts in Computer Science Springer, 1997.
- Introduction to Automata Theory, Languages and Computation, J. Hopcroft, R. Motwani, J. Ullman, Pearson New International Edition, 3rd Edition, 2014.
- Theory of computation, George Tourlakis, Wiley Editions, 2012.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), optional intermediate written examination, and optional individual homework sets.

Assessment Criteria

The final grade is set to the final written examination grade. If the latter is a passing grade then participation to the optional activities will raise it.

3436 Databases

Compulsory Core Course, 4th semester, 8 ECTS units

Instructor: Adjunct Professor Dr. Theofilos Mailis

URL: https://eclass.aueb.gr/courses/INF243/

Course Description

Basic principles, the three architectural levels (internal, logical, external). Data modelling (practical aspects, data interrelationships). SQL (direct and indirect usage). Introduction to data normalisation (1NF, 2NF, 3NF, 4NF, 5NF). Relational algebra, Tuple Relational Calculus (TRC), Domain Relational Calculus (DRC), query composition (advanced query formulation, attribute and relational representation). Database design and management using SQL (schemata, views, cursors, permissions). Triggers (design and applications). Application development using a host language (connectivity, indexing, retrieval). Web application design (XML, HTML, web-based languages). Sub-schemata and renaming, equivalence of algebraic operations, logical checks and constraints. Transactions (semantics, processing, verification and commitment). Advanced query optimisation. The network model and NDL.

Learning Outcomes

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

- Understand, appreciate, and effectively explain the underlying concepts of database systems.
- Describe the basic concepts of the relational model and understand its mathematical foundation.
- Apply conceptual database modeling methods to design a relational database.
- Understand data normalization and apply normal forms to evaluate the quality of the logical schema of a relational database.
- Use SQL in conjunction with a modern RDBMS to define, query and manipulate a relational database.
- Develop database applications using a host language.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Programming” or the course “Computer Programming in JAVA”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Database management systems, R. Ramakrishnan, J. Gehrke, 3rd edition, McGraw-Hill, 2012.
- Database system concepts, A. Silberschatz, H. F. Korth, S. Sudarshan, 6th edition, McGraw-Hill, 2006.
- Βάσεις Δεδομένων: Θεωρία και πράξη, Ε. Ι. Γιαννακουδάκης, Εκδόσεις Μπένος, 2014.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), group and individual homework assignments.

Assessment Criteria

The final grade is based on the final written examination grade (which has a maximum of 10) and an individual oral lab examination, as follows: if the final written examination grade is at least 5, then the final grade is the weighted average of that grade (with an 80% weight) and the oral examination grade (with a 20% grade). Otherwise, the final grade is set to the final written examination grade.

3464 Operating Systems

Compulsory Core Course, 4th semester, 8 ECTS units

Instructor: Assistant Professor Spyridon Voulgaris

URL: https://eclass.aueb.gr/courses/INF168/

Course Description

Basic concepts of operating systems, operating system structure, historical perspective. Concurrent processes, threads of execution, mutual exclusion, process management and scheduling. Interprocess communication and thread synchronization. Memory management, address spaces, virtual memory, paging and segmentation, memory management hardware. Files and directories, storage space management, file system implementation. Input/output management, user interfaces, power management. Deadlocks and deadlock management. Operating system security, cryptography, protection mechanisms, security threats, threat mitigation. Case study: LINUX and POSIX/UNIX. Introduction to the C programming language, programming with processes and threads.

Learning Outcomes

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

- Define the basic operating system concepts (process, thread, memory, device, file) and describe the various ways of structuring them (kernel, microkernel, hierarchy, virtualization).
- Distinguish different methods of organizing and implementing the basic components of operating systems (execution units, memory systems, devices and file systems).
- Identify the various types of security threats to operating systems and assess the possible ways of mitigating them.
- Compose low level programs that take advantage of concurrency and system calls of a typical POSIX/UNIX system.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Programming” or the course “Computer Programming in JAVA”. However, it is recommended that students have successfully completed both these courses, as well as the courses “Computer Programming in C++” and “Computer Systems Organization”.

Bibliography

- Modern Operating Systems, A. S. Tanenbaum, 4th edition, Pearson, 2015.
- Operating Systems Concepts, P. Silberschatz, P. Galvin, G. Gagne, 10th edition, Wiley, 2018.
- Operating Systems, W. Stallings, 9th edition, Pearson, 2017.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours every 2 weeks), and programming homework assignments.

Assessment Criteria

The final grade is set to the final written examination grade (which is up to 7), if that grade is less than 3, and, otherwise, to the final written examination grade, increased by at most 3, depending on the performance of the student in the programming homework assignments.

3648 Software Engineering

Compulsory Core Course, 5th semester, 8 ECTS units

Instructor:

URL: https://eclass.aueb.gr/courses/INF138/

Course Description

The scope of software engineering. The software development process, software quality factors, software lifecycle models. Agile software development processes. Software requirements (system modeling, requirements specification, requirements documentation, requirements validation). Architectural software design (design methods, design documentation, logical and physical architectural design, architectural design patterns). Detailed software design, design quality, design patterns. Coding. Software testing, automated testing, continuous integration. Continuous delivery and continuous deployment. Software maintenance, software configuration management, software documentation. Object oriented software (analysis / design methods, object-oriented modeling languages). The UML language. Software development environments. Improving the software development process.

Learning Outcomes

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

- Understand software development processes (including iterative and agile processes).
- Derive and specify software requirements.
- Analyze, model, and specify software systems.
- Understand the basic concepts of software architecture and software design with emphasis on object-oriented methods.
- Create, model, and document design solutions and implement them into software modules.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Data Structures” or the course “Computer Programming with JAVA”. In addition, it is recommended that students have successfully completed the course “Introduction to Computer Programming” in a previous semester.

Bibliography

- Software Engineering: A Practitioner's Approach, R. S. Pressman, McGraw-Hill Education, 2014.
- Software Engineering, I. Sommerville, Pearson, 2015.
- Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, C. Larman, Addison Wesley, 2004.
- Agile Software Development: Principles, Patterns and Practices, R. C. Martin, Prentice Hall, 2003.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 weekly recitation of 2 hours), individual and group optional homework assignments.

Assessment Criteria

The final grade is set to the final written examination grade, taking into account the optional group homework assignments (with a weight of 40%) and individual homework assignments (with a weight of 10%).

3571 Communication Networks

Compulsory Core Course, 5th semester, 8 ECTS units

Instructor: Full Professor Iordanis Koutsopoulos

URL: https://eclass.aueb.gr/courses/INF119/

Course Description

Key concepts and principles of communication networks. Network hardware and software, reference models, review of existing networks, standardization. Physical layer: theoretical basis for data transmission, analog and digital transmission systems, digital modulation, coding, transmission media, wireless transmission and wireless channel, multiplexing, performance limites, channel capacity. Data link layer: framing, error control, error detection and correction, standards and protocols. Multiple access: channelization, multiple access protocols (Aloha, CSMA/CA, CSMA/CD). Local area networks (Ethernet, Fast Ethernet, Gigabit Ethernet, WiFi, VLANs), switches and their operation, scheduling policies, introduction to wireless networks. MAC and IP addresses. Network layer of the Internet: the TCP/IP protocol family, Internet addresses and subnetting, control protocols, routing algorithms (Bellman-Ford, Dijkstra), routing protocols (OSFP, BGP). Introduction to Software Defined Networks. Introduction to Quantum internet. Transport layer: introduction to TCP and UDP. Use of lab tools (e.g. WireShark) to understand and simulate communication networks and protocols, including at the application layer.

Learning Outcomes

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

- Describe and analyze the operating principles and design choices of modern communication networks, as well as describe the basic characteristics of the more prevalent networking technologies.
- Describe the operation of the networking layer of the TCP/IP protocol stack and understand the design and IP addressing issues of networks employing it, as well as the most common TCP/IP routing protocols.
- Describe the basic concepts of the transport layer and of the better known network services.
- Evaluate the performance of modern network technologies and observe the research evolutionary trends in the area of communication networks.
- Deploy network analyzing and simulating tools.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Operating Systems” or the course “Computer Systems Organization”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Computer Networking: A Top-Down Approach, J. F. Kurose, K. W. Ross, 8th edition, Pearson, 2021.
- Computer Networks, A. S. Tanenbaum, N. Feamster, D. J. Wetherall, 6th edition, Pearson, 2021.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), presentations, and project assignments on the use of networking tools.

Assessment Criteria

The final grade is a weighted average of the final written examination, the grade of a midterm examination, 4-5 short quizzes on lab material, and the grade of the project assignments on the use of network tools.

3515 Logic

Elective Core Course, 5th semester, 7 ECTS units

Instructor: Assistant Professor Evgenia Foustoukou

URL: https://eclass.aueb.gr/courses/INF441/

Course Description

Formal analysis of the concepts of provability and semantical implication. Propositional Logic: propositional formulas, assignments and satisfiability, logical implication, complete set of connectives, axiomatic system using the Modus Ponens rule, axiomatic system using the resolution rule, formal proofs, soundness and completeness theorems, compactness theorem. Predicate Logic: propositional formulas, structures, valuations, truth within a structure, logical implication, formal proofs, axiomatic system with Modus Ponens rule of proof, axiomatic system with resolution rule of proof, the soundness and completeness theorems, the compactness theorem. Introduction to the principles of Logic Programming. Other topics of logic with applications in Computer Science may include: (Monadic) Second Order Logic, modal logics and temporal logics.

Learning Outcomes

Upon completion of the course, students will be able:

- To understand and manipulate fundamental concepts of logical systems (logical formulas, satisfiability, logical implication, logical equivalence, axiomatic systems, proof rules, formal proofs) focusing on Propositional Logic and (First-Order) Predicate Logic.
- To understand and manipulate fundamental concepts of Propositional Logic as well as basic theorems (Soundness, Completeness, Deduction and Compactness).
- To understand and manipulate fundamental concepts of Predicate Logic (predicate symbols, function symbols, constant symbols, quantifiers, structure, interpretation) as well as basic theorems.
- To understand and find the differences between syntactic notions and semantic ones and between the object-language and the metalanguage (both in Propositional Logic and in Predicate Logic).
- To describe the use of Logic as a Programming Language.

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students have successfully completed the course "Discrete Mathematics", as well as other courses with mathematical reasoning and proofs, in a previous semester.

Bibliography

- A Mathematical Introduction to Logic, Herbert B Enderton, Second Edition, Academic Press, 2001.
- From logic to logic programming, Kees Doets, The MIT Press, 1994.
- Στοιχεία Μαθηματικής Λογικής, Τζουβάρας Αθανάσιος, Εκδ. Ζήτη, Θεσσαλονίκη, 1986.
- Λογική: η δομή του επιχειρήματος, Δ. Πορτίδης, Σ. Ψύλλος, Δ. Αναπολιτάνος, Νεφέλη, 2007.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), one optional intermediate written examination, and optional individual homework sets.

Assessment Criteria

The final grade is set to the final written examination grade. If the latter is a passing grade then participation to the optional activities will raise it.

3155 Statistics in Informatics.

Elective Core Course, 5th semester, 7 ECTS units

Instructor: Assistant Professor Antonios Dimakis

URL: https://eclass.aueb.gr/courses/INF223/

Course Description

Producing data, sampling and sampling distributions. Review of probability theory. Statistical inference: confidence intervals, z and t tests of hypothesis for the mean, comparing the means of two populations. Inference for categorical variables: hypothesis testing, confidence intervals, comparing two populations, χ^2 tests for independence and goodness of fit. Inference for linear regression. Analysis of variance, logistic regression. The principle of maximum likelihood. Analysis with statistical software. Applications to Informatics.

Learning Outcomes

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

- Understand the different type of statistical inference.
- Understand the nature of statistical inference.
- Explore data using numeric and graphical descriptors.
- Make inferences about the general population using statistical surveys.
- Evaluate the accuracy of statistical studies.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Probability” or the course “Mathematics II”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Introduction to the Practice of Statistics, D. S. Moore, G. P. McCabe, B. A. Craig, 6th edition, W. H. Freeman, 2007.
- Using R for Introductory Statistics, J. Verzani, Chapman & Hall/CRC The R Series, 2014.
- Στατιστική Μεθοδολογία, Π. Ζαΐρης, αναθεωρημένη έκδοση, Εκδόσεις Κριτική, 2010.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), statistical analysis lab (1 lab of 2 hours every two weeks), recitations (1 recitation of 2 hours every two weeks), and homework assignments (either individual or in pairs).

Assessment Criteria

The final grade is set to the weighted average of the final examination grade (with a weight of 70%) and the grade of the homework assignments (with a weight of 30%).

3531 Artificial Intelligence

Compulsory Course,5th semester, 7 ECTS units

Instructor: Full Professor Ioannis (Ion) Androutsopoulos

URL: https://eclass.aueb.gr/courses/INF153/

Course Description

Introduction, definitions of AI, Turing test. Problem-solving by search: breadth/depth-first, iterative deepening, admissible and consistent heuristics, A*, hill climbing, beam search, simulated annealing, genetic algorithms, MiniMax, alpha-beta pruning. Knowledge representation and inference in propositional and first-order predicate logic: syntax, semantics, entailment, soundness, completeness, satisfiability, validity, decidability, conjunctive normal form, unification, resolution, inference with Horn clauses. Machine learning: k-nearest neighbors, k-means, Naïve Bayes, entropy, feature selection, over/under-fitting, ID3, Random Forest, linear regression, gradient descent, logistic regression, regularization, linear separability, Perceptron, multi-layer Perceptrons (MLPs), back-propagation, cross-entropy, dropout, word embeddings, recurrent neural networks (RNNs), stacked, bidirectional, RNNs with self-attention, RNN language models, convolutional neural networks (CNNs) and applications in computer vision, Transformers, BERT, Large Language Models (LLMs) based on Transformers, prompting, adding vision to LLMs (VLMs). Ethical issues related to the use of AI.

Learning Outcomes

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

- Describe examples of problems that Artificial Intelligence aims to solve and algorithms it uses, especially in the areas of problem solving by search, knowledge representation and inference via Logic, and Machine Learning.
- Select appropriate Artificial Intelligence algorithms per problem, especially in problems of the areas above.
- Implement and apply Artificial Intelligence algorithms, especially in problems of the areas above.
- Evaluate the effectiveness and efficiency of Artificial Intelligence algorithms and systems, especially in problems of the areas above.

Prerequisite Courses

To enroll in the class, students must have successfully completed, in a previous semester, one of the courses “Mathematics II” or “Algorithms”. More generally, it is recommended that students have completed the courses: “Discrete Mathematics”, “Mathematics I”, “Mathematics II”, “Probabilities”, “Algorithms”, “Computation Theory”. It is also recommended to attend the course “Logic”. The programming assignments of the course assume that students have completed the courses “Introduction to Computer Programming” (Python), “Computer Programming in Java”, “Data Structures”.

Bibliography

- “Artificial Intelligence – A Modern Approach”, Russel, S. and Norvig, P., 4th Edition, Pearson, 2020.
- “Artificial Intelligence: A Textbook”, C.C. Aggarwal, Springer, 2021.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), labs/tutorials (2 hours weekly), group homework assignments (2).

Assessment Criteria

Students of the Department of Informatics are assessed by a final written examination (60% of the final grade) and two group programming assignments (20% each). If the written examination grade, however, is lower than 4, the assignment grades are ignored, and the final grade equals the written examination grade. For students of other departments, the programming assignments are optional.

3664 Distributed Systems.

Compulsory Core Course, 6th semester, 8 ECTS units

Instructor: Full Professor Vasiliki Kalogeraki

URL: https://eclass.aueb.gr/courses/INF363/

Course Description

Introduction, non-centralized systems, goals and services of distributed systems, the client-server model. Event ordering and mutual exclusion. Global states. Global predicate evaluation, deadlocks, distributed termination. Leader election algorithms. Networking in Java. Remote procedure calls. Threads and their implementation in Java. Organization of processors and processes. Code migration. Distributed naming (entity naming, naming, directory and entity location services). Distributed file systems, case studies (NFS and AFS). Atomic transactions. Distributed object systems, architectures and case studies (Java RMI and CORBA). Fault tolerance, replication, recovery, load balancing, distributed agreement. Security in Java. Peer-to-peer systems, distributed hash tables, applications. Programming models for parallelism, case studies (MapReduce).

Learning Outcomes

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

- Understand the basic structures and functions of a distributed system
- Study modern distributed systems
- Understand the abstractions provided in the middleware layers in the distributed system
- Implement parts of a distributed system
- Use modern technologies to create novel distributed applications

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Operating Systems” or the course “Computer Programming in JAVA”. However, it is recommended that students have successfully completed both these courses, as well as the courses “Communication Networks” and “Introduction to Computer Programming” in a previous semester.

Bibliography

- *Distributed Systems: Concepts and Design,* G. Coulouris, J. Dollimore and T. Kindberg, Fifth Edition, Addison Wesley, 2011.
- *Distributed Systems: Principles and Paradigms,* Andrew Tanenbaum, Maarten van Steen, Prentice Hall, 2016.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), seminars, group and individual laboratory exercises, group homework assignments, written research report and field exercise.

Assessment Criteria

The final grade is the average (with equal weights) of the final written examination and the group homework assignments. The grade of the group homework assignments is based in an oral examination, an intermediate examination and a final examination.

3513 Numerical Linear Algebra (former "Applied Numerical Analysis")

Elective Core Course, 6th semester, 7 ECTS units

Instructor: Full Professor Paraskevas Vassalos

URL: https://eclass.aueb.gr/courses/INF223/

Course Description

Facts from Linear Algebra: vector spaces, transformations, vectors, matrices. Inner products, vector/matrix/function norms . Special forms of matrices and Tensors. Iterative methods for the solution of Linear Systems. The classical methods Jacobi,Gauss-Seidel and SOR. Elements on the theory of function approximation. Numerical optimization. Least Squares problem and its variations. Important decomposition (QR, SVD) of matrices and tensors and their applications (PCA, LCA etc). Dimension reduction and low rank approximation. Numerical methods for eigenvalues/eigenvectors.

Learning Outcomes

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

- Choose the most appropriate numerical method to solve a given linear algebra problem.
- Analyze the speed, rate of convergence, and stability of numerical algorithms.
- Use the basic iterative methods for solving systems of linear equations.
- Describe the basic matrix methods for solving linear least square problems.
- Explain and describe the properties of the SVD and QR methods.
- Apply the basic numerical methods for computing the eigenvalues/eigenvectors of a matrix.
- Understand the spectral methods for data analysis and compression.
- Implement effectively the above numerical methods in MATLAB/Octave.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, one of the courses "Mathematics II" and "Computational Mathematics". However, it is recommended that students have successfully completed both these courses.

Bibliography

- Numerical Linear Algebra and Applications, B. Datta, SIAM, 2010.
- Numerical Methods in Scientific Computing Volume II, A. Bjorck, G.Dahlquist, SIAM, 2010
- Applied Numerical Linear Algebra, J. Demmel, Philadelphia, PA: Society for Industrial and Applied Mathematics, 1997.
- Numerical Linear Algebra, L. Trefethen & D. Bau.. Philadelphia, PA: Society for Industrial and Applied Mathematics,1997.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (2 recitation of 2 hours each, weekly), weekly group computational homework assignments, weekly optional individual homework assignments on the theory, and three optional intermediate written examinations.

Assessment Criteria

The final written examination is awarded a maximum of 7.5 units. If the grade of this examination is greater than 3.5, then the group computational homework assignments provide an extra 2.5 units, towards the maximum of 10 units. An extra bonus unit is awarded if the weekly individual homework assignments are solved satisfactorily. Instead of sitting in the final examination, students have the option to sit in three intermediate written examinations that also award 7.5 units, provided the student secures the minimum passing grade (1.25 out of 2.5) in each of them.

3662 Cybersecurity

Elective Core Course, 6th semester, 7 ECTS units

URL: https://www.infosec.aueb.gr/index.php

Instructor: Assistant Professor Georgios Stergiopoulos

Course Description

Basic Concepts and Definitions. Analysis and presentation through E-R diagrams. Risk Assessment: Goals, capabilities and limitations of risk analysis and management methodologies. Example methodologies (CRAMM, OCTAVE, etc.). Access Control: Identification, Authentication, Authorization, Use of CAPTCHA Methods, Agnostic and Probabilistic Protocols, Biometric Technologies. Introduction to Cryptography: Conceptual foundation. Symmetric and Asymmetric Cryptography. Public Key Infrastructures (PKI). Digital Signatures and Certificates. Cryptanalysis. Malicious Software: Definition and Classification. Trojan horses, worms, viruses. Algorithmic approach. Foundations: Cohen (Turing Machines), Adleman (Gödel Numbering), Kephart (directed-graphs). Policies, methods and techniques for proactive and reactive defenses. Internet Security, Hackers and Hacking: Theory of Four Discontinuities. Ethics of Security. Hacking and Hacktivism. Wireless Local Area Network (WLAN) security. Security assessment and auditing software (Openvas | Nessus, Metasploit, Nmap, Aircracking, etc.). Personal Data Protection: Privacy and protection of personal data, General Data Protection Regulation. Role and responsibility of the IT professionals. Security in Ubiquitous Computing: Cloud Computing Security. Internet of Things. Security and Privacy Strategies in the Information Society. Topics in security and privacy protection (OSN, VoIP, critical infrastructures, etc.).

Learning Outcomes

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

- Understand in depth and be able to use the Information Systems Security terminology.
- Assist in the design and implementation of information systems security plans and policies.
- Evaluate the risk of an information system, using appropriate tools.
- Design, implement, and evaluate an access control system.
- Evaluate and choose the appropriate cryptosystem to protect a system.
- Protect an information system using Cryptologic techniques and methods.
- Overcome an attack by viral software (virus, worm, Trojan horse, etc.)
- Conduct penetration testing to evaluate the security of an information system or application.
- The role and impact of the sociopolitical context for protecting an information system.
- Evaluate, highlight and support the importance of privacy protection.
- Understand and comply with the current legislation on the protection of personal data.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Operating Systems” or the course “Software Engineering”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Gritzalis S., Katsikas S., Gritzalis D., Computer Network Security, pg. 69-141, Papasotiriou, 2011.
- Gritzalis D., Autonomy and Civil Disobedience in Cyberspace, pg. 295-365, Papasotiriou, 2014.
- Katsikas S., Gritzalis D., Gritzalis S., Information Systems Security,, New Tech Pub, 2010.
- Anderson R., Security Engineering, Wiley, 2013.

Teaching and Learning Activities

Lectures (2 weekly lectures, 2 hours each) and laboratory exercises (6 meetings, 2 hours each).

Assessment Criteria

The final grade is the weighted sum of a written homework (30%), a laboratory examination (30%) and the grade in the final written examination (40%).

3672 Computer Networks

Elective Core Course, 6th semester, 7 ECTS units

Instructor: Full Professor George Stamoulis

URL: https://eclass.aueb.gr/courses/INF178/

Course Description

The course aims on the in-depth understanding of the fundamental issues of computer networks, including the main networking architectures and of the most prevalent technologies (with emphasis on the Internet) and their protocols, and issues on the specification and provisioning of services to applications. In particular, the course covers: Data link layer: sliding window protocols, verification of protocol correctness. Network layer: design topics, routing algorithms, flow control, quality of service, internetworking, IP extensions (multicasting, mobility, IPv6). Transport layer: client-server model, network APIs (sockets), transport protocol design, TCP algorithms, performance issues. Application layer and services: e-mail (protocols SMTP, POP, IMAP), the World Wide Web (WWW), content delivery networks. Introduction to network security: cryptography, digital signatures, IPsec architecture, network protection.

Learning Outcomes

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

- Describe the functionalities pertaining to the various layers of computer networks.
- Explain the corresponding solutions and protocols of the main networking architectures.
- Understand the requirements imposed on networks by the main networking applications.
- Understand the entirety of functionalities of computer networks as a whole in all layers and the interaction among the protocols of the different layers, with emphasis on the Internet.
- Evaluate the level of service of the most common networking applications by the most prevalent networking architectures and technologies.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Operating Systems” or the course “Introduction to Computer Science”. However, it is recommended that students have successfully completed both these courses as well as the courses “Computer Networks” and “Probability” in a previous semester.

Bibliography

- Computer Networks, A. Tanenbaum, D. Wetherall, 5th edition, Pearson, 2010.
- Computer Networks and Internets, D. Comer, 6th edition, Pearson, 2014.
- Computer Networking: a Top-Down Approach, J. Kurose, K. Ross, 7th edition, Pearson, 2016.
- Data and Computer Communications, W. Stallings, 10th edition, Pearson, 2013.
- Computer Networks: a Systems Approach, L. Peterson, B. Davie, 5th edition, Morgan Kaufmann, 2012.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours every 2 weeks), 3 homework assignments (including on theoretical exercises and applied exercises on the Wireshark tool), and a semester-long assignment on sockets (submitted in two parts). Students complete assignments in groups of three.

Assessment Criteria

The final grade is set to the final written examination grade (which has a maximum of 10), or the weighted average of the final written examination grade and the grades of the homework assignments, if this weighted average is greater than the final written examination grade. Assignments are counted only if the final examination grade exceeds a given threshold.

3642 Software Verification, Validation and Maintenance

Elective Core Course, 6th semester, 7 ECTS units

Instructor: Assistant Professor Marios Fragkoulis (Appointment pending)

URL: https://eclass.aueb.gr/courses/INF198/

Course Description

The importance of user requirements and software specifications. Programming practice and the impact of programming languages on software development. Production of high quality software. Software quality and methods for achieving it. Software quality assurance. Testing methods. Software verification and related techniques. Software validation with respect to specifications and requirements. Formal methods for software verification. Software portability and reuse. Software maintenance. The need for effective methodologies for software maintenance. The importance of software and testing documentation. Software development cost evaluation. Principles of software reliability. The intricacies of object oriented software and web applications. Software tools for the above topics.

Learning Outcomes

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

- Understand that when a piece of software delivers acceptable results upon running it with a data set, it is not necessarily implied that this will also be the case with all test data sets.
- Understand that if certain methodologies are used, the produced software will be of high quality and therefore its maintenance will be performed easier.
- Anticipate how the rules and quantitative criteria ought to be applied in order to establish high quality assurance.
- Be in the position to apply techniques for revealing software errors in a piece of software.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Programming” or the course “Computer Programming with JAVA”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Software Testing and Analysis: Process, Principles and Techniques, M. Pezze, M. Young, Wiley, 2008.
- Software Testing: A Craftsman’s Approach, P. C. Jorgensen, CRC Press, 2013.
- Επαλήθευση, Επικύρωση και Συντήρηση Λογισμικού, Πανεπιστημιακές παραδόσεις, Ν. Μαλεύρης, ΟΠΑ, 2015.
- Software Engineering, I. Sommerville, 9th Edition, Pearson, 2010.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours every 2 weeks), and an elective, individual or group, homework assignment.

Assessment Criteria

For those students that have not completeδ the elective homework assignment, the final grade is set to the final written examination grade. For the rest of the students, the final grade is set to the weighted average of the final examination grade (with a weight of 60%) and the homework assignment grade (with a weight of 40%).

3511 Optimization Theory and Models

Elective Core Course, 6th semester, 7 ECTS units

Instructor: Assistant Professor Antonios Dimakis

URL: https://eclass.aueb.gr/courses/INF114/

Course Description

Setting up optimization models, main paradigms (linear, nonlinear, convex, mixed integer, dynamic) and their solution using computer software. Optimization over open sets, optimization with equality and inequality constraints, the Karush-Kuhn Tucker conditions, solution algorithms and convergence analysis. Convex programming: implications of convexity, duality, primal and dual algorithms. Linear programming: the simplex method, initialization (phase I), sensitivity analysis. Dynamic programming: dynamic programming equation, backward induction, deterministic models.

Learning Outcomes

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

- Design systems with optimal behavior.
- Develop mathematical models for optimizing systems.
- Recognize the different types of mathematical models of optimization problems.
- Determine the optimal solutions of optimization problems.
- Explain the mathematical properties and algorithms underlying the solution of optimization problems.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Mathematics I” or the course “Mathematics II”. However, it is recommended that students have successfully completed both these courses as well as the course “Introduction to Computer Programming” in a previous semester.

Bibliography

- Operations Research: An Introduction, H. Taha, 9th edition, Pearson, 2010.
- Introduction to Operations Research, F. S. Hillier and G. J. Lieberman, 10th edition, McGraw-Hill, 2014.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 weekly recitation of 2 hours), and homework assignments, which students complete either individually or in pairs.

Assessment Criteria

The final grade is set to the weighted average of the final examination grade (with a weight of 60%), the grade of an intermediate written examination (with a weight of 20%), and the grades of the homework assignments (with a weight of 20%).

3745 Machine Learning

Elective Core Course, 6th semester, 7 ECTS units

Instructor: Associate Professor Themos Stafylakis

URL: https://eclass.aueb.gr/courses/INF267/

Course Description

Introduction to general learning techniques: Supervised learning, unsupervised learning and reinforcement learning. Introduction to probabilistic modeling and statistical learning techniques. Optimization methods and the gradient ascent and descent techniques. Linear and polynomial regression and data classification models. The multivariate normal distribution and its properties. Kernel methods and support vector machines. Probabilistic graphical models and conditional independence of random variables. The exponential family of distributions and generalized linear models. The Expectation-Maximization (EM) algorithm for clustering and probability density estimation. Dynamic Markov models, hidden Markov models, and the Viterbi, Forward and Forward-Backward algorithms. Introduction to neural networks and deep learning: Convolutional, recurrent architectures. The attention mechanism and the Transformers architecture. The backpropagation training algorithm.

Learning Outcomes

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

- Be fully familiar with classic machine learning methods such as linear regression, logistic regression, and data clustering with EM.
- Understand more advanced techniques such as neural networks, support vector machines, probabilistic modelling with hidden variables and probabilistic graphical models.
- Be able to program and train machine learning models in the Python programming language, using optimization algorithms, and perform model selection using cross-validation.
- Be familiar with a wide range of machine learning applications as well as real data modelling problems.

Prerequisite Courses

To enroll in the course, the student must have passed the previous semester's either the course "Mathematics II" or the course "Artificial Intelligence". However, it is recommended that students have also passed the courses "Probability", "Statistics in Computer Science", and the programming courses of the department. It is also recommended that students enroll concurrently to the course "Optimization Theory and Models", also offered in the 6th semester.

Bibliography

- Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006 (available online).
- Probabilistic Machine Learning: An Introduction, Kevin Murphy, MIT Press, 2022 (available online).
- Bayesian Reasoning and Machine Learning, David Barber, Cambridge University Press, 2012.
- Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016 (available online).

Teaching and Learning Activities

Lectures (2 two-hour lectures per week), workshops (1 two-hour workshop every two weeks), and two individual programming exercises.

Assessment Criteria

The final grade is equal to the grade of the final exam (out of 8) plus the grade of the planning exercises (out of 2).

3543 Data Management and Analysis Systems

Elective Core Course, 6th semester, 7 ECTS units

Instructor: Full Professor Ioannis Kotidis

URL: https://eclass.aueb.gr/courses/INF245/

Course Description

Memory hierarchy, modern storage devices, operational characteristics, and performance considerations in a Database Management System (DBMS), the 5-minute rule. DBMS file organization, database indices (simple, B-trees, hash-based, multidimensional indices, space filling curves), their operation and performance in database applications. Overview of query optimization, join algorithms, use of statistics in cost estimation. Logical database schema design, attributes, keys, insertion/deletion/update anomalies. Functional dependencies, normal forms, synthesis and decomposition of relational schemas. Transactions, isolation levels, transactional systems, database recovery. Data warehouses, definition and architecture, logical schema design, views, the Data Cube operator, examples of OLAP and data analytics. Introduction to big data systems.

Learning Outcomes

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

- Analyze and design database schemas using proper conceptual, logical and physical level design techniques.
- Describe the architecture and operation of modern storage media and assess their performance in different database applications.
- Describe and use data indexing structures and data manipulation algorithms.
- Estimate the performance of user queries and suggest optimizations that can expedite long-running queries.
- Identify the differences between on-line transactional processing and on-line analytical processing.
- Know the architecture of a data warehouse and applications of the data cube.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Data structures” or the course “Databases”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Fundamentals of Database Systems, R. Emasri, S. B. Navathe, 6th Edition, Addison-Wesley Publishing Company, 2012.
- Database Systems, The Complete Book, H. Garcia-Molina, J. D. Ullman, J. Widom, Prentice Hall, 2012.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours every two weeks), 2 individual homework assignments, and 2 individual programming assignments.

Assessment Criteria

The final grade is set to the weighted average of the final examination grade (with a weight of 60%) and the homework assignment grade (with a weight of 40%).

3541 Information Systems Analysis and Design

Elective Course, 6th semester, 8 ECTS units

Instructor: Laboratory Teaching Staff Member Dr. Chrysostomos Kapetis

URL: https://eclass.aueb.gr/courses/INF261/

Course Description

This course offers a systematic introduction to information systems analysis and design, covering theoretical, technical and methodological issues. Information, information system (IS), IS development lifecycle. Organizational view, organizational processes, functional kinds of IS. Requirements analysis. Modelling functions (SADT, IDEF0, DFD, BPMN, decision tables and trees), modeling data (E-R diagrams), introduction to UML. IS architectures. IS user interfaces: user interface design principles, input and output design. Managing IS development: IS development methods, standards, quality assurance, project management. Case studies.

Learning Outcomes

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

- Understand the function of an IS within an organizational environment, and the IS development life cycle.
- Use methods for IS requirements analysis and specification.
- Use function and data modelling methods.
- Analyze and design information structures and IS functions.
- Appreciate the bearing of human-computer interaction on IS effectiveness and efficiency.
- Be familiar with methods for managing information systems development.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Programming” or the course “Computer Programming in JAVA”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Requirements Analysis and System Design, L. A. Maciaszek, 3rd ed., Pearson, 2007.
- Requirements Engineering: From System Goals to UML Models to Software Specifications, Axel van Lamsweerde, Wiley, 2009

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), individual or group homework assignments.

Assessment Criteria

If the final written examination grade is passing, the final grade is the weighted average of the final written examination grade (with a weight of 60%) and the homework assignments grade (with a weight of 40%). Otherwise, the final grade is set to the final written examination grade.

3761 Network Security

Elective Course, 7th semester, 6 ECTS units (will be offered in the 8th semester for the Academic Year 25-26)

Instructor: Assistant Professor George Stergiopoulos

URL: https://eclass.aueb.gr/courses/INF104/

Course Description

Introduction to cryptography (symmetric, public key) and cryptographic hashing techniques, weaknesses and modern aspects. Authentication protocols (Needham-Schroeder, Kerberos, Lamport S/Keys, OTPs, MAC/EAP). Vulnerabilities and threats to the local network and the Internet (tapping, spoofing, replication, attack, piracy). Defense techniques and countermeasures. Availability and intrusion detection. Secure network protocols and services (VPNs, IPSec/IKE, IPv6, secure routing, secure network management, NAT/PAT, DNS security, SSL/TLS/SSH, PGP/S-MIME). Certification Services Mediator and Security as a Service Providers. Privacy, integrity and authentication in wireless and mobile networks. Internet application security (Cookies, HTTPs, Digest Authentication). Malicious Software, Viruses and OS security.

Learning Outcomes

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

- Understand network and computer security issues and relative international organizations standards such as ISO/ OSI, IETF and IEEE, NIST, ETSI.
- Match security needs and measures with network/computer security mechanisms and cryptographic techniques.
- Understand weaknesses and attacks on computers and at all networking levels, as well as countermeasures that have been widely applied and implemented.
- Be aware of the need to protect privacy on the web and have learned relevant mitigation techniques
- Understand the functionality and feasibility of Internet security protocols, their weaknesses and ways of protecting them.
- Be aware of modern security and protection issues, such as identity and trust management architectures.
- Identify modern security threats and ways to deal with them.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, one of the courses “Communication Networks” or “Computer Networks”. However, it is recommended that students have successfully completed both these courses.

Bibliography

- Cryptography and Network Security, William Stallings, 3rd edition, Pearson.
- Computer Network Security, S. Katsikas, S. Gritzalis, D. Gritzalis, Papasotiriou, 2003.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours bi-weekly), exercises on labs, and optional experimental/programming project assignment.

Assessment Criteria

If the final written examination grade is equal to or greater than 5/10, then the final grade is the weighted average of the final examination grade (with a weight of 60%), and the grade of the lab and optional assignments (with a weight for 40%). If the final written examination grade is smaller than 5/10, then the final grade equals the final written examination grade.

3771 Wireless Networks and Mobile Communications

Elective Course, 7th semester, 6 ECTS units

Instructor: Full Professor Vasileios Syris

URL: https://eclass.aueb.gr/courses/INF124/

Course Description

Introduction and general overview of wireless and mobile communications. Wireless channel and signal propagation. Wireless multiple access schemes. IEEE 802.11 Wireless Local Area Networks. 1-5G and 6G mobile telecommunication systems. TCP over wireless networks. Mobile IP and micro-mobility. Mobile Ad Hoc Networks and mobile Internet of Things (IoT). Device-to-Device communication. Reliable and trusted communication for wireless and mobile devices. Mobile Computing. The course does not focus on physical layer issues but investigates how wireless transmission and mobility influences network protocols and applications.

Learning Outcomes

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

- Describe and manipulate the fundamental concepts and principles of wireless networks and mobile communications.
- Describe how protocols for medium access, network, and transport need to be adapted to the characteristics of the wireless medium and wireless signal propagation.
- Describe and manipulate the basic protocols and procedures for mobile metropolitan and wireless local area networks.
- Design at a high level the architecture of integrated wired, mobile and wireless local area networks.
- Solve problems related to the design and operation of wireless and mobile networks.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Communication Networks” or the course “Computer Networks”.

Bibliography

- Wireless Communication Networks and Systems, C. Beard, W. Stallings, Pearson, 2016.
- Wireless Networks C. Smith, D. Collins, 3rd edition, McGraw-Hill, 2014.
- Wireless Communications Fundamental and Advanced Concepts, S. Kumar, River Publishers, 2015.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours weekly), and three experimental/programming assignments.

Assessment Criteria

If the final written examination grade is equal to or greater than 4/10, then the final grade is the weighted average of the final examination grade (with a weight of 50%) and the grade of the three assignments (with a weight of 50%). If the final written examination grade is smaller than 4/10, then the final grade equals the final written examination grade.

3781 Computer Graphics

Elective Course, 7th semester, 6 ECTS units

Instructor: Assistant Professor Andreas Alexandros Vassilakis

URL: https://eclass.aueb.gr/courses/INF124/

Course Description

Digital imaging synthesis, applications and representation models. Basic drawing algorithms, antialiasing and supersampling. 2D and 3D transformations and coordinate systems, kinematic chains, scene graphs and modeling. Culling, viewing transformations and projections. Data structures for polygonal models. Back face removal. Hidden surface elimination and depth sorting. Scan-conversion and the Z-buffer algorithm. Illumination models, the bidirectional reflectivity distribution function and empirical local illumination models and algorithms. Texturing: Texture maps, texture coordinates and transformations, antialiasing and procedural textures. Introduction to shaders. Animation techniques and motion synthesis. Shadow generation: the Shadow maps algorithm and its variants. Interactive computer game graphics technologies and specialized architectures. Practical application of the above using the Unity game engine (transformations, materials, shading, animation, shadows, static and dynamic global lighting, light probes, shader programming). Optional lab in graphics programming using OpenGL and C/C++.

Learning Outcomes

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

- Have a grasp of elementary computer graphics and 2D/3D geometry representation foundations.
- Describe and analyze the principal phenomena governing light transport on surfaces and within media.
- Apply elements of real-time computer graphics theory to modern applications.
- Implement interactive applications, such as computer games, using OpenGL or Unity.
- Implement models and algorithms for shading, animation and display of surfaces using shaders.
- Evaluate the suitability of a given computer graphics algorithm or model to solve a particular problem.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, at least one of the following courses: “Mathematics I”, “Computer Programming in C++”, or “Computer Programming in Java”. However, it is recommended that students have successfully completed at least one programming course (Computer Programming in C++, preferably), as well as the course “Computer System Organization” in a previous semester.

Bibliography

- Graphics and Visualization: Principles & Algorithms, T. Theoharis, G. Papaioannou, N. Platis, N. M. Patrikalakis, A. K. Peters, Ltd., 2008.
- Real-Time Rendering, T. Akenine-Möller, E. Haines, N. Hoffman, 3rd edition, CRC Press, 2008.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), lab in Unity and optionally, OpenGL (1 weekly lab of 2 hours), and a final group (of 2-3 persons) or individual project assignment.

Assessment Criteria

The final grade is equal to the final written examination grade (to a maximum of 8), if that grade is not passing, and the final written examination grade increased by at most 3, depending on the performance of the student in the final project.

3632 Special Topics on Algorithms

Elective Course, 7th semester, 6 ECTS units

Instructor: Full Professor Evangelos Markakis

URL: https://eclass.aueb.gr/courses/INF171/

Course Description

Number theoretic algorithms and applications to cryptography: exponentiation, Euclidean algorithm for greatest common divisor, modulo arithmetic, primality testing, RSA and ElGamal cryptosystems. Average case complexity and randomized algorithms: introductory examples, quicksort, order statistics, analysis of binary search trees, hashing. Amortized complexity: UNION-FIND, splay trees. Dynamic programming algorithms. Combinatorial optimization problems: clique, independent set, vertex cover, set cover, Hamilton cycle and Hamilton path, traveling salesman problem (TSP), 3D-matching, Subset sum, integer knapsack, Partition, bin packing. Complexity classes, NP-completeness and polynomial reductions. Approximation algorithms: algorithms with a constant factor approximation, applications to vertex cover, TSP with triangle inequality and job scheduling. Randomized approximation algorithms. Polynomial Time Approximation Schemes (PTAS and FPTAS). Linear programming and integer linear programming. Maximum flows and matchings. Complementary slackness conditions, LP duality theory. Applications of linear programming for the design of approximation algorithms (LP-rounding and primal-dual methodologies).

Learning Outcomes

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

- Analyze the complexity of basic number-theoretic algorithms, such as exponentiation, computing Fibonacci numbers, finding the greatest common divisor, and primality testing.
- Design algorithms using the technique of dynamic programming.
- Design approximation algorithms for NP-complete problems.
- Use linear programming techniques to model combinatorial problems and design algorithms for them.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Data structures” or the course “Algorithms”. However, it is recommended that students have successfully completed both of these courses in a previous semester.

Bibliography

- Introduction to Algorithms, T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, 3rd edition, MIT Press, 2012.
- Algorithms, S. Dasgupta, C. H. Papadimitriou, U. V. Vazirani, McGraw-Hill, 2006.
- Algorithm Design, J. Kleinberg, E. Tardos, Pearson, 2005.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 weekly recitation of 2 hours), 1 intermediate examination, 1 individual homework assignment, and 1-2 individual presentations of publications related to the course material.

Assessment Criteria

The final grade equals the grade of the final written examination, if that grade is not passing; otherwise, it is equal to the weighted average of the final written examination grade (with a weight for 70%), the intermediate written examination grade (with a weight of 15%), and the individual homework assignment and presentation grade (with a weight of 15%).

3612 Topics in Discrete Mathematics

Elective Course, 7th semester, 6 ECTS units

Instructor: Assistant Professor Georgios Amanatidis

URL: https://eclass.aueb.gr/courses/INF238/

Course Description

Graph theory: graphs and subgraphs. Trees. Optimal spanning trees. Optimal paths and optimal spanning trees. Counting trees. Rooted trees. Prefix codes and Huffman's algorithm. Paths and distances. Connectivity and construction of reliable communication networks. Hamilton cycles. The traveling salesman problem. Euler trails. The Chinese postman problem. Designs: fundamental concepts. Fisher's theorem. Symmetric designs. Designs and codes. Algebraic systems: groups. Subgroups. Generators and evaluation of powers. Cosets and Lagrange's theorem. Codes and group codes. Isomorphisms and automorphisms. Homomorphisms and normal subgroups. Rings.

Learning Outcomes

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

- Describe and manipulate the basic concepts and theorems of the selected topics in Discrete Mathematics covered in this course, such as Graph Theory, Design Theory, and Coding Theory.
- Combine the basic tools of the above topics in order to solve problems spanning them.
- Model and solve problems appearing in Informatics using the above selected topics of Discrete Mathematics.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, the course "Discrete Mathematics".

Bibliography

- Aspects of Combinatorics, V. Bryant, Cambridge University Press, 1993.
- Graph Theory with Applications, J. A. Bondy, U. S. R. Murty, North Holland, 1976.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly).

Assessment Criteria

The final grade is set to the grade in the final written examination.

3614 Applied Probability and Randomized Algorithms

Elective Course, 7th semester, 6 ECTS units

Instructor: Full Professor George Stamoulis

URL: https://eclass.aueb.gr/courses/INF464/

Course Description

Introduction to important methods of applied probability and their applications to Computer Science problems. Overview of key topics in Probability Theory. The exponential distribution and the Poisson process. Union and Chernoff barriers, moment generators, and their applications. Balls in boxes and Poisson approximation. Probabilistic analysis of classical algorithms and randomized algorithms. Models of Markov chains and random walks, and their theoretical analysis. Applications to basic queueing paradigms. Simulation topics with discrete and continuous random variables, Markov Chain Monte Carlo algorithms.

Learning Outcomes

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

- Understand and apply the fundamental concepts and the basic theorems and tools of applied probability.
- Model and solve problems appearing in Computer Science using the tools of applied probability.
- To assess the most appropriate tools to derive conclusions in each given case.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Probability” or the course “Mathematics II”. However, it is recommended that students have successfully completed both these courses as well as the course “Mathematics I” in a previous semester.

Bibliography

- Introduction to Probability, I.Kontogiannis, S. Toumpis, Editions Kallipos, 2015.
- Introduction to Probability Models, Sh. Ross, 10th edition, Academic Press, 2009.
- Introduction to Probability, 2nd Edition, D.P. Bertsekas and John N. Tsitsiklis, Athena Scientific, 2009.
- Probability and Computing: Randomized Algorithms and Probabilistic Analysis. M. Mitzenmacher, E. Upfal, Cambridge University Press, 2005.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), recitations (1 semester recitation of 2 hours), and individual, bi-weekly homework assignments.

Assessment Criteria

The final grade results from the grade of the written final exam, while the grades of the weekly exercises are taken into account towards increasing the grade.

7116 Accounting Information Systems via the Internet

Elective Course, 7th semester, 6 ECTS units

Instructor: Associate Professor Orestis Vlismas

URL: https://eclass.aueb.gr/courses/LOXR320/

Course Description

The primary objective of the course is to introduce students to the subject of Accounting Information Systems (AIS) as a tool for information and management of modern enterprises. Students are invited to familiarize themselves with modern techniques and technologies in the area of information systems from the point of view of accounting.

The structure of the course includes the following subject areas:

- Introduction to Accounting Information Systems (AIS). General Systems Theory. The Information System and its Operations. Accounting as an Information System. Definition of AIS and differences with the Management Information System.
- Process Documentation Methods. Entity - Relationships Diagrams. Data Flow Diagrams. Flowcharts.
- The Business Cycle/circuit and its Subsystems. Business and Accounting Procedures. Basic Structure of Accounting Procedures.
- Modeling of Business Sub-Systems (Purchasing-Import Circuit, Production Circuit, Sales-Output Circuit, Financial Circuit).
- Relational Data Bases and Resource – Event – Agent Ontology.
- Internal Audit, Fraud Control and AIS.
- E.R.P. Elements

Learning Outcomes

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

- Understand the operation of the AIS as a management tool for a business system.
- To familiarize themselves with the logical design of an AIS, the modeling of business and accounting processes and the basic issues of running an information system.
- Understand the feasibility and ways of operating an AIS, analyzing the procedures for collecting, recording and reserving business accounting data.
- Understand the design and modeling of accounting processes, as well as their support by an AIS.
- Understand specific issues of perception of the role of an AIS in the context of modern enterprises, such as the Ontology of Resource - Event - Agent, Control and AIS, Development of AIS etc.
- Familiarize themselves with modern technologies in the field of information systems, such as Databases, E.R.P. systems etc.

Prerequisite Courses

There are no prerequisite courses

Bibliography

- Venieris Georgios, Cohen Sandra, Vlismas Orestis, Accounting Information Systems, 2015
- D. Ginoglou, P. Tachynakis, N. Protogeros, Accounting Information Systems Computerized Accounting, Rosili Publications, 2004

Teaching and Learning Activities

Lectures (2 lecture of 2 hours weekly) and lab exercise

Assessment Criteria

The final grade is set to the grade in the final written examination, which is in multiple choice test format.

6127 Statistical and Machine Learning Methods

Elective Course, 7th semester, 8 ECTS units

Instructor: Full Professor Dimitrios Karlis, Department of Statistics

URL: https://eclass.aueb.gr/courses/STAT248/

Course Description

Distinguishing statistical learning methods as supervised and unsupervised and determining the type of statistical problems they treat, the concept of distance in Statistics, Clustering (K-means, Hierarchical clustering, Model-based clustering), Classification (LDA, QDA, K-nearest neighbors, Fisher's discriminant analysis). Resampling methods (cross-validation, bootstrap), linear model selection and regularization (subset selection, shrinkage, dimension reduction), multinomial regression,, step functions, regression splines, tree methods, support vector machines, neural networks.

Learning Outcomes

Upon completion of the course the students will be able to: apply contemporary statistical methods using the R software to analyze big data, chart and understand relationships in the data, find groups of observations, create classification rules, apply methods and work with large data sets. At the end of the course, the student will be able to construct graphs and understand relationships between data, identify observation clusters in the data, be able to build classification rules

Prerequisite Courses

There are no required prerequisite courses.

Bibliography

- Bartholomew D.J., Steele F., Moustaki I., Galbraithe J.I., Ανάλυση Πολυμεταβλητών Τεχνικών στις Κοινωνικές Επιστήμες, Εκδόσεις Κλειδάριθμος ΕΠΕ, 2011.
- Ιωαννίδης Δ., Αθανασιάδης Ι., Στατιστική και Μηχανική Μάθηση με την R, Εκδόσεις Τζιόλα, 2017.
- Rajaraman A., Ullman D.J., Εξόρυξη από Μεγάλα Σύνολα Δεδομένων, Εκδόσεις Νέων Τεχνολογιών, 2014.
- Sidney B., Everitt, Casella G., Fienberg, S., Ingram O., An R and S-PLUS Companion to
- Multivariate Analysis, Springer-Verlag London Limited, 2005.
- Hastie, Tibshirani and Friedman (2009) Elements of Statistical Learning, 2nd edition Springer
- James, Witten, Hastie and Tibshirani (2011) Introduction to Statistical Learning with applications in R, Springer
- B. S. Everitt, S. Landau, M. Leese, and D. Stahl (2011) Cluster Analysis, Fifth Edition, Wiley.

Teaching and Learning Activities

Class lectures. Lab exercise. Studying and analyzing bibliography. Tutorial.Assignments.

Assessment Criteria

Written exam at the end of the semester. Oral exam .Written exam (Project).

3634 Compilers.

Elective Course, 7th semester, 6 ECTS units

Instructor: Laboratory Teaching Staff Member Dr. Athanasios Androutsos

URL: https://eclass.aueb.gr/courses/INF320/

Course Description

Principles and history of compilers. Lexical analysis, Syntax analysis, Semantic analysis (SLR and LR(1) machines). Type analysis, run-time environments, communication with the operating system and the effect of the underlying computer architecture to a compiler. Intermediate code generation, assembly code generation, garbage collection and introduction to code optimization. Implementation of all compiler phases for aa MiniJava compiler.

Learning Outcomes

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

- Understand the basic structures and functions of a compiler
- Study techniques for lexical, syntax and semantic analysis, run-time environment, intermediate code and assembly code generation
- Implement parts of a compiler
- Use practical tools and techniques to build a compiler

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Data structures” or the course “Theory of Computation”. However, it is recommended that students have successfully completed both these courses as well as the courses “Introduction to Computer Programming”, “Computer Programming with JAVA”, and “Operating Systems” in a previous semester.

Bibliography

- "Compilers Principles, Techniques and Tools,'' A.V.Aho, R. Sethi, J. D. Ullman. Εκδόσεις, Addison Wesley 1986
- "Modern Compiler Implementation in Java" by A.W.Appel, J.Palsberg. Cambridge University Press, 2002

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), seminars, group and individual laboratory exercises, group homework assignments, written research report and field exercise.

Assessment Criteria

The final grade is the average (with equal weights) of the final written examination and the group homework assignments. The grade of the group homework assignments is based in an oral examination, an intermediate examination and a final examination.

3818 Network Economics

Elective Course, 7th semester, 6 ECTS units

Instructor: Full Professor George Stamoulis

URL: https://eclass.aueb.gr/courses/INF155/

Course Description

This course aims to present the main economic issues on networking technologies and services, and to familiarize the student with the relevant microeconomic concepts and models. In particular, the course aims to build the background necessary for the student to understand (among others) the different charging models, the economics of flow and congestion control, as well as practical topics such as the new value chains formed in communication services due to the prevailance of Internet technologies, and analyze the strategies of the players participating in such chains. In particular, the course covers: Basic economic concepts: consumer and producer models, application in networks, basic notions of social welfare, externalities, competition models, game theory, lock-in. Basic telecommunication services concepts: multiplexing and data transportation services, telecommunication services and contracts, the Internet value chain. Pricing of communication network services: congestion pricing, resource allocation, flow control models and pricing, pricing in the Internet. Auctions. The telecommunications market today: broadband services, mobile and wireless services, competition in the Internet, regulation. Economic models of new services in the Internet and strategies of the players: content delivery, network neutrality.

Learning Outcomes

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

- Know and apply the basic micro-economic concepts and models,
- Explain the role of charging as a control mechanism in networks,
- Understand the use of auctions as a mechanism for allocation of scarce resources,
- Know the main technologies for broadband services, both wired and wireless,
- Understand in depth the most important economic and business issues of the Internet (network neutrality, competition, strategies of providers),
- Compose value chains for services offered to users over Internet that cover from content delivery to infrastructure provision,
- Evaluate the strategies of providers in value chains.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Introduction to Computer Science” or the course “Communication Networks”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Pricing Communication Networks: Economics, Technology, and Modelling, C. Courcoubetis and R. Weber, Wiley 2003.
- Telecommunication Network Economics: From Theory to Applications, P. Maille and B. Tuffin, Cambridge University Press, 2014.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours weekly), recitations (a total of 3 hours in the semester), 3 homework assignments and a semester project with an overview of a business sector or a research article, on which a report is submitted and an oral presentation is made). The homework assignments and the project are undertaken by pairs of students.

Assessment Criteria

The final grade is set to the weighted average of the final written examination grade and the grades of the projects and the homework assignments, if the final written examination grade exceeds a threshold. Otherwise, the final grade is set to the final written examination grade.

3573 Signals, Systems, and Digital Signal Processing

Elective Course, 7th semester, 6 ECTS units

Instructor: Associate Professor Themos Stafylakis

URL:

Course Description

Continuous and discrete-time signals: complex number theory, continuous-time series and Fourier transform, periodic signals and Fourier transform, the spectrum and phase of signals, autocorrelation and cross-correlation of signals, the sampling theorem and the Nyquist frequency. Linear time-invariant discrete-time systems: the discrete-time Fourier transform, impulse response of systems, convolution theorem, Z-transform, digital filters of finite and infinite impulse response, the transfer function, stability of systems. Spectral signal estimation: parametric estimation, the source-filter model and linear prediction coding, non-parametric estimation and windowing theory, denoising and Wiener filters. Applications: differentiable digital signal processing and neural networks, radio signal modulation and demodulation, voice signal analysis, processing and synthesis, image analysis and processing.

Learning Outcomes

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

- To apply the Fourier transform
- To understand the concept of convolution between signals and its relationship to the Fourier transform
- To study the stability of linear time-invariant systems
- To know and apply spectral signal estimation
- To process discrete time signals and images using filters
- To know basic principles of modulation and demodulation of radio signals
- Understand the relationship between convolutional and recurrent neural networks with finite and infinite impulse response filters.

Prerequisite Courses

To enroll in the course, the student must have passed in previous semesters the course "Mathematics I". However, it is recommended that students have also passed the courses “Applied probability theory” and "Mathematics II”.

Bibliography

- Sanjit K. Mitra, “Digital Signal Processing: A Computer-Based Approach” (3rd Edition),
- New York: McGraw-Hill Higher Education, 2006.
- A. V. Oppenheim and R. W. Schafer, “Discrete-time Signal Processing”, Prentice-Hall, 2009.
- Γεώργιος Καραγιάννης και Πέτρος Μαραγκός, “Βασικές Αρχές Σημάτων και Συστημάτων”,
- Εκδόσεις Παπασωτηρίου, Αθήνα 2010. (In Greek)
- Allen Downey, “Think DSP”

Teaching and Learning Activities

Lectures (2 two-hour lectures per week), workshops (1 two-hour workshop every two weeks), and a project.

Assessment Criteria

The final grade is equal to the grade of the final exam (60% weight) and the grade of the project (40% weight).

8143 Combinatorial Optimization

Elective Course, 7th semester, 6 ECTS units

Instructor: Full Professor Ioannis Mourtos, Department of Management Science and Technology

URL: https://edu.dmst.aueb.gr/

Course Description

The course deals with theory, algorithms and applications of discrete (also known as combinatorial) optimization with an emphasis on problems regarding flows, paths and matchings on graphs. More specifically, the course presents algorithms for the problems of shortest path, maximum flow, minimum-cost flow, maximum-cardinality and maximum-weight matchings (mostly regarding bipartite graphs) and, last, stable matchings and b-matchings on bipartite graphs. Apart from solving such problems using specialized combinatorial algorithms, the students are also expected to formulate applications and real-life problems such as flow, path or matching problems on graphs. In addition, this course introduces general methods for discrete optimization problems that can be modeled as Linear Integer Programs, i.e., Branch-and-Bound and Branch-and-Cut. The purpose of this course is the understanding of algorithmic design specifically for discrete optimization algorithms defined on graphs and integer programming methods. Apart from understanding all related notions, the purpose is to investigate the application of such algorithms (i.e., algorithms for paths, flows and matchings) on real-life problems.

The course material includes the following topics:

- Network Flows and Integer Programming
- Shortest-path algorithms: Dijkstra, Bellman-Ford, Floyd-Warshall
- Maximum-flow and minimum-cost flow algorithms
- Matching algorithms in bipartite graphs: maximum-cardinality matching, maximum-weight matching, stable matching and stable b-matching
- Applications modeled as flow problems: project management, job assignment to machines, distinct and restricted representatives, capital allocation, etc
- Integer programming: branch and bound algorithms, Balas' additive algorithm, branch and cut algorithms
- Integer programming applications
- Trees: properties, traversal algorithms, minimum spanning tree algorithms, Steiner trees.

Learning Outcomes

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

- Describe and employ the fundamental concepts, the basic theorems of Combinatorial Optimisation.
- Perform the calculations for specific methods or algorithms of Combinatorial Optimisation for problems of reasonable scale, e.g., steps of max-flow algorithm, steps of integer programming.
- Model real-life problems arising from a variety of applications as Combinatorial Optimisation problems and identify the appropriate optimisation method or algorithm.
- Comprehend the proofs of relevant theorems and the broader mathematical foundations of Combinatorial Optimisation, use specific theorems (e.g., max-flow min-cut theorem) to resolve more effectively relevant problems and be able to explain and reproduce the most basic among these proofs.
- Study autonomously and in depth the current literature from academic journals and books of Combinatorial Optimisation, even in areas that marginally fall within the content of this course.

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students successfully complete the courses “Mathematics I”, “Mathematics II”, and “Operations Research” before enrolling to this course.

Bibliography

- Textbook (lecture notes): P. Miliotis, I. Mourtos: Discrete Optimisation, AUEB edition (in Greek)
- Additional textbooks, available in AUEB library
- Integer and combinatorial optimization, Wolsey, Laurence A., Nemhauser, George L., New York: Wiley 1988

- Combinatorial optimization: networks and matroids, Lawler, Eugene L., New York: Holt,
- Surveys in combinatorial optimization, Martello, Silvano, Amsterdam: North-Holland 1987
- Geometric algorithms and combinatorial optimization, Grotschel, Martin, Lovasz, Laszlo, Schrijver, Alexander, Berlin: Springer 1988
- Combinatorial optimization: algorithms and complexity, Papadimitriou Christos., Steiglitz, Kenneth Englewood Cliffs, N.J.: Prentice-Hall 1982
- Additional notes, slides and exercises are available on the course website

Teaching and Learning Activities

- Lectures (2 lectures of 2 hours each weekly), recitations (1 recitation of 2 hours weekly), and optional individual homework assignments (weekly).

Assessment Criteria

- The final grade is set to the weighted average of the final written examination grade (with a weight of 80%) and the home assignments grade (with a weight of 20%), or the final written examination grade, whichever is larger.

3644 Information Retrieval Systems

Elective Course, 7th semester, 6 ECTS units

Instructor: Laboratory Teaching Staff Member Dr. Antonia Kyriakopoulou

URL: https://eclass.aueb.gr/courses/INF248/

Course Description

Fundamental concepts of information retrieval. Introduction to inverted indexes. Boolean retrieval model. Indexing. Crawlers, text preprocessing (tokenization, linguistic analysis, stemming, lemmatization). Search structures in inverted indexes, query processing methods, enrichment techniques, and variations of inverted indexes. Algorithms for constructing inverted indexes. Text statistics and compression of inverted indexes. Ranked retrieval. Vector space retrieval model. Evaluation of retrieval systems. Computing scores in a complete retrieval system. Relevance feedback. Latent semantic indexing. Probabilistic retrieval systems. Language model. Machine learning in information retrieval. Learning to Rank algorithms. Neural networks in information retrieval. New similarity approaches based on the retrieval problem (document ranking, query auto-completion, next query suggestion). New term, query, and text representations (embeddings). Retrieval using embeddings – Dense retrieval. Multimodal retrieval. Retrieval-augmented generation (RAG). Applications: Semantic search and question-answering systems using BERT models. Chatbot systems for information retrieval using the Hugging Face library.

Learning Outcomes

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

- Describe the theoretical background of key Information Retrieval models for text collections and the World Wide Web.
- Address issues arising in preprocessing, indexing, and retrieval of information.
- Analyze, design, and implement real-world Information Retrieval applications.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course "Artificial Intelligence" or the course “Data Management and Analysis Systems”. It is also recommended that students have successfully completed the courses "Data Structures," "Probabilities", "Mathematics II," and a programming course in previous semesters.

Bibliography

- C.D. Manning, P. Raghavan, H. Schütze, Εισαγωγή στην Ανάκτηση Πληροφοριών, Kleidarithmos Publications, 2008.
- Ανάκτηση Πληροφορίας, Baeza-Yates Ricardo, Ribeiro-Neto Berthier, 2nd Edition, Tziola Publications, 2014.

Teaching and Learning Activities

Lectures (two 2-hour lectures per week), labs (one 2-hour lab every two weeks), one group programming assignment.

Assessment Criteria

The final grade is the weighted average of the written exam (60%) and the programming assignment (40%), with the condition that the exam grade is at least 4.

3747 Technologies and Programming of Web Applications.

Elective Course, 7th semester, 6 ECTS units

Instructor:

URL: https://eclass.aueb.gr/courses/INF165/

Course Description

World Wide Web – Basic concepts. Web architecture and standards. Web Servers, Proxies and Caches. Architecture of web applications : three-tier architectures, the role of each tier. The Web Browser as a platform for application development: the role of HTML5, CSS and JavaScript (JS) standards. Semantic markup of web content using HTML5, XML. The CSS standard for web content formatting and layout. Syntax of CSS rules and the cascading mechanism. Layout of web content with CSS. Responsive Web Design. Introduction to the JavaScript programming language. Object Oriented Programming in JS. Application development in the Web Browser platform with JS (execution model, DOM API, HTML Forms, events and event handling). Asynchronous programming in JS. AJAX techniques for dynamic content. Single Page Applications – introduction to the React library. Development of server applications in JS - the Node.js platform. Frameworks for development of Node.js web applications. Application development using web services – the REST model. Automated testing of web applications. Web application security, attacks and troubleshooting techniques. Application technology to increase performance, use caching, load balancing. The MongoDB database – data model and application domain. The SaaS, PaaS and IaaS for application development in the Cloud.

Learning Outcomes

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

- Have knowledge of basic concepts and standards of the World Wide Web,
- Understand the factors that shape the architecture of Web applications,
- Understand the appropriate use of the HTML5 and CSS standards,
- Apply HTML5/CSS concepts to produce interactive web content using Responsive Web Design techniques,
- Have knowledge of core principles and implications of JavaScript programming,
- Understand the execution model of JS applications in the Web Browser platform,
- Develop applications in the Web Browser platform using JS and core browser APIs (e.g. DOM API, Fetch API),
- Use the React framework for developing single page applications,
- Understand and apply the REST principles for web service design,
- Develop JavaScript web services in the Node.js platform,
- Understand the challenges of web application testing,
- Use of the MongoDB database for the development of Node.js applications

Prerequisite Courses

To enroll in the course, the student must have successfully completed in a previous semester either the course "Introduction to Computer Programming," "Computer Programming with JAVA," or "Artificial Intelligence." However, it is recommended that students have successfully completed all three of these courses in a previous semester, as well as the courses "Software Engineering" and "Computer Programming with C++".

Bibliography

- Fundamentals of Web Development, 3rd edition, Author: R. Connolly, R. Hoar, Pearson, 2021.
- HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3, and ES6, 3rd edition, Author: J. Kyrnin, J. C. Meloni, Sams Editions, 2021.
- Mastering HTML, CSS JavaScript Web Publishing, Author: R. Colburn, J. Kyrnin, L. Lemay, BPB Publications, 2016.
- Exploring JavaScript (ES2024 Edition), Author: Axel Rauschmayer, Available online: https://exploringjs.com/js/index.html, 2025

Teaching and Learning Activities

The course includes two two-hour lectures per week, a two-hour tutorial per week, and two mandatory programming assignments. The tutorials cover programming skills and present technical implementations of case studies. The programming assignment is assigned to groups of two or three students.

Assessment Criteria

Students are graded through final written exams (70% of the final grade) and a mandatory group project (30% of the final grade). The grading of the projects includes an individual oral examination. If the grade of the written exams is less than 4, the project grades are not counted, and the final grade is equal to the grade of the written exams.

3783 Human-Computer Interaction

Elective Course, 8th semester, 6 ECTS units

Instructor: Assistant Professor Andreas A. Vasilakis

URL: https://eclass.aueb.gr/courses/INF144/

Course Description

Part A – Development of highly usable user interfaces

Introduction to Human–Computer Interaction. Usability of interactive systems. Cognitive models, memory, perception, attention, automatic processes, scripts, metaphors, structural and functional models. Interaction styles: command line, menus, forms, direct manipulation, virtual worlds, natural language, gestures, multimodal interfaces, natural interfaces, cooperation support systems, social networks, interfaces for people with special needs. Development of interactive systems: waterfall model, spiral model, principles of human-centered development, user and context studies, task analysis. User interface design guidelines: design rules, examples of errors, design guidelines for web sites and portable devices. Evaluating interactive systems: formative and summative assessment, keystroke-level models, cognitive walkthrough, usability inspection, measures of effectiveness, efficiency, satisfaction, think aloud, logging actions, interviews, questionnaires, field studies.

Part B – Technology of intelligent user interfaces

Methodology and development tools for: (i) graphical user interfaces, (ii) multimodal user interfaces (e.g., with facial recognition, gesture recognition, speech recognition and synthesis, by using already available machine learning models), (iii) natural language dialogue systems (e.g., with natural language understanding and dialogue management functions, mostly using already available large language models), (iv) 3D user interfaces (virtual, augmented, and mixed reality, using interactive/immersive application development platforms, e.g., Unity).

Learning Outcomes

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

- Describe the main kinds of user interfaces and methods to design, implement, and evaluate interactive computer systems.
- Design, implement, and evaluate user interfaces, assigning central importance to the needs, skills, and preferences of users.
- Design and implement intelligent user interfaces by utilizing existing tools and models for natural language and speech processing, computer vision, virtual, augmented, and mixed reality.

Prerequisite Courses

To enroll to the course, students must have successfully completed at least one of the following courses in previous semesters: “Introduction to Computer Programming (Python)” or “Computer Programming in Java”. It is recommended, however, that students have successfully completed all two courses in previous semesters, as well the courses “Computer Programming in C++”, “Artificial Intelligence”, “Computer Graphics”.

Bibliography

- Interaction Design: Beyond Human-Computer Interaction, 5th Edition, H. Sharp, J. Preece, Y. Rogers. Wiley, 2019.
- Designing the User Interface: Strategies for Effective Human-computer Interaction, 6th Edition, B. Shneiderman B., C. Plaisant, M. Cohen, S. Jacobs, N. Elmqvist, Pearson, 2017.
- Human-Computer Interaction, 3rd Edition, A. Dix, J.E. Finlay, G.D. Abowd, R. Beale. Pearson, 2003.
- The slides of the course contain additional pointers to relevant bibliography, which is freely available or accessible through the AUEB library, and covers Part B in greater detail.

Teaching and Learning Activities

The course comprises two two-hour lectures per week (one for Part A, one for Part B), one two-hour tutorial per week, and one compulsory programming assignment. The tutorials focus on providing relevant programming skills, as well as solving study exercises.

Assessment Criteria

Students of the Department of Informatics are graded by a final written examination (60% of the final grade) and a compulsory group assignment (40%). The grading of the assignment includes an oral examination. If the grade of the written examination is lower than 4, the grade of the programming assignment is ignored, and the final grade equals the grade of the written examination. For students of other departments, the programming assignment is optional.

6005 Data Analysis

Elective Course, 8th semester, 8 ECTS units

Instructor: Professor Ioannis Ntzoufras, Assistant Professor Xanthi Penteli, Department of Statistics

URL:

Course Description

Statistical methods in simple problems using statistical packages (emphasis on R and secondary on other statistical packages): Descriptive statistics, visualization, simulating random numbers from theoretical distributions, confidence intervals, hypothesis testing for one and two independent samples, hypothesis testing for two dependent samples, contingency tables, simple and multiple regression analysis, AnCoVa models and analysis for one and two factors (and one continuous explanatory). Case studies and analysis real data sets from various scientific fields (economics, marketing, social sciences, sports, medicine, psychology etc.). Basic principles for writing professional and scientific reports.

Learning Outcomes

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

- Manage real life problems and analyze data in R,
- Perform basic hypothesis testing,
- Construct and interpret regression models, and
- Write statistical reports in a professional manner.

Prerequisite Courses

There are no required prerequisite courses.

Bibliography

- Ντζούφρας Ι., Καρλής Δ., Εισαγωγή στον Προγραμματισμό και στη Στατιστική Ανάλυση με R, Εκδόσεις Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα Αποθετήριο "Κάλλιπος'', 2016.
- Φουσκάκης Δ. (2013). Ανάλυση Δεδομένων με Χρήση της R. Εκδόσεις Τσότρας. Αθήνα.
- Marques de Sa, Joaquim P., Applied Statistics Using SPSS, STATISTICA, MATLAB and R, Editions Springer-Verlag, 2008.
- Chatterjee S., Handcock M.S., Simonoff J.S. (1995). A Casebook for a First Course in Statistics and Data Analysis. John Wiley & Sons.
- Faraway J.J. (2002). Practical Regression and Anova using R. Free electronic book available at http://cran.rproject.org/doc/contrib/Faraway-PRA.pdf.
- Fox J. & Weisberg H.S. (2011). An R Companion to Applied Regression. 2nd edition. SAGE Publications Inc.

Teaching and Learning Activities

Class lectures. Lab exercises. Studying and analyzing bibliography. Tutorial. Assignments.

Assessment Criteria

Student Assessment Method: Written exam at the end of the semester (50%). Assignment and oral examination/presentation (50%). Lab exercises (small extra bonus).

3862 Performance Evaluation of Complex Networked Systems

Elective Course, 8th semester, 6 ECTS units

Instructor: Full Professor Iordanis Koutsopoulos

URL: https://eclass.aueb.gr/courses/INF334/

*Course Description **

The purpose of the course is to teach and apply the basic analytical and experimental methods for evaluating the performance of complex networked systems such as (1) wired and wireless computer and network systems, (2) the smart energy grid (Smart grid), (3) social networks, (4) other networked systems such as the web, as well as the use of these methods to optimize the design and operation of these systems. The content of the course is structured in the following sections. (a) Performance models with M/M/1, M/M/m, M/G/1 queues and applications in computer and network systems. (b) Throughput and maximization algorithms in wireless networks. Delay. Energy consumption. (c) Markov chains and applications in networks and the web. (d) Markovian decision processes. (e) Introduction to Reinforcement Learning and Multi-armed bandits. (f) Modern learning techniques such as Federated Learning and Continuous Learning. (g) Introduction to the quantum internet.

*Learning Outcomes **

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

- Describe and handle the basic performance measures and mathematical tools used in the performance analysis of complex networked systems.
- Combine simple models (such as queues) in order to construct and study more complex system models.
- Understand throughput and latency as performance measures, as well as their optimization algorithms.
- Model real complex networked systems, possibly making appropriate simplifications, and determine their performance with mathematical tools, if possible, and with simulations, if necessary.
- To compare different systems and networks and their models, evaluating their quantitative and qualitative characteristics.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, one of the courses “Probability” or “Communication Networks”.

*Bibliography **

- Data Networks, D. Bertsekas, R. Gallager, 2nd edition, Prentice Hall, 1992.
- T. Lattimore, C. Szepesvari, “Bandit Algorithms”, Cambridge University Press, July 2020, ISBN: 9781108571401

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly) and individual homework assignments.

Assessment Criteria

The final grade is the weighted average of the final examination grade (with a weight of 80%) and the grade of the personal homework assignments (with a grade of 20%).

3842 Information Systems Applications Development

Elective Course, 8th semester, 6 ECTS units

Instructor: Full Professor Ioannis Kotidis

URL: https://eclass.aueb.gr/courses/INF183/

Course Description

Tools and environments used in developing Information Systems. Management of IT projects. Scheduling, network analysis, Activity on Arrow, Activity on Node networks, PERT analysis. Resource management, adjustments, cost estimation, monitoring. Big Data applications. Caveats of using big data analytics in decision making. Big data systems and tools. Data streams management systems. Applications of hashing in big data systems. Quick introduction to data mining. Data reduction techniques. Locality sensitive hashing for nearest neighbor queries. Implementation of an IT application (group project), requirement gathering and analysis. Conceptual modeling, technical design. Demonstration of working system.

Learning Outcomes

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

- Know the methodology of designing, scheduling and monitoring an IT project.
- Publicly present and defend the goals of their IT project.
- Conceptualize and implement a group IT project.
- Identify opportunities for applying data analysis techniques in order to enhance the functionality of a modern Information System.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, one of the courses “Databases” or “Software Engineering”. However, it is recommended that students have successfully completed both these courses as well as the course “Analysis and Design of Information Systems”.

Bibliography

- Fundamentals of Project Management, R. Burke, Burke Publishing, 2010.
- Modern Systems Analysis and Design, J. Hoffer, J. George, J. Valacich, Prentice Hall Publishing, 2011.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), recitations (a total of 2 recitation of 2 hours each), a group project assignment, 2 group presentations, and a final group project assignment presentation.

Assessment Criteria

The final grade is set to the weighted average of the final examination grade (with a weight of 30%) and the grade of the group assignment (with a weight of 70%). The grade of the group project assignment is based on the project code, its documentation, its deliverables, and its presentations.

3561 Computer Architecture

Elective Course, 8th semester, 6 ECTS units, TAUGHT IN ENGLISH

Instructor: Assistant Professor Spyros Voulgaris

URL: https://eclass.aueb.gr/courses/INF156/

Course Description

Modern computer architectures and design cycle of integrated circuits and systems. MIPS assembly, compilers and their relation to computer architecture. Computer architecture and the VHDL language. Design of the data path and control circuit for MIPS (one cycle), pipeline and MIPS design, MIPS of multiple cycles. Instruction level parallelism, out of order execution, microprogramming, memory hierarchy, cache memories, and I/O. Cluster computers. Case studies of Pentium, PowerPC and other RISC architectures. Embedded systems and Systems-on-Chip.

Learning Outcomes

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

- Understand the principles and detailed operation of computer processors.
- Design CPUs, memories, I/O systems
- Understand the design trade-offs
- Compare different CPU architectures
- Program in MIPS assembly language
- Use Quartus for designing digital systems

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, the course “Computer Systems Organization”. However, it is recommended that students have successfully completed the courses “Digital System Design” and “Algorithms”.

Bibliography

- Computer Organization and Design: The Hardware/Software Interface – D. Hennessy and J. Patterson, 6th edition (MIPS edition).
- Structured Computer Organization, A.S. Tanenbaum, 6th edition, 2012
- Οργάνωση Συστημάτων Υπολογιστών, Ι. Κάβουρας, Εκδόσεις Κλειδάριθμος, 2009.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 weekly recitation of 2 hours), and laboratory exercises.

Assessment Criteria

The final grade is a weighted average of the final written examination (with an 70% weight) and the grade of all assignments (with a 30% weight).

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6082 Linear Algebra II.

Elective Course, 8th semester, 7.5 ECTS units

Instructor: Full Professor Michail Zazanis and Adjunct Lecturer Evangelos Melas, Department of Statistics

URL: https://eclass.aueb.gr/courses/STAT218/

Course Description

Rectangular matrices, the Gramm-Schmidt rectangularization and A = QR factorization. Determinants. Eigenvalues and characteristic polynomial, eigenvectors and eigen spaces. The minimal polynomial. Matrix powers and spectral theorem for symmetric matrices. Basis coordinates and similar matrices. Quadratic forms in symmetrical matrices: positive, Raleygh quotient, ellipsoids in n – dimensions. The Jordan canonical form. The Principal Component Analysis (PCA). The Singular values decomposition SVD). The Polar decomposition. Complex and 37 hermitian matrices. The generalized inverse (Moore-Penrose inverse) and its applications in linear regression and projection matrices.

Learning Outcomes

In-depth understanding of the concepts of the course so that students be able to answer questions demonstrating this understanding. The acquisition of a geometric oversight of concepts such as projection, determinant, eigenvalues and eigenvectors. Finally, applying this knowledge to solving exercises, such as calculating a projection matrix, solving a function interpolation problem with least squares, matrix diagonalization, calculating the square type contour lines. Applications of eigenvalues/eigenvectors also include an introduction to the Principal Component Analysis method and Dynamical systems..

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students successfully complete the course “Discrete Mathematics” before enrolling to this course.

Bibliography

- Gilbert Strang (1999), Γραμμική Άλγεβρα και Εφαρμογές, Πανεπιστημιακές Εκδόσεις Κρήτης.
- Ε. Ξεκαλάκη & Ι. Πανάρετος (1993), Γραμμική Άλγεβρα για Στατιστικές Εφαρμογές, Αθήνα.
- Η. Φλυτζάνης (1999), Γραμμική Άλγεβρα & Εφαρμογές, Τεύχος Α: Γραμμική Άλγεβρα, Το Οικονομικό.
- Γ. Δονάτος-Μ. Αδάμ (2008), Γραμμική Άλγεβρα Θεωρία και Εφαρμογές, Gutenberg.
- D. C. Lay, (2012), Linear Algebra and Applications, Addison-Wesley.
- Harville, D. A. (1997), Matrix Algebra from a Statistician’s perspective, Springer.
- Healy, M.J.R. (1995), Matrices for Statistics, Oxford University Press.
- Searle, S. R. (1982), Matrix Algebra Useful for Statistics, Wiley.

Teaching and Learning Activities

Class lectures. Tutorial.

Assessment Criteria

Written exam at the end of the semester.

3741 Conceptual System Modelling.

Elective Course, 8th semester, 6 ECTS units

Instructor: Full Professor Panagiotis Constantopoulos

URL: https://eclass.aueb.gr/courses/INF224/

Course Description

The study of natural, biological, and social systems, as well as the design of engineered systems—including information systems—relies on the use of models. By *models*, we mean abstract representations of an application domain expressed in an appropriate language (logical, mathematical, or diagrammatic). Models are used to describe the structure and processes of a system in sufficient detail to enable its analysis, that is, the study of its operation, behavior, and possible interventions. They also serve as the conceptual space in which the creative work of system design takes place, namely the specification of a system's structure and functionality so that it fulfills predefined objectives. So-called *conceptual models* describe a domain using categories that closely resemble those employed in human cognition, making them particularly suitable for system analysis. *Conceptual modeling* concerns the construction of such models, first as conceptual abstractions and subsequently as formal specifications in a dedicated modeling language. It constitutes an essential part of *knowledge representation*, a field that lies at the intersection of data management and artificial intelligence.

The course covers the following topics: the role of conceptual modeling in the development of organizational and information systems; semiotic foundations; elements of conceptual models, including entities, attributes, relationships, individuals, and classes; abstraction mechanisms, such as classification, attribute assignment, and generalization; inheritance; conceptual modeling languages and environments; production rules and integrity constraints; reification of attributes; general modeling patterns, including identity, meronymy (part–whole relationships), grouping, roles, and realization; metamodels; metadata; Semantic Web languages (XML, RDF, and OWL); Linked Data; knowledge organization systems, including taxonomies, thesauri, and the SKOS standard; ontologies; the CIDOC CRM standard; and data transformation and integration.

Learning Outcomes

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

- Have in-depth working knowledge of conceptual modeling methods.
- Perform domain analysis and design models on a real scale.
- Use advanced modeling languages and environments.
- Have working knowledge of knowledge organization systems and ontologies.

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students successfully complete the courses “Databases” and “Logic” before enrolling to this course.

Bibliography

- Conceptual Modeling of Information Systems, A. Olivé, Springer, 2007.
- Conceptual Modelling, M. Boman, J. Bubenko Jr., P. Johannesson, B. Wangler, Prentice Hall, 1997.
- Metamodeling for Method Engineering, M. Jeusfeld, M. Jarke, J. Mylopoulos, MIT Press, 2009.
- Analysis Patterns, M. Fowler, Addison-Wesley, 1997

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each, weekly), recitations (1 recitation of 2 hours at selected weeks), individual homework assignments and a group homework assignment.

Assessment Criteria

If the final written examination grade is passing, the final grade is set to the weighted average of the final written examination grade (with a weight of 80%), the individual homework assignment grade (with a weight of 10%) and the group homework assignment grade (with a weight of 10%). Otherwise, the final grade is set to the final written examination grade.

3743 Data Mining and Data Science

Optional Course,8th semester, 6 ECTS units

Instructor: Assistant Professor Ioannis (John) Pavlopoulos

URL: https://eclass.aueb.gr/courses/INF131/

Content

Programmatic access via Python to large and openly accessible data collections. Data preprocessing and analysis (Pandas), spatiotemporal mapping of texts (geopandas, folium). Text segmentation (byte-pair encoding) and macroscopic data analysis with regular expressions in Python. Representation of lexical units and texts (fastText, BERT, Instructor). Visualisation (Matplotlib, Seaborn, Tensorflow). Manual annotation of texts and images, assessment of inter-rater agreement with relevant indices (Kappa coefficient), extraction of ground truth data. Supervised learning with noisy or biased data. Identification of biases in data. Interaction with large language models (LLMs). Data augmentation with large language models (LLMs) and through crawling. Prompting large language models with few-shot learning. Introduction to conformal prediction and its applications in supervised learning. Data clustering with K-Means, DBSCAN, agglomerative, deep clustering. The Silhouette index and its use for determining the optimal number of clusters. Evaluation of clustering solutions. Text clustering with representations from large language models (Instructor, E5). Dimensionality reduction with T-SNE and UMAP. Introduction to topic modelling (Latent Dirichlet Allocation).

Learning Outcomes

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

- Explain in detail the core concepts in Data Science.
- Use statistical methods and visualisation techniques to explore a dataset.
- Apply Machine Learning algorithms to make predictions based on available data.
- Develop data analysis software.
- Use critical thinking and diagnostic tests to make appropriate data-driven decisions.

Prerequisite Courses

To enroll in the course, the student must have successfully passed either the "Artificial Intelligence" course or the "Machine Learning" course in a previous semester. However, it is recommended that students have successfully passed both courses as well as the courses "Introduction to Computer Programming," "Mathematics II," "Probabilities," "Algorithms," and "Statistics in Informatics" in a previous semester.

Recommended Bibliography

- Grus, Joel. Data science from scratch: first principles with python. O'Reilly Media, 2019, 2nd Edition, ISBN: 9781492041139.
- VanderPlas, Jake. Python data science handbook. O'Reilly Media, Inc., 2022, 2nd Edition, ISBN: 9781098121228.

Teaching and Learning Methods

Lectures (2 lectures of 2 hours per week), laboratories (1 laboratory of 2 hours per week), and semester project.

Assessment/Grading Methods

The final grade is equal to the grade of the written final exam (which has a maximum score of 6), if that grade is less than 3. If the grade of the written final exam is at least 3, the final grade is the exam grade increased by up to 4 points, depending on the performance at the progress test, exercises, and the assignment. For the group assignment, which is assessed orally at the end of the semester, the grade is individual per student.

2610 Business Strategy

Elective Course, 8th semester, 6 ECTS units

Instructor: Full Professor Vasilios Papadakis

URL: https://eclass.aueb.gr/courses/ODE293/

Course Description

The course approaches a plethora of problems that puzzle every company and manager. We discuss such issues as:

- How to analyze the external environment of the company (Structural Analysis of Industries, Strategic Groups, Trends).
- How to exploit and build resources and capabilities needed to achieve, maintain and improve the firm's market positioning (strategy as the creation of dynamic capabilities).
- The processes of strategy formulation and to what extent Greek companies are following them.
- How to direct the company into the future (mission/vision/strategic intent).
- How to make a strategic choice, given a number of alternative strategic options (choices include: in which areas should we diversify, in which products/services should we expand, how are we going to implement this expansion, are we going to acquire, merge, form an alliance with another business).
- How to build and sustain competitive advantage.
- What type of structure, systems, people, does a company need to successfully implement a chosen strategy.
- How to make better strategic decisions and how to avoid the hidden traps that lead to erroneous decisions.

Learning Outcomes

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

- Understand the basic theories and tools of strategy that have been developed in theory and practice.
- Use the tools and techniques of strategy analysis and to understand their pros and cons.
- Understand how to craft and implement strategy, given a number of alternative strategic options
- Evaluate alternative strategies and choose the optimal ones.
- Develop understanding on how to build and sustain competitive advantage.
- Realize what type of structure, systems, people, a company needs to successfully implement a chosen strategy.
- Spot and discuss the most common strategy mistakes taking place.

Prerequisite Courses

The knowledge of basic concepts of Business Administration and Marketing helps in the better understanding of the material of this course.

Bibliography

- Contemporary Strategy Analysis, R. M. Grant, Wiley, 9th edition, 2016.
- Strategic Management Theory, C. Hill, G. Jones, M.A. Schilling, Cengage Learning, 11th edition, 2015.
- Exploring Strategy, G. Johnson, R. Whittington, K. Scholes, D. Angwin, P. Renger, Prentice Hall, 10th Edition, 2014.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly).

Assessment Criteria

The final grade is based on a final written examination.

3713 Decision and Game Theory

Elective Course, 8th semester, 6 ECTS units

Instructor: Assistant Professor Alkmini Sgouritsa

URL: https://eclass.aueb.gr/courses/INF506/

Course Description

A priori, a posteriori and subjective probabilities. Decision problem formulation through Decision trees. Decision selection criteria. Bayes' theorem and Bayes' decision rules. Utility function determination. Competitive decisions. Game theory: game trees, extensive and normal form. Two player games, zero and nonzero sum. Applications to auctions, and other applications in economics, computer science and business.

Learning Outcomes

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

- Describe basic decision problems, using decision trees.
- Analyze decision problems and portfolio selection problems.
- Model scenarios of competition as multi-player games.
- Analyze games according to the solution concept of Nash equilibrium, and describe the recommended strategies.
- Evaluate different strategies using game-theoretic criteria.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, one of the courses “Mathematics I” or “Probability”. However, it is recommended that students have successfully completed both these courses.

Bibliography

- An Introduction to Game Theory, M. J. Osborne, Oxford University Press, 2003.
- A Primer in Game Theory, R. Gibbons, Pearson Education Limited, 1992.
- Decision Analysis: Introductory Lectures on Choices under Uncertainty, H. Raiffa, Addison Wesley, 1968.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), recitations (1 weekly recitation of 2 hours), and 2 individual homework assignments.

Assessment Criteria

The final grade is equal to the grade of the final written examination, if that grade is not passing; otherwise, it is equal to the weighted average of the final written examination (with a weight of 85%) and the grade of the homework assignments (with a weight of 15%).

3814 Information Theory

Elective Course,, 8th semester, 6 ECTS units

Instructor: Not offered in Academic Year 2026-2027

URL:

Course Description

Information theory studies the fundamental questions relating to data compression and transmission. This class offers a broad introduction to the basic concepts of information theory, together with some elements of practical applications to data compression and to channel coding. Connections with computer science are also discussed. Specifically: entropy and information. The "asymptotic equipartition" property. Lossless data compression: theory and the algorithms of Shannon and Huffman, arithmetic coding. Noisy channels: coding and channel capacity. Source-channel separation. Quantization and lossy data compression; the rate-distortion function. Kolmogorov complexity and entropy.

Learning Outcomes

At the conclusion of the course, students should be able to:

- Describe, manipulate, and apply the basic concepts (entropy, mutual information, capacity, rate-distortion function) and basic coding theorems (compression with or without losses, channel coding through noisy channels) of Information Theory.
- Identify the fundamental tradeoffs and limitations that are present in systems for transmitting and storing information.
- Model systems that create, transmit, and store information using the fundamental, constituent models of Information Theory.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, the course "Probability". However, it is recommended that students have also successfully completed the courses "Applied Mathematics and Randomized Algorithms" and "Mathematics II".

Bibliography

- Elements of Information Theory, T. Cover, J. Thomas, 2nd edition, Wiley, 2006.
- Information Theory, Inference and Learning Algorithms, D. J. C. MacKay, Cambridge University Press, 2003.

Teaching and Learning Activities

Lectures (1 lecture of 3 hours weekly), recitations (1 recitation of 2 hours weekly) and weekly individual homework assignments.

Assessment Criteria

The final grade is set to the grade in the final written examination.

8116 Mathematical Optimization

Elective Course, 8th semester, 6 ECTS units

Instructor:

URL: https://edu.dmst.aueb.gr/

Course Description

The course examines the theory and algorithms of Mathematical Optimization, as well as their relationship with other fields (such as Game Theory). Specifically, the optimization of linear problems, Dual Theory, basic Linear Programming algorithms, basic concepts of Non-Linear Programming and Integer Programming, problem formulation, Dynamic Programming, and the relationship of Linear Programming to Game Theory are examined.

The course material includes the following topics:

- Elements of Linear Algebra, parametric solution of linear equations
- The Simplex Method: description, geometric interpretation and special cases
- Sensitivity analysis and economic meaning
- The Karush-Kuhn-Tucker conditions, description and proof
- Duality Theory • Introduction to Non-Linear Programming
- The transportation problem and the Network Simplex Algorithm
- Model building and formulation, applications and case-studies
- Integer Programming, modeling and solution methods
- Linear Programming and Game Theory
- Dynamic Programming: formulations, solution approach and applications

Learning Outcomes

The aim is to understand the above and their combined application to optimization problems as they arise from practical applications. Sub-objectives are to deepen the understanding of mathematical structures and properties of problem categories, the use of Mathematical Optimization algorithms and the design of their variants for special cases of problems and the formulation and solution of relevant practical problems.

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students successfully complete the courses “Mathematics I”, “Mathematics II”, and “Discrete Mathematics” before enrolling to this course.

Bibliography

- Textbook (lecture notes): P. Miliotis, I. Mourtos: Discrete Optimisation, AUEB edition (in Greek)
- Additional textbooks, available in AUEB library
- Integer and combinatorial optimization, Wolsey, Laurence A., Nemhauser, George L., New York: Wiley 1988.
- Combinatorial optimization: networks and matroids, Lawler, Eugene L., New York: Holt.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), recitations (1 recitation of 2 hours weekly), and optional individual homework assignments (weekly).

Assessment Criteria

The final grade is set to the grade in the final written examination.

3822 Parallel Programming (formerly “Special Topics on Parallel Programming)

Elective Course, 8th semester, 6 ECTS units ***URL:***

Instructor: Assistant Professor Andreas A. Vasilakis

Course Description

The purpose of this course is to familiarize students with the fundamental concepts, organization, challenges, and programming techniques of parallel computing systems, as well as their various architectures. By attending this course, students will develop skills in designing and programming efficient parallel systems. The course will cover major parallel computer architectures, such as shared memory systems, multicore/manycore systems, computing clusters, and general-purpose GPU programming (GPGPU programming). Students will also learn about the shared address space model and message-passing model, through popular standards such as POSIX threads, OpenMP, CUDA, and MPI. In addition to providing general knowledge that enables students to program parallel applications and algorithms, the course includes hands-on practice using widely adopted programming models and libraries that are used internationally. Students will be required to complete programming assignments aimed at enhancing their understanding, providing practical experience, and assessing their progress.

Learning Outcomes

The aim of the course is to introduce students to the scientific field of parallel computer programming and to equip them with the necessary knowledge for its practical application. Upon successful completion of the course, students will be able to:

- Study and understand the organization of a parallel computer.
- Analyze the advantages and disadvantages of architectural choices.
- Understand memory hierarchy issues, such as cache coherence and memory consistency.
- Understand and analyze processor interconnection network topology and switching/routing techniques.
- Design the organization of a parallel system based on goals or specifications.
- Develop parallel software.
- Program using the shared address space model, employing threads and OpenMP.
- Program using the message-passing model, employing MPI.
- Analyze the performance of a parallel system.

Prerequisite Courses

To enroll in the course, students must have successfully completed the course “Computer Programming in C++” in a previous semester. In addition, it is recommended that students have also successfully completed the course “Computer Systems Organization” in a prior semester.

Bibliography

- “ Parallel Systems and Programming”, V. Dimakopoulos (2015). (in Greek)
- “An Introduction to Parallel Programming ”, P. Pacheco (2015).
- “Introduction to Parallel Computing" (2nd Edition) ”, Pantziou, Mamalis, Tomaras (2013). (in Greek)
- “Programming and Architecture of Parallel Processing Systems” Papadakis & Diamantaras (2012). (in Greek)
- “ Programming Massively Parallel Processors: A Hands-on Approach”, D. B. Kirk, W-m. W. Hwu (2010).

Teaching and Learning Activities

- Lectures (2 lectures weekly), recitations (1 recitation of 2 hours weekly), and 3 individual homework assignments.

Assessment Criteria

The final grade for each student is based on two criteria: performance on programming assignments (30% of the final grade) and the final written exam (70% of the final grade). To pass the course, the student must meet the minimum required performance in both grading components (assignments and final exam). Specifically, the student must successfully complete and submit the programming assignment, undergo an oral examination on the assignment and receive a grade of at least 1.5, and attend the final written exam and achieve a grade of at least 3.5. Meeting these minimum thresholds in both components is mandatory to pass the course.

6142 Probability II

Elective Course, 8th semester, 7.5 ECTS units

Instructor: Full Professor Petros Dellaportas and Assistant Professor Stavros Vakeroudis, Department of Statistics

URL: https://edu.dmst.aueb.gr/

Course Description

Joint distributions of discrete random variables, marginal and conditional distributions. The multinomial and the multi-hypergeometric distribution. Joint distributions of continuous random variables. Joint, marginal, and conditional densities. Transformations of multidimensional random variables. The $\chi 2$, t, and F distributions. Order Statistics. The multivariate normal distribution. Convergence in distribution. The Central Limit Theorem..

Learning Outcomes

Upon successful completion of the course, students will have a fuller and deeper understanding of the concepts learned in the introductory probability course. They will have understood the basic concepts underlying multidimensional probability distributions and obtained the necessary mathematical skills in order to use them in the context of statistical problems.

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students successfully complete the course "Probability" before enrolling to this course.

Bibliography

- Wayne L. Winston: Introduction to Mathematical Programming: Operations Research, Thomson Learning; 4th edition, 2002.
- H. Paul Williams: Model Building in Mathematical Programming, 5th edition, Wiley, 2013
- D. Bertsimas and J. Tsitsiklis: Introduction to Linear Optimization, 3rd edition, Athena Scientific, 1997.
- D. Alevras and M. W. Padberg: Linear Optimization and Extensions: Problems and Solutions, Springer, 2013.
- L. A. Wolsey: Integer Programming, Wiley-Interscience, 1998.

Teaching and Learning Activities

Class lectures. Tutorial. Assignments. Self Study.

Assessment Criteria

Written exam at the end of the semester.

6125 Simulation

Elective Course, 8th semester, 7 ECTS units

Instructor: Full Professor Petros Dellaportas

URL: https://eclass.aueb.gr/courses/STAT204/

Course Description

Generating uniform random variables, reductive generators, random number tests, methods of generating random numbers. The inversion method, the rejection method, component method, other methods. Methods for specific distributions. Dispersion reduction techniques and the Monte Carlo integration: Monte Carlo simulation, significance sampling, opposite random variables, control random variables. Generating dependent random variables: ranked sample, exponential spaces, multivariate normal distribution, Poisson process, Markov chains, random Markov fields, Gibbs sampler, Particle filtering.

Learning Outcomes

The students after successfully completing the course will be able to understand elements of stochastic simulation and implement it on a computer.

Prerequisite Courses

There are no required prerequisite courses. It is, however, recommended that students successfully complete the course “Probability” before enrolling to this course.

Bibliography

- Δελλαπόρτας, Π. (1994). Στοχαστικά Μοντέλα και Προσομοίωση. Σημειώσεις παραδόσεων, τμήμα Στατιστικής, Οικονομικό Πανεπιστήμιο Αθηνών. Διαθέσιμες στη διεύθυνση http://www.stat-athens.aueb.gr/~ptd/simulation.ps.
- Devroye, L. (1986). Non-Uniform Random Variable Generation, Springer-Verlag, New York.
- Ripley, Brian D. (1987). Stochastic Simulation, John Wiley, New York.
- Robinson, S. (2004). Simulation: The Practice of Model Development and Use, Wiley, Chichest, UK.
- Robert, C., Casella, G. (2010). Introducing Monte Carlo Methods with R. Springer.

Teaching and Learning Activities

Class lectures. Tutorial. Assignments. Self Study.

Assessment Criteria

One assignment. Written exam (Project).

3791 Elements of Information Law

Elective course, 8th semester, 6 ECTS units

Instructor: Adjunct Lecturer Dr. Evangelia Vagena

URL: https://eclass.aueb.gr/courses/INF365/

Course Description

The course aims to provide the students with the basic knowledge on the following topics:

- Copyright and Information Society (software protection, technological protection and management measures, peer-to-peer / P2P exchanges, collective management, open source, etc.)
- E-Commerce (electronic transactions, consumer protection, domain names, special issues, geolocalization, online gambling, etc.)
- Liability of providers (ISPs, search engines, webhosts, etc.)
- Protection of privacy and confidentiality and the relationship with information systems security (especially new GDPR, NIS directive)
- Specific issues of privacy and personal data protection (working relationships in the Information Society and employee surveillance, public surveillance, search engine privacy issues, privacy and social networking)
- Protection of confidentiality (especially in electronic transactions and in relation to the possibilities of removing the confidentiality of communications, etc.)
- Cybercrime and information systems security (Hacking, DDOS, Budapest cybercrime convention, Computer / Digital Forensics etc.).

Learning Outcomes

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

- recognize the limits of their legal action regarding the use of the internet and IT applications
- develop applications that will take into account the requirements of the regulatory framework by design
- know their rights and obligations in the context of the information society

Prerequisite Courses

There are no required prerequisite courses.

Bibliography

- Notes distributed by the instructor
- legal texts distributed
- Vagena E., Technological protection, Nomiki Vivliothiki publications, 2011
- Mitrou L., Kokolakis S., facebook, Blogs and rights, Sakkoulas SA publications, 2010
- Papakonstantinou V., IT Law, Sakkoulas SA publications, 2010
- Igglezakis I, Informatics Law, 3rd ed., PN Sakkoulas publications, 2018
- Dalakouras Th, Electronic Crime, Nomiki Vivliothiki publications, 2019

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each per week), lectures by guest expert speakers and individual / or group assignments .

Assessment Criteria

The final grade is set to the grade in the final written examination (best mark 10) or in combination with the assessment of the individual or group assignment.

3882 Multimedia Technology

Elective Course, 7th semester, 6 ECTS units

Instructor: Full Professor Georgios Xylomenos

URL: https://eclass.aueb.gr/courses/INF179/

Course Description

Introduction, motivation, relationship with other fields and trends. Multimedia applications and systems. Definitions and attributes of media types. Data streams, media and multimedia. Audio, images and video. Elements of information theory. Data encoding and compression. Compression standards: JPEG, MPEG (1, 2, 4), H.264, MP3, AAC. Synchronization, SMIL. Multimedia in communication networks and the World Wide Web. Multimedia multicasting. Teleconferencing. Synchronization. Media streaming, media servers, RTP/RTCP, RTSP, IPTV, MPEG-DASH. Quality of Service with and without network support.

Learning Outcomes

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

- Define the concept of multimedia, describe the basic media types and distinguish the various types of multimedia applications.
- Distinguish various schemes of digital media representation (audio, image, video) and distinguish the basic encoding schemes (entropy, differential, transform, vector quantization).
- Describe the basic standard media encoding schemes (JPEG, H.26x, MPEG-x).
- Determine the basic problems in quality of service provisioning for networked multimedia and describe the main protocols used (RTP, RTCP, RTSP, DASH).
- Compose networked multimedia applications using standardized libraries and programming environments of their choice.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, either the course “Communication Networks” or the course “Computer Programming in C++”. However, it is recommended that students have successfully completed both these courses in a previous semester.

Bibliography

- Multimedia Communications, F. Halsall, Addison-Wesley, 2001.
- Fundamentals of Multimedia, Z. N. Li and M.S. Drew, Prentice Hall, 2004.
- Multimedia Systems, R. Steinmetz, K. Nahrstedt, Springer, 2004.
- Multimedia Applications, R. Steinmetz, K. Nahrstedt, Springer, 2004.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly), recitations (1 recitation of 2 hours weekly), and programming homework assignments.

Assessment Criteria

The final grade is set to the final written examination grade (which has a maximum of 6), if that grade is below 3. Otherwise, it is set to the final written examination grade increased by at most 4, depending on the performance of students in the programming homework assignments.

3584 Technological Innovation and Entrepreneurship

Elective Course, 8th semester, 6 ECTS units ***Instructor: Academic Scholar Dr. Aggeliki Karagiannaki***

URL: https://eclass.aueb.gr/courses/INF309/

Course Description

The course covers key modules, such as: development and design of innovative products and services; innovative trends recognition and creativity techniques; market and competition analysis; design and evaluation of the business model using the business model canvas; presentation of innovative applications and case studies; mockup and customer-centric design; developing presentation skills (Pitching); financial analysis for start-ups; managing innovation teams; digital marketing, sales and online promotion; legal guide to an innovative idea; funding opportunities; technology transfer models. During the course, students are encouraged to work together (in groups) with a project/assignment/start-up company to better consolidate and apply knowledge. During the project, the students understand all the steps starting from the concept of business opportunity, the design and development of the business model to the implementation of mockup screens and a first prototype version and all the necessary challenges encountered when setting up a new business. The innovative business idea may involve new products or services but also new processes, new ways of interacting with the customer, and new business models and practices.

Learning Outcomes

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

- Apply techniques for boosting creativity and the production of novel ideas.
- Focus on the target market, conduct market research, and evaluate competition.
- Analyze how to design and evaluate alternative business models.
- Understand basic aspects of business planning (such as digital marketing and sales, legals issues, financing issues, etc.)
- Structure their ideas around a robust whole and support them with appropriate arguments, combining persuasion, action, and creativity.
- Understand the challenges of building a work team and have a better understanding of themselves as businessmen and their incentives, roles, and basic responsibilities.

Prerequisite Courses

There are no prerequisite courses.

Bibliography

- Disciplined Entrepreneurship. Bill Aulet. Edited by Nikolaos Theodorakis. Utopia Publications, 2021.
- Entrepreneurship & Business Planning. Katerina Sarri and Stavroula Laspita. Tziolas Publications, 2022.
- Innovate–Entrepreneur. Edited by S. Lioukas. Athens University of Economics and Business Publications, 2013.
- Entrepreneurship. Alain Fayolle. Translated into Greek by Danae Helmi. Propobos Publications, 2020.
- Innovation and Entrepreneurship (translated from the English original). John Bessant and Joe Tidd. Tziolas Publications, 2016.
- Innovation and Entrepreneurship: From Theory to Practice. I. L. Karagiannis and I. Bakouros. Sofia Publications, 2010.
- Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, A. Osterwalder, Y. Pigneur, 2010.
- Diffusion of Innovations, E. M. Rogers, 4th edition, Simon and Schuster, 2003.
- The Lean Startup: How Constant Innovation Creates Radically Successful Businesses, E. Ries, Penguin Books Limited, 2011
- Ten Types of Innovation: The Discipline of Building Breakthroughs, L. Keeley, H. Walters, R. Pikkel, B. Quinn, Wiley & Sons, 2013.
- The Four Steps to the Epiphany: Successful Strategies for Products that Win, S. G. Blank, Cafepress.com, 2007.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours each weekly) and a semester project.

Assessment Criteria

The final grade is calculated as 30% from the written final exam and 70% from the semester project. In order to pass the course, students must obtain at least a passing grade in both components.

3517 Computability and Complexity

Elective Course, 8th semester, 6 ECTS units

Instructor: Assistant Professor Evgenia Foustoukou

URL: https://eclass.aueb.gr/courses/INF147/

*Course Description **

Computability: Inductive proofs and recursive definitions. Encodings. Introduction to computation models. Primitive recursive functions and relations. Partial recursive functions and minimization. Turing machines and Turing-computable functions. Equivalence between recursive functions and Turing-computable functions. Church-Turing Thesis. The basic theorems: normal type theorem, enumeration theorem and parameters theorem (s-m-n theorem). Recursively enumerable sets and unsolvable problems. Definability and arithmetical hierarchy. Turing-reducibility and degrees of unsolvability. Complexity: Classes NP and co-NP. NP-completeness. The classes of the polynomial hierarchy and the class PSPACE. PSPACE-completeness. Complexity classes for finding problems (FP, FNP, PPAD). Counting problems: the class #P.

*Learning Outcomes **

Upon completion of the course, students will be able:

- To understand and manipulate definitions and proofs concerning the intuitive/empirical definition of algorithm and computable function.
- To understand and manipulate definitions and proofs concerning the notion of algorithm defined as a mathematical object within two equivalent theories (the Recursive Functions Theory and the Turing-Computable Functions Theory).
- To understand and manipulate the encoding of recursive functions, of Turing machines and of algorithms into natural numbers, as well as the reverse process of decoding.
- To understand and manipulate fundamental notions of Recursive Functions Theory on natural numbers as well as basic theorems.
- To understand and manipulate the computation model of Turing-computable functions.
- To understand and manipulate fundamental theorems of m-reducibility and Turing-reducibility.
- To describe the following complexity classes: classes NP and co-NP, classes of the polynomial hierarchy, class PSPACE, complexity classes for finding problems (FP, FNP, PPAD) and for counting problems (#P).
- To understand and manipulate fundamental theorems of NP-completeness and PSPACE-completeness.

Prerequisite Courses

To enroll in the course, students must have successfully completed, in a previous semester, one of the courses “Theory of Computation” or “Algorithms”. However, it is recommended that students have successfully completed both these courses as well as the course “Logic”.

*Bibliography **

- Introduction to the Theory of Computation, M. Sipser, Cengage Learning, 3rd edition, 2013.
- Computable functions, A. Shen, N.K. Vereshchagin, Student Mathematical Library Vol 19, American Mathematical Society, 2003.
- Theory of Computation, Dexter Kozen, Texts in Computer Science, Springer, 2006.
- Theory of computation, George Tourlakis, Wiley Editions, 2012.
- Computability Theory, Rebecca Weber, Student Mathematical Library Vol 62, American Mathematical Society, 2012.

Teaching and Learning Activities

Lectures (2 lectures of two hours each, weekly), optional homework exercises and an optional project with presentation.

Assessment Criteria

The final grade is set to the final written examination grade. If the latter is a passing grade then participation to the optional activities will raise it.

6023 Linear Models

Elective,7th or 8th semester, 8 ECTS units

Instructor: Assistant Professor Panagiotis Papastamoulis, Department of Statistics

URL:

Course Description

Introduction to simple linear regression, model coefficients estimates. Properties of estimated coefficients, mean value, variance, confidence intervals, hypothesis testing, estimation of conditional variance. Predicted values, simple linear regression ANOVA, R^2, Ftest. Introduction to multivariate normal distribution. Multiple regression, design matrix, introduction to pseudo variables, general form of linear model, LS estimates and properties. Unbiased estimate of data variance. Maximum likelihood estimation. Multiple correlation coefficient, model ANOVA, partial F-tests. Simple residuals, standardized and studentized residuals, normality test, Q-Q plots, residual plots, added variable plots. Transformations, influence statistics and diagnostic tests, multicollinearity. Model choice, forward, backward, 44 stepwise methods, all possible regressions, model choice using AIC, BIC, Mallows Cp.

Learning Outcomes

After successfully completing this course, students will be able to handle topics concerning: correlation coefficient, simple and multiple linear regression, statistical inference in linear regression, hypothesis testing and diagnostic tests, transformations, general linear model, algorithmic methods for choosing the optimal (sub)model, multicollinearity and dummy variables.

Prerequisite Courses

There are no required prerequisite courses.

Bibliography

- Draper N.R. and Smith, H. (1997). Εφαρμοσμένη Ανάλυση Παλινδρόμησης, Παπαζήσης
- Κούτρας, Μ. Και Ευαγγελάρας, Χ. (2010). Ανάλυση Παλινδρόμησης: Θεωρία και Εφαρμογές, Σταμούλης
- Montgomery, D.C., Peck, E.A. and Vining, G.G. (2012). Introduction to Linear Regression Analysis, Wiley.
- Weisberg, S. (2014). Applied Linear Regression, Wiley

Teaching and Learning Activities

Class lectures. Lab exercise. Tutorial. Assignments..

Assessment Criteria

Written exam at the end of the semester. Home assignment.

3090 Digital Learning Materials

Free Elective Course, 7th semester, 6 ECTS units

Instructor: Laboratory Teaching Staff Dr. Athanassios Androutsos

URL: https://eclass.aueb.gr/courses/INF183/

Course Description

Contemporary educational methodologies: Design-oriented pedagogy (DOP), Phenomenon-Based Learning (PhenoBL) and Learning by Collaborative Design (LCD). Organization, management and design of educational projects. GANTT charts and mind maps. Introduction to ICT. Web technologies, Web 2.0, Semantic Web (Web 3.0). Search, find, share and organize information on World Wide Web. Digital presentation tools. Development of digital educational material. Insert, edit multimedia (text, audio, video) in presentations and synchronization. Video Conferencing, Digital Storytelling, Screen recording and production of annotated presentations. Cooperative learning. Digital Learning Objects. Creating Learning Objects. Metadata and Educational Metadata. Online Digital Courses. Learning Management Systems (LMS). Synchronous and Asynchronous eLearning. Sharing of educational material. Educational communities. Social media. Massive Open Online Courses (MOOCs). Intellectual Property and Open Educational Resources (OER).

Learning Outcomes

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

- Understand, describe and discern the theory and practical aspects of Phenomenon-based Learning, Design-Oriented Pedagogy and Learning by Collaborative Design.
- Analyze and solve real-world problems with economic, technological and social dimensions by combining their subject area with pedagogical objectives.
- Design and organize educational projects using GANTT charts and mind maps.
- Discover, analyze and classify information and resources from World Wide Web using digital tools and appreciate the value of collaboration within a contemporary technological framework with advanced digital tools.
- Combine, compose, explain, evaluate and present information by using digital media, produce digital educational material, and develop and demonstrate digital learning objects.
- Understand intellectual property and open educational resources, share digital educational material, and create online communities using digital tools and social media tools.
- Understand and discern the use of Learning Management Systems (LMS) and Massive Open Online Courses (MOOCs).

Prerequisite Courses

There are no formal prerequisites, but a solid background in Probability is highly recommended.

Bibliography

- Educational Technology for Teaching and Learning, T. Newby, D. Stepich, J. Lehman και J. Russel, Pearson, 4th Edition, 2010.
- Vartiainen, H. (2014) Principles for Design-Oriented Pedagogy for Learning from and with Museum Objects, Publication of the University of Eastern Finland, Dissertations in Education, Humanities, and Technology No 60. Joensuu: Kopijyvä Oy.
- Griffin, P & McGaw, P & Care, E. (eds.), (2012) Assessment and Teaching of 21st Century Skills, New York: Springer.
- Ananiadou, K. & Claro, M. (2009) "21st Century Skills and Competences for New Millennium Learners in OECD Countries", OECD Education Working Papers, No. 41, OECD Publishing.
- European Parliament (Ed.). (2015) Innovative Schools: Teaching & Learning in the Digital Era – Workshop Documentation. Brussels: European Parliament.

Teaching and Learning Activities

Lectures (2 lectures of 2 hours weekly), group assignment.

Assessment Criteria

- The final grade is set to the weighted average of the final written examination grade (with a weight of 40%) and the group assignment grade (with a weight of 60%).

3802 Senior Thesis

Elective course, 6 ECTS units

Course Description

Undertaking a Senior Thesis constitutes an opportunity for in-depth engagement with a specific subject area. To undertake the Senior Thesis, written approval is required from a faculty member (DEP or EDIP who is eligible to independently teach in the Department of Informatics), or (following a decision by the Department Assembly) from another instructor who will supervise and grade the thesis and define its subject matter. The project may be research-based, bibliographic, programming-oriented, experimental, constructive, or theoretical. The thesis is optional for students, has a duration of one semester, and is considered an elective course within a study cycle. The supervisor determines the study cycle under which the thesis is categorized. The thesis can be undertaken in any semester of studies, provided that the student has successfully passed all required courses except for at most two. The formatting of the thesis must follow the guidelines approved by the supervisor. It is recommended to use the template available here: https://www.overleaf.com/read/zyzwnbkrtqhh, with appropriate adjustments, if the LaTeX formatting software is not used. The final thesis may be uploaded to the Institutional Repository "Pyxida": https://www.pyxida.aueb.gr/, subject to a decision by the supervisor.

Assessment Criteria

The final grade is decided by the supervising faculty member.

3850 Research Project

Elective course, 6 ECTS units

URL:

Course Description

This course offers students the opportunity to deepen their understanding of a specific scientific subject by extending their senior thesis (the successful completion of which in a previous semester is a prerequisite). The extension may include a more comprehensive literature review, additional experiments, further analysis and discussion (e.g., limitations and ethical considerations), with the ultimate goal of submitting a peer-reviewed article to a scientific journal or conference, with the student as the primary (and first-listed) author. Enrollment in the course requires written approval from the thesis supervisor, who will define the relevant bibliography, supervise the writing process, and be responsible for the final assessment. Grading is based on the submitted manuscript and the official submission of the article to a journal or conference for peer review or the submission o a preprint in a public repository. The Research Project spans one semester, is an elective course carrying 6 ECTS credits, and may be undertaken in any semester following the successful evaluation of the undergraduate thesis. The supervisor determines the course cycle in which the project may be included. The formatting of the final deliverable must follow the guidelines of the journal or conference to which the article is submitted.

Prerequisite Courses

Students must have completed a senior thesis during a previous semester

Assessment Criteria

The final grade is decided by the supervising faculty member.

Practical Training

Elective Course, 6 ECTS units

URL: http://internship.cs.aueb.gr/

Course Description

The Internship is conducted by the student in a real work environment to provide exposure to real working conditions and gain work experience before obtaining their degree. The Internship is optional for students and is equivalent to the weight of one course. It can be undertaken in any semester after the sixth semester, provided the student has previously passed all mandatory courses except for at most four. To begin the internship, written approval is required from a faculty member who will supervise and grade it, and who will determine the subject of the internship in collaboration with the internship provider. In the Computer Science Department, the employment period is set at 6 months of part-time work (20 hours per week) during two academic semesters (fall and spring). The only exception is for internships starting in July, where the duration is set at 3 months of full-time work (40 hours per week). Preparation seminars are conducted before each internship period.

Prerequisite Courses

All the core courses, except at most four, must be completed before starting Practical Training

Assessment Criteria

The final grade is decided by the supervising faculty member.

X. POSTGRADUATE STUDIES

The Department of Informatics offers five postgraduate programs that lead to Master's (M.Sc.) and Doctoral (Ph.D.) degrees: the Postgraduate Program in Information Systems, the Postgraduate Program in Computer Science, and the Postgraduate Program in Data Science. Furthermore, the Department offers a Postgraduate Program, jointly with the Departments of Mathematics and Economics of the National and Kapodistrian University of Athens, in Business Mathematics. All these postgraduate programs provide high quality studies and are strongly competitive at both the national and the international level.

The programs that lead to a Master's degree accept university (including university of applied sciences) graduates that have majored in Informatics, Computer Science, Computer Engineering, and Economics, as well as graduates from universities of applied sciences and higher military educational institutions or other equivalent institutions in Greece or abroad, provided they satisfy the necessary requirements for successful completion of each program.

More information on the postgraduate programs offered by the Department of Informatics can be obtained by the Secretariat of Postgraduate Studies of the Department at the Evelpidon Building, tel. 2108203643-645-646. Applicants may also refer to the Postgraduate Studies Guides, which provide additional information on the objectives, requirements, program structure and areas of specialization of these programs. Information on all postgraduate programs is also available on the web pages listed below.

M.Sc. in Development and Security of Information Systems

The Postgraduate Program in the Development and Security of Information Systems (http://mscis.cs.aueb.gr/) offers postgraduate level expertise in the area of Information Systems. The courses offered aim at promoting excellence by developing an interdisciplinary research agenda, as well as strengthening practical skills required for building state-of-the-art IT applications.

The program aims at the development of qualified graduates, with strong theoretical background coupled with practical skills who are able to successfully meet the ever-increasing needs of enterprises and organizations related to planning, implementing and managing IT and Telematics applications. Special emphasis is given to areas that are related to Information Systems Development, Data Management (Databases, Big Data), Management Information Systems, E-Commerce, Software Engineering, Multimedia, Computer Networks, Network Security, and Information Systems Security.

M.Sc. in Computer Science

The Postgraduate Program in Computer Science (http://grad.cs.aueb.gr/) aims at providing a solid background in Computer Science fundamentals. It covers key areas of significant theoretical and applied interest, such as the areas of Foundations of Computer Science, Information Retrieval, Networks and Mobile Communications, and others. Specialization in these areas helps our graduates to successfully pursue their personal career goals in business, academia and research.

The aim of the program is to provide our students with a solid background in Computer Science fundamentals in one of these areas and to prepare them for a successful career in the industry. It also offers graduates the opportunity to participate in cutting edge research and, for the case of Doctoral candidates, fulfill the breadth and depth requirements for their Ph.D.

M.Sc. in Data Science

The purpose of the program (https://www.dept.aueb.gr/el/node/5765) is to prepare scientists and executives who have the following skills. First, understanding of the representation, storage and manipulation theory and practices of different data types and formats by modern data management algorithms, systems, and applications. Second, theoretical knowledge and practical skills in Probability, Statistics, and Algebra covering both basic an well as state-of-the-art practices and tools from these fields and applications of these techniques in various datasets. Thirdly, knowledge of the major developments over the last 10 years in the field of Data Science that involve the joint application of algorithmic, algebraic and statistical problem-solving techniques and recent advances in big data processing for the extraction of predictive models and decision-making. Fourthly, knowledge and skills for the effective and scientifically sound presentation and summarization of complex datasets and models, and, finally, basic knowledge in selected fields of application. A last skill involves identifying and abstracting similarities between different problem descriptions in order to address new challenging technical problems.

The students of the program are encouraged to apply the techniques learned via laboratory assignments and a capstone project. The program has an international outreach, responding to the worldwide demand in the field of Data Science.

Master of Science (MSc) in Digital Methods for the Humanities

The MSc in Digital Methods for the Humanities aims to provide university graduates specialized knowledge in developing and applying digital methods in the humanities. It aims to promote knowledge, develop interdisciplinary approach and research and prepare students for participating in productive and research roles in the interdisciplinary area of Digital Humanities. The graduates of this MSc program will be able to assume roles in research, production, documentation, editing, organization and management of information resources, and in administering projects with an intense use of digital media and techniques in the fields of humanities and cultural heritage. Holders of similar degrees are usually employed in museums, libraries, archives, publishing houses, research organizations, development projects and productions in fields of cultural heritage, electronic commerce and start-ups.

Students of the Program must hold a university degree of the first cycle of studies or certified equivalent (Law 4485/2017, article 34). The Program invites applicants of all specialties, primarily addressing graduates in the humanities, social sciences, political sciences and law, as well as in information science, informatics and computer science, with a strong interest in applying digital methods and technologies in the humanities, as well as in the changes in work practices these methods and technologies bring about.

M.Sc. in Business Mathematics

The Postgraduate Program in Business Mathematics (http://map.aueb.gr) is jointly organized by the National and Kapodistrian University of Athens (Department of Mathematics and Department of Economics) and AUEB (Department of Informatics). Mathematics was always essential in analyzing markets, production systems and business operation in general. The quantification of business activities intensified in the beginning of the 20th century, took explosive proportions in the 70's, and contributed to the reformulation of whole fields such as banking and finance. The expansion of computing power also contributed to the expanded use of quantitative methodologies, as it allowed both the data collection and its advanced processing.

Those aspiring to actively participate in modern developments in finance, logistics, and production, to mention just a few areas, need to have a firm grasp of quantitative techniques. The program in Business Mathematics provides a first step towards such an understanding. The program aims to prepare individuals who will follow a career applying mathematics in real-world problems, and not in research establishments. This is not to say that a career in research is precluded for our students - on the contrary. But the emphasis is not on mathematical depth but in a thorough exposition of important applications of quantitative techniques in everyday business and industrial practice.

Doctoral Diploma

The doctoral program of the Department leads to a Ph.D. degree and is implemented through the aforementioned postgraduate programs. Admission for doctoral studies is granted upon request and evaluation to holders of M.Sc. or equivalent degrees in Informatics or in a related subject. In exceptional cases, university graduates who are not holders of a Master's degree may be admitted. The duration of the doctoral studies is at least three years after the appointment of the three-member Advisory Committee of the Ph.D. candidate and at most six from the date of his enrolment in the doctoral program.

Ph.D. candidates undertake, as part of their training, research and teaching assistantship appointments. They are also required to attend an assigned list of graduate courses offered by the Department's Postgraduate Programs.

Ph.D. candidates are expected to publish their research in top-tier journals and conferences in order to compile a doctoral dissertation that constitutes a substantial and original contribution to science.

The Department regularly announces positions for Ph.D. candidates. More information about doctoral studies in the Department can be found in the available Doctoral Studies Guide.

XI. GENERAL INFORMATION FOR STUDENTS

AUEB places an emphasis not only on providing students with high quality education, but also high-quality auxiliary student services. Notably, with the promulgation of Presidential Decree 387/83 and Law 1404/83, the operation and administration of Student Clubs in Greek universities was set forth. The aim of these clubs was to improve the living standards of students, their entertainment, and their social and spiritual well-being through a variety of participatory processes and initiatives.

The implementation of these objectives is pursued by ensuring the necessary infrastructure for housing, catering, sports activities, by providing restaurants, cafeterias, reading rooms, libraries, by organizing lectures, concerts, theater performances and excursions in Greece and abroad, by developing international student relations, teaching foreign languages and Greek as a foreign language for foreigners and persons of Greek descent, and by any other means possible.

Detailed information about: a) food and housing, b) foreign languages, c) sports and cultural activities, and d) grants and scholarships, is provided on the website of the Student Club (**https://lesxi.aueb.gr/**).

Housing and Food

The Student Club of AUEB ensures the provision of free housing to its students under specific conditions, which are detailed on the Student Club's website at https://lesxi.aueb.gr/. Additionally, the University's Student Club operates a Housing Office located in the main building, which gathers apartment rental listings.

In the central university building, there is a restaurant where all members of the university community can dine, either for free or at a cost. Free meals are available to those who meet the necessary criteria, which can be obtained from the Student Club office.

The cost of living for students, calculated based on current housing and food prices, is reduced accordingly if the student qualifies for free housing and meals.

Electronic Services

A significant number of procedures related to both student life and student welfare are conducted electronically through applications provided by the University or the Ministry of Education, Religion, and Sports. These applications are accessible using the same credentials (username & password) and are described below:

- Email (e-mail): All students acquire an email account in the format "username@aueb.gr". Access to email is granted using the username/password of their academic account. Detailed instructions are available at: **https://www.aueb.gr/el/content/webmail-manual**
- Student Record System (e-Secretariat): The **e-Secretariat** application is the information system through which students can interact with the Department's Secretariat via the web.
- eLearning Platform (eCLASS): The Open eClass platform is a comprehensive eLearning Management System and is the Academic Network's proposal for supporting Asynchronous eLearning Services. Usage instructions are provided at: **https://eclass.aueb.gr/info/manual.php**.
- Wireless Network at the University (WiFi): Using their personal credentials, students have access to the wireless network throughout the premises of AUEB. More information can be found at **WiFi Instructions**
- Virtual Private Network (VPN): If students wish to access services such as library resources (books/journals), they need to connect their computer to the AUEB VPN service. Instructions can be found at **https://www.aueb.gr/content/vpn-service**.
- "ΕΥΔΟΞΟΣ" Program: Using their personal credentials, students have access to the "ΕΥΔΟΞΟΣ" system, which automates the selection and distribution of textbooks for all universities. Through **the Integrated Management System for Textbooks and Other Aids (ΕΥΔΟΞΟΣ),** students can select the textbooks they need for each course and be informed about the pickup location and time.
- Communication – Information – Connection with the AUEB Community:
    - Official AUEB channels, available at https://www.aueb.gr/el/content/social-media-aueb, provide updates on university news and activities.
    - "AUEB Cast" includes webcasts and podcasts on topics such as entrepreneurship, innovation, technology, and social responsibility. Shows can be found at https://www.aueb.gr/el/content/aueb-cast.
    - AUEB introduces the "3D Virtual Tour Application" providing a unique guided tour experience of its premises, enhancing accessibility. Explore the Virtual Walkthrough at https://www.aueb.gr/el/content/egkatastaseis.

- Visit the "ΟΠΑ News" newspaper at https://www.aueb.gr/el/opanews, published regularly with special features and articles on contemporary and interesting topics.
- "myAUEB" Application: This undergraduate studies application, linked to university information systems and external information systems, provides students with information on a wide range of services and capabilities, such as digital communication with the Department's Secretariat for submitting requests, connection to e-class and e-Secretariat, and linking to AUEB Social Media, etc. More information is available at https://www.myauebapp.gr/

Medical services, insurance, healthcare

Undergraduate and postgraduate students as well as doctoral candidates of the University who do not have other health and hospital care coverage are entitled to full medical and hospital care under the National Health System (NHS) with expenses covered by the National Organization for Healthcare Services Provision (EOPYY). The University also operates a Mental Health Counseling Service, staffed by a psychiatrist specializing in the psychodynamic treatment of mental health issues (https://www.aueb.gr/el/content/ypiresia-symvoulou-psyhikis-ygeias). For more information, please visit the website: https://www.aueb.gr/el/content/medicalservices.

Services for students with disabilities

AUEB ensures the facilitation of students with special needs through the design, implementation, and application of adaptations in the environment to access university buildings. Specifically, the main building is equipped with specially designed elevators, ramps, and lifts. Additionally, there are specific regulations for conducting exams for students with special needs.

At AUEB, a Committee for Equal Access of Persons with Disabilities and Persons with Special Educational Needs has been established. The Committee serves as an advisory body and its mission is to submit recommendations to the competent authorities for the development and implementation of policies for equal access for persons with disabilities and persons with special educational needs.

Furthermore, the University provides a special vehicle that will serve the daily needs of students facing mobility challenges, picking them up from their residences and transporting them to AUEB facilities to attend lectures in amphitheaters, just like their fellow students. This pioneering initiative is expected to be launched from the new academic year, starting in September 2024.

Moreover, through the Library services of AUEB, students with print disabilities have the opportunity for electronic access to the recommended Greek bibliography for courses taught at the University. Within this framework, the Association of Greek Academic Libraries (HEAL-Link) has developed a multi-topic electronic library named AMELib. More information is available on the website: https://www.aueb.gr/el/lib/content/αμεα-άτομα-με-ιδιαίτερες-ανάγκες.

Student financial support

The undergraduate students of Higher Education Institutions and Higher Ecclesiastical Academies, of Greek citizenship or with citizenship of other European Union countries, are eligible for an annual housing allowance according to the terms and conditions mentioned in the Joint Ministerial Decision (JMD) 140832/Z1/25-8-2017 (Greek Government Gazette 2993 B/31-8-2017).

Additionally, the State Scholarships Foundation (IKY) provides, based on performance, grants, scholarships and loan grants each year to students that excelled in the exams of: a) the semester courses and b) the entrance examinations to Greek universities. The Secretaries of the corresponding departments disclose with an announcement the names of the candidate scholars and set the deadlines within which their supporting documents should be submitted.

Furthermore, the "George Chalkiopoulos Institution", which provides scholarships based on the performance of their studies and the economic status of the candidates, operates at the university. In October of each academic year the Department of Public Relations announces the amount of the scholarship, as well as the submission method and time of applications for those interested.

Finally, other awards are granted occasionally by different institutions, organizations and businesses. Information is provided by the Directorate of Education Department of Student Affairs (ground floor of the main building) and the Secretaries of the Departments where appropriate, as well as in the main webpage of the AUEB.

Faculty Advisors

The Department has established the institution of the Faculty Advisor (or Academic Advisor), whose role is to guide and advise students on matters related to their studies. Students can find their assigned Academic Advisor on the Department's website: https://www.dept.aueb.gr/el/stat/content/symvouloi-kathigities. Faculty Advisors (members of the academic staff) are available to meet with students to answer questions and provide guidance regarding the educational process during office hours announced outside their offices.

More specifically, the Faculty Advisor scheme aims to provide a framework for individualized guidance and support to students of the Department of Statistics, with the following objectives:

- To facilitate students' smooth academic and social integration into the university environment.
- To improve students' academic performance and reduce student attrition.
- To strengthen communication and collaboration between students and academic staff.
- To provide guidance on career planning, postgraduate studies, and research opportunities.

The Faculty Advisor serves as the academic mentor for the students assigned to them. Their main responsibilities include:

- Providing advice on the curriculum, course selection, and academic progress.
- Offering guidance on academic regulations, procedures, deadlines, and administrative matters.
- Advising students on career development, mobility opportunities (such as Erasmus), and research opportunities.
- Supporting students who experience adjustment difficulties or psychological or social challenges, in cooperation with the University's appropriate support services.

The Faculty Advisor does not have a supervisory or evaluative role with respect to students; rather, they serve as a supportive mentor and advisor.

Classrooms - Study Halls - Libraries

The Library and Information Center (LIC) of AUEB was established in 1920 and operates in the first and the second floor of the main building of the University. It participates in the Hellenic Academic Libraries Link (Heal-LINK), the Europe Direct network of the European Documentation Center, and the Hellenic Economic Library Network (H.E.LI.N.). Also, within the Library, three (3) Documentation Centers are in operation:

- The European Documentation Center (EDC), since 1992,
- The Organization for Economic Co-operation and Development (OECD) Center, since 1997,
- The Heritage Center of publications of the World Tourism Organization (UNWTO), since 2004.

The Library contributes decisively in both meeting the needs of scientific information of the university community and supporting the educational and research work. This objective is achieved through the uniform organization of the collections and the coordination of the provided services. The Library offers access to:

- printed collection of books and scientific journals,
- the textbooks taught in the courses,
- collection of electronic scientific journals,
- collection of electronic books,
- the postgraduate dissertations and PhD theses completed at AUEB and filed in digital format at the Institutional Repository PYXIDA,
- sectoral studies,
- statistical series from national and international organizations,
- audiovisual material,
- information material (encyclopedias, dictionaries),
- collections of the official governmental publications of the European Union, the OECD, and the UNWTO,
- databases of issues cultivated at the University,
- printed collection of other academic libraries

The Library is a lending library for its members in regard to all printed collections, except for the collection of journals and statistical series, according to its internal operating rules. The Library and Information Center (LIC) of AUEB features a study hall, working stations with PCs for the guests, photocopying and printing equipment, and also provides the option to the students to lend them books and journal articles of other academic libraries that are members of the networks that the library participates.

International programs and practical information for international student mobility

AUEB actively participates in the Erasmus+ Program, promoting cooperation with universities, businesses and international organizations of the European Union (EU) and the mobility of the University students, teaching and administrative faculty. As part of the above program, the University collaborates with more than 220 European Institutions in scientific areas relevant to the University Departments. It is worth mentioning that more the 7000 students have participated in the "ERASMUS" Program up until today. Among them, approximately 4000 students of AUEB attended courses in collaborating universities in the European Union and approximately 3000 foreign students conducted a period of their studies in AUEB, with ensured academic recognition through the European Credit Transfer and Accumulation System (ECTS). Moreover, the Institution coordinates the Internship Association Erasmus+ in partnership with the National Technical University of Athens and the Universities of Crete, Ioannina and Macedonia, giving both the ability of internship to students of the five universities and also the ability of teaching/education to faculty members. Finally, AUEB, in the context of an internationalization openness strategy, successfully participates in the International Credit Mobility Program Erasmus+, aiming in the advancement of international collaborations in education and research with University Partners in countries outside EU through: a) student mobility, b) teaching faculty mobility for short-term teaching appointments, and c) mobility of teaching/administrative faculty for educational purposes. The Program is operating at the University since the academic year of 2015-2016 and up until today 52 students and faculty members in total moved from or towards 8 Partner Institutions in countries outside EU (USA, Canada, Singapore, Russia, South Korea, Armenia). For more information, you can search at the main webpage of the Institution (https://www.aueb.gr/el/content/πρόγραμμα-έρασμος).

The equivalency of courses is outlined in the LEARNING AGREEMENT, which must be signed by both the student and the academic coordinator. Any modification to the Learning Agreement by the student must receive signed approval from the academic coordinator.

Note that students of the department who have been selected for the ERASMUS+ program and are attending courses at partner universities abroad are not entitled to attend or be examined in a course examination at the Athens University of Economics and Business (AUEB) during the period (semester) of their stay at the foreign university, except only during the retake examination period in September.

Foreign Language Courses

The knowledge of foreign languages, as a universally accepted educational value, comprises an essential asset towards successful participation of an individual to the complex professional and social reality. The Students Association, realizing this modern educational necessity, provides each university student interested with the opportunity to attend relevant courses. The courses conducted concern the English, French, German, Spanish, Italian and Russian languages, while there is also the ability to organize courses in other languages, assuming there is corresponding interest.

Student Support Unit

The unit operates the following offices:

- Internships and Career Integration Office: This office is aimed at undergraduate and graduate students and graduates of the institution's programs. Its mission is to promote the best possible connection between theory and practice and to facilitate the transition of students from academic to professional life. Internships are an integral part of education at AUEB, as all departments have institutionalized and included them in their curriculum.
- Support for International Students and Mobility Office: This office addresses international students enrolled in undergraduate, graduate, and postgraduate programs, as well as students interested in participating in mobility programs.

Sports facilities

AUEB organizes a variety of sport activities. It has a long history in sports accompanied by multiple distinctions, metals, cups and awards in national and international events. In order to continuously provide a complete education to its students, AUEB collaborates with the Cultural, Sports and Youth Organization of the City of Athens, and utilizes its sport facilities, located at 10 Passov Str, Grava, Ano Patisia (indoor pool, indoor basketball and volleyball court, open sports field of classic sports - track & field), at the junction of Ermonassis & Pitiountos Streets - Thermida (open soccer stadium 5x5) and at the junction of Mitsaki and Polyla - Ano Patisia (open-air tennis court).

The teaching of the courses at the Physical Education Department of AUEB follows the teaching schedule of the academic courses. It begins at the beginning of the courses in the winter semester and expires at the end of the courses in the spring semester. It is

worth mentioning that students are permitted to attend courses of the Physical Educational Department up until six months after their graduation. The Physical Education Department of AUEB comprises highly qualified Physical Education teachers and contingent qualified educational faculty.

Student associations

Within the university community of AUEB various Organizations and Student Associations are active and developing. For more information you can search the main webpage of AUEB (https://www.aueb.gr/el/content/σύλλογοι-φοιτητών).

Technology Transfer and Innovation Unit

The distinctive title of the unit is "Center for Entrepreneurship, Innovation, and Technology Transfer" (https://acein.aueb.gr/). The unit comprises two subunits:

- Technology Transfer Office
- Business Incubator

The objective of the Technology Transfer and Innovation Unit is to enhance the research capacity of the institution, foster its connection with industry, transfer knowledge produced to society, and cultivate the idea of entrepreneurship within the academic community.

The general responsibilities of the unit towards the university's students include:

- Educating students on technology transfer, entrepreneurship, and commercialization of research outcomes.
- Providing specialized consulting services to students on matters within the unit's competence.
- Developing entrepreneurial skills among students through competitions, specialized seminars, summer schools on entrepreneurship, etc.
- Supporting the process of creating entrepreneurial teams and establishing/developing startups utilizing emerging business opportunities, initiated by students or graduates of AUEB, and supporting their integration into the National Register of New Enterprises.

Alumni Network

In continuation of its tradition of promoting top executives in the economic, social, and political life of the country, AUEB is proud that thousands of its graduates hold leadership positions in universities in Greece and abroad, international research institutes and organizations, and major public and private sector companies. Recognizing the importance of developing and strengthening bonds with its alumni, AUEB has created its Alumni Network, a platform (https://alumni.aueb.gr/) where all university graduates can register. The main objectives of the network are to reconnect graduates with their colleagues and former classmates and to keep them informed about all activities, services, and events relevant to them.

For additional information, please visit: https://www.aueb.gr/el/content/οργανώσεις-και-σύλλογοι-φοιτητών-και-αποφοίτων.

Volunteering Program

As part of its strategy for Social Contribution, AUEB has launched the "AUEB Volunteers" Program. The program aims to foster a culture of volunteering both as a significant learning experience and as a responsibility of every responsible citizen. The objectives of "AUEB Volunteers" include: (a) volunteer actions in collaboration with NGOs or independently, (b) awareness-raising activities on volunteering and citizen engagement, and (c) improvement actions for university infrastructures and services (https://www.aueb.gr/el/volunteers).

Quality Assurance Unit

AUEB implements a quality assurance policy aimed at continuously improving the quality of its study programs, research activities, and administrative services, enhancing academic and administrative work, and improving overall university operation.

The Quality Assurance Unit (MOQI) (https://www.aueb.gr/el/modip) coordinates and supports evaluation processes. Specifically, quality assurance in educational activities is achieved through the use of questionnaires for evaluating: (a) courses/teaching of

undergraduate and postgraduate study programs, (b) educational laboratories of the institution, (c) research of postgraduate students, and (d) research of first-year students, which are completed by students.

Center for Continuing Education and Lifelong Learning

The Center for Continuing Education and Lifelong Learning is a unit of AUEB that ensures coordination and interdisciplinary collaboration in the development of vocational programs, continuing education, training, and general lifelong learning. These programs complement, modernize, or upgrade knowledge, skills, and abilities acquired through formal education systems, vocational training, initial professional training, or professional experience, facilitating integration or reintegration into the labor market, ensuring employment, and promoting professional and personal development (https://www.aueb.gr/el/content/dia-vioy-mathisi-kedivim-opa).

Complaints and Appeals

With the aim of continuously improving the quality of educational and administrative services offered by the university, a process for managing complaints and appeals of students has been established to ensure their immediate and comprehensive handling with a focus on effectiveness and confidentiality. You can find the complaints and appeals form at the following link: https://www.aueb.gr/el/complaints-form.

Gender Equality

Promoting Gender Equality at all levels of operation and all aspects of academic life at AUEB is a significant dimension of the University's Social Responsibility. The actions and structures for Gender Equality that AUEB has aim to inform its academic community about its prominent importance and to fully integrate Gender Equality into the university's functions. Through these structures and actions, AUEB seeks to instill a culture of equality and fairness within the institution (https://isotita.aueb.gr/).

XII. SYNOPSIS OF CHANGES

This chapter summarizes the most significant changes that have been introduced to the Study Guide in recent years, and the exceptional changes applicable to the current academic year.

Study Guide 2023–2024

Compared with the 2022–2023 Study Guide, the main changes were:

- The course "Artificial Intelligence" became a compulsory course.
- The course "Analysis and Design of Information Systems" became a Core Elective course.

Study Guide 2024–2025

Compared with the 2023–2024 Study Guide, the main change was:

- The courses "Applied Linear Algebra" and "Machine Learning" became Core Elective courses.

Study Guide 2025–2026

Compared with the 2024–2025 Study Guide, the main changes are:

- The courses "Computer Architecture," "Multimedia Technology," and "Computer Graphics" are now taught in English.
- The regulations governing grade improvement (re-examination for grade enhancement) have been relaxed.
- The number of Free Elective courses has been significantly reduced.

Exceptional Changes for the 2026–2027 Study Guide