University of the Aegean

UNDERGRADUATE

program guide

DEPARTMENT OF INFORMATION AND COMMUNICATION SYSTEMS ENGINEERING

2018-2019

Karlovasi - Samos


Designed by: Eva Kyriazi

UNIVERSITY OF THE AEGEAN

SCHOOL OF ENGINEERING
DEPARTMENT OF INFORMATION AND COMMUNICATION SYSTEMS ENGINEERING

UNDERGRADUATE
PROGRAM GUIDE
ACADEMIC YEAR
2018-2019

UNIVERSITY OF THE AEGEAN

The Department of Information and Communication Systems Engineering is one of the pioneering departments of the University of the Aegean.

It has been designed and operates so as to offer high quality courses, within a creative environment, with emphasis on the connection of studies with practical application and research.

This guide contains all the necessary information for current, as well as future students of the Department.

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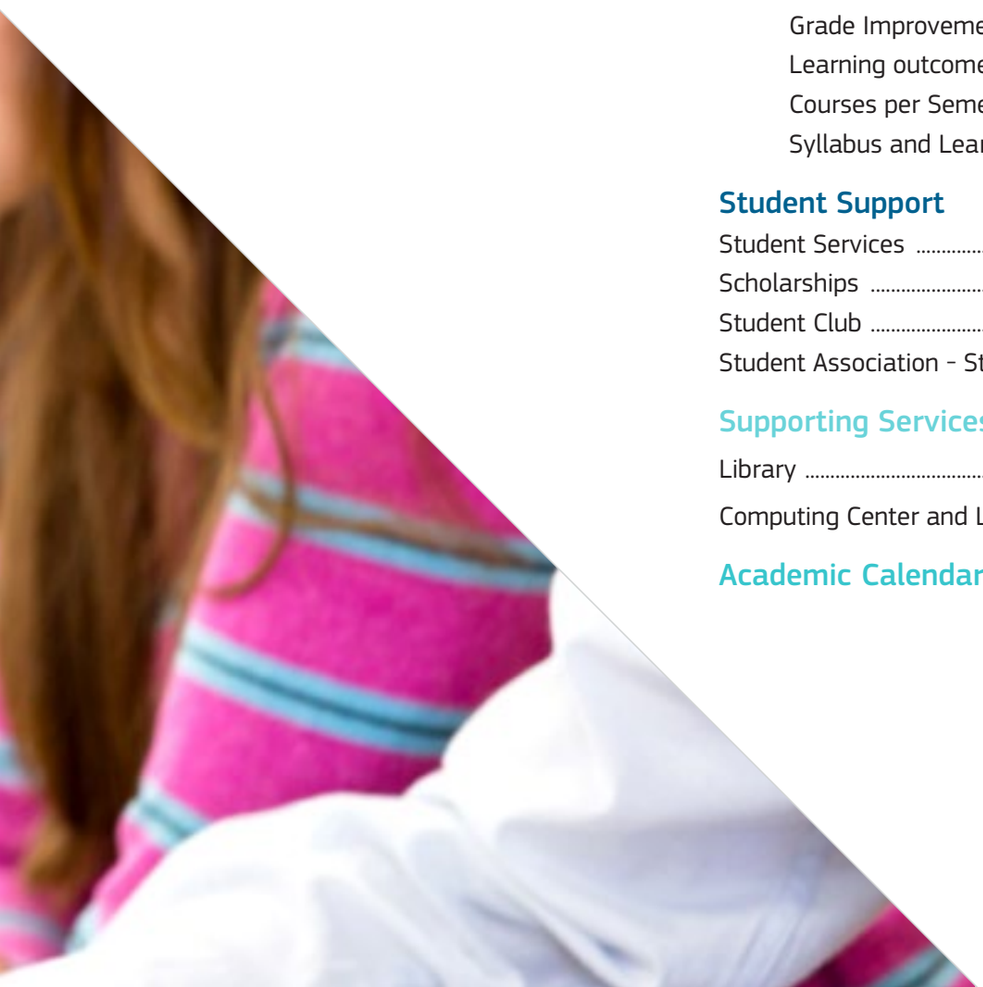

University of the Aegean

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UNIVERSITY of the AEGEAN

About

The establishment of the University of the Aegean is the realization of an idea of the great Greek mathematician **Constantine Caratheodory.**

The University of the Aegean was founded in 1984 and is one of the newest universities in Greece. Today, having completed the second phase of its development with eighteen (18) academic Departments, more than forty (40) Postgraduate Programs and eighteen thousand (18,000) undergraduate and graduate students, the University of the Aegean ranks among the largest universities in the country.

Administrative headquarters of the University is **Mytilene**, while various departments have been established in towns of the **islands of Lesvos** (Mytilene), **Chios** (Chios), **Samos** (Karlovasi), **Rhodes** (Rhodes), **Syros** (Ermoupolis) and **Lemnos** (Myrina), forming a University-network covering both the administrative divisions of the Aegean (North and South Aegean).

The University of the Aegean, with its spatial dispersion, **aims** to **provide modern scientific education and to promote high quality basic and applied research.** Keeping a flexible, non bureaucratic, organizational structure, it has established high standards for the scientific level of both its graduates, and the research and teaching staff.

The main feature of the Departments of the University is the development of innovative disciplines, often interdisciplinary, which meet the needs of modern Greek and international society, as well as the demands and expectations of students for studies of high scientific value, combined with excellent prospects for career development.

The University of the Aegean **is growing steadily and methodically**, according to the Strategic Plans and the Five-Year Development Plans prepared. These plans reflect the experiences gained both from the operational difficulties of academic departments on border islands and the communication within a University-network, which operates under the particular conditions of the Greek Archipelago. These experiences led the University of the Aegean to be the first Greek University that fully integrates the information and communication technologies in everyday broad administrative practice, thereby creating the conditions of development of a Society of Information and Knowledge.

Schools and Departments

Currently the University of the Aegean comprises the following eighteen (18) Departments and six (6) Schools:

School of Engineering
Dept. of Information and Communication Systems Engineering (Samos)
Dept. of Product and Systems Design Engineering (Syros)
Dept. of Financial and Management Engineering (Chios)
School of Sciences (Samos)
Dept. of Mathematics
Dept. of Statistics and Actuarial-Financial Mathematics**
School of Social Sciences (Lesvos)
Dept. of Social Anthropology and History
Dept. of Geography
Dept. of Sociology
Dept. of Cultural Technology and Communication
School of the Environment (Lesvos)
Dept. of Environment
Dept. of Marine Sciences
Dept. of Food Sciences and Nutrition (Lemnos)
School of Business (Chios)
Dept. of Business Administration
Dept. of Shipping, Trade and Transport
Dept. of Tourism Economics and Administration
School of Humanities (Rhodes)
Dept. of Primary Education
Dept. of Pre-School Education and Educational Design
Dept. of Mediterranean Studies

Administration

The University of the Aegean is managed by the **Senate**, the **Rector** and the **Vice Rectors**, who, for the academic year **2018-2019** are:

Rector

- Professor **Chryssi Vitsilaki**

Vice Rectors

- Associate Professor **Maria Mavri,** *Department of Business Administration*
- Professor **Dimitris Papageorgiou**, *Department of Cultural Technology and Communication*
- Professor **Charalambos Skianis**, *Department of Information and Communication Systems Engineering*
- Professor **Helen Theodoropoulou**, *Department of Pre-School Education Sciences and Educational Design*

The administrative facilities of the University of the Aegean are located at the following places:

Lesvos (University Headquarters - Rector's Office)

University Hill, Administration Building, Mytilene, Lesvos, GR- 81100, Greece
Tel. +30-22510-36000 | Fax: +30-22510-36009

Syros (School of Engineering's head office):

1 Constantinoupoleos str. 841 00, Ermoupolis, Syros
Dean of School of Engineering: Spyros Kokolakis, Associate Professor, Department of Information and Communication Systems Engineering

Samos

Karlovasi, Samos, GR-83200, Greece

Administrative Head	Fotis Kyriakou	Tel.: +30-22730-82015 Email: sam_regional_dir@samos.aegean.gr
Secretariat of the Department of Information and Communication Systems Engineering	Eirini Grammatikou	Tel.: +30-22730-82026 Fax: +30-22730-82219 Email: rena@aegean.gr
Undergraduate Studies Secretariat of the Department of Information and Communication Systems Engineering	Alexandros Shoinas	Tel.: +30-22730-82021 Fax: +30-22730-82219 Email: asxoin@aegean.gr
	Eirini Grammatikou	Tel.: +30-22730-82026 Fax: +30-22730-82219 Email: rena@aegean.gr
Postgraduate Studies Secretariat of the Department of Information and Communication Systems Engineering	Eirini Grammatikou	Tel.: +30-22730-82019 Fax: +30-22730-82219 Email: mairi@aegean.gr
	Alexandros Shoinas	Tel.: +30-22730-82021 Fax: +30-22730-82219 Email: asxoin@aegean.gr
Student Support	Apostolos Galanopoulos	Tel.: +30-22730-82028 Fax: +30-22730-82009 Email: agalan@aegean.gr
	Giorgos Mitatakis	Tel.: +30-22730-82011 Fax: +30-22730-82009 Email: gmitatakis@aegean.gr

For more information about the University of the Aegean please visit our web site: **http://www.aegean.gr**

For the School of Engineering please visit our web site: **http://eng.aegean.gr**

Computing Center	Aggeliki Parianou Nikos Zacharis	Tel.: +30-22730-82046 Fax: +30-22730-82049 Email: apr@aegean.gr Tel: +30-22730-82040 Email: nzar@aegean.gr Helpdesk Tel.: +30-22730-82166 Email: help@samos.aegean.gr
Library	Vasiliki Gouvala	Tel.: +30-22730-82030 Fax: +30-22730-82039 Email: vgou@aegean.gr
Administrative Services	Manto Katsiani Grammatiki Chatzikonstanti	Tel.: +30-22730-82010 Fax: +30-22730-82008 Email: manto@aegean.gr Tel.:+30-22730-82017 Fax.: +30-22730-82009 Email: kchatz@aegean.gr
Financial Services	Fotis Kyriakou	Tel.: +30-22730-82015 Email: fotisk@aegean.gr
Technical Services	Constantinos Protopappas	Tel.:+30-22730-82056 Email: Samos_tech_ypir@samos.aegean.gr
Public/ International Relations and Publications	Nikoleta Tsesmeli	Tel.:+30-22730-82012 Fax.: +30-22730-82007 Email: ntsesm@aegean.gr

Chios

Michalon 8, Chios, GR-82100, Greece
Tel.: +30-22710-35000
Fax: +30-22710-35099

Rhodes

Demokratias Avenue 1, Rhodes,
GR-85100, Greece
Tel.: +30-22410-99000
Fax: +30-22410-99009

Syros

Ermoupolis, Syros
GR-84100, Greece
Tel.: +30-22810-97000
Fax: +30-22810-97009

Lemnos

Mitropoliti Ioakeim 2, Myrina,
GR-81400, Greece
Tel.: +30-22540-83013
Fax: +30-22540-83109

Athens

30 Boulgaroktonou Str., Athens, GR-11472, Greece
Tel.: +30-210-6492000
Fax: +30-210-6492299

Facilities

The islands of the Aegean possess an architectural wealth of significant historical value. The exploitation of this wealth by the University of the Aegean contributes to the preservation of our national heritage. The aim of the University is that its activities are housed – where possible – in traditional buildings on the islands.

On the **island of Samos**, the University of the Aegean utilizes the following buildings:

Karlovasi

- Emporiki Sholi Building (Classrooms, Helpdesk)
- Igemoneio (Faculty Offices of Mathematics Department, Secretariat)
- Chatzigianneio (Library)
- Liberis Building (School of Science Secretariat, Faculty Offices of the Department of Information and Communication Systems Engineering, Secretariat, Classroom, Labotatories)
- Vourlioti Building (Faculty Offices of the Department of Statistics and Actuarial-Financial Mathematics, Secretariat)
- Morali Building (Faculty Offices of the Department of Mathematics)
- Sofouli Building (Classrooms, Faculty Offices)
- Tsobana Building (Multimedia center)
- Kalatzis Warehouses (under construction)
- “Former Papanikolaou” Building (Offices of Postgraduate Students)
- Middle Karlovasi School Group (Classrooms)
- Student Residences of the University Unit of Samos
- “Former Katsika” Building (Technical Services)
- “Former Psatha” Building (offices)
- “Former Karagiannis” Building (warehouses)
- “Former Thrasyvoulou” Building (warehouses)
- “Former Pantazoni” Building (warehouses)

DEPARTMENT OF INFORMATION and COMMUNICATION SYSTEMS ENGINEERING

Scope and Objectives

> *"Throughout the world, information and communications technologies are generating a new industrial revolution already as significant and far-reaching as those of the past. It is a revolution based on information, itself the expression of human knowledge. Technological progress now enables us to process, store, retrieve and communicate information in whatever form it may take - oral, written or visual - unconstrained by distance, time and volume. This revolution adds huge new capacities to human intelligence and constitutes a resource which changes the way we work together and the way we live together".*
>
> ***Bangemann Committee Report 1994***

The technological revolution, which, since 1994, has led European countries to adopt, as their **central objective, the development of a European Information Society**, has changed radically almost every aspect of economic and social life. Despite the impressive penetration of new technologies in all areas of life, new trends and visions pop up constantly, **making the field of information and communication systems the most dynamic field of modern science and technology**.

At this point in time, when there is an effort for the vision of a European Information Society to be translated into action for overcoming the technical, social and economic barriers and establishing national and European information infrastructures for the benefit of European citizens and their quality of life, the scientists in this field are asked to take an important, creative, and very demanding role, as far as it regards their knowledge and skills.The **Department of Information and Communication Systems Engineering of the University of the Aegean** (**www.icsd.aegean.gr**) has, as **main goal, the training of engineers with a high level of education, creative and critical spirit, able to analyze problems and take advantage of modern Information and Communication Technologies for the design, development and management of information and communication systems.** The educational activity of the Department combined with the extensive activity

in basic and applied research aims to produce new knowledge and disseminate it in a National and European level.

Since the time of its foundation in 1997, the Department had already embraced the vision that in a very short time the classical concepts of telecommunications engineers and computer scientists would no longer be a separate entity and a new integrated scientific subject, the one of Information and Communication Systems Engineering, would be required to meet those needs. The integration of information and communication technologies has given a special character to the Department, which is maintained and enhanced until today.

The Department of Information and Communication Systems Engineering of the University of the Aegean adopts the above concept as to the nature of information and communication systems. **An information system is a system that is able to receive, store, retrieve and process information.** It is an organized set of separate interacting components: people, processes, data, software and hardware. This approach covers not only the first component of the name of the department, but the second one as well, since according to it, the term "communication system" is not regarded as an independent and complementary subject, but as an intrinsic characteristic of an integrated information system. Thus, the two dimensions of the name of the Department reflect the completeness of the studies required to achieve the stated objectives.

The Curriculum of the Department has been designed taking into account international standards of education, which are adapted to the needs of the Greek reality. It covers all the objects that make up the core of knowledge related to information and communication systems, offering high quality courses. In this direction, student-centered teaching systems, assessment of the educational process, a high level of cooperation between teachers and students and actions connecting teaching with production are adopted.

In addition, the curriculum is constantly updated following the dynamics of the industry, so that the studies offered by the Department have always a modern, dynamic and competitive character.

Successful completion of the first circle studies, organized by the Department of Information and Communication Systems Engineering of the School of Engineering of the University of the Aegean, leads to the award of a unified and inseparable Diploma of postgraduate level (integrated master), in the specialty of the Department, of level 7 of the National and European Qualifications Framework (FEK 3524/21.08.2018).

According to the information of August 2018, the number of registered students in the Department is 1143 and 210 for the Undergraduate and Postgraduate Programmes respectively. Additionally, there are 76 PhD candidates. The total number of graduates of the Department is 544, 457 and 54 for the Undergraduate, Postgraduate and PhD Programmes respectively.

Faculty

Head of Department	*Associate Professor* ***Georgios Kambourakis***
Vice Head of Department	*Associate Professor* ***Demosthenes Vouyioukas***
Director of Postgraduate Study Programmes before the 2018-19 academic year	*Associate Professor* ***Georgios Kambourakis***
Director of Postgraduate Study Programme 'Information and Communication Systems Security'	*Associate Professor* ***Georgios Kambourakis***
Director of Postgraduate Study Programme 'Internet of Things: Smart Environments in Next Generation Networks'	*Associate Professor* ***Demosthenes Vouyioukas***
Director of Postgraduate Study Programme 'Electronic Governance'	*Professor* ***Euripidis Loukis***
Director of Postgraduate Study Programme 'Information and Communication Systems'	*Associate Professor* ***Spyros Kokolakis***
Director of Postgraduate Study Programme 'Digital Innovation and Startup Entrepreneurship'	*Associate Professor* ***Yannis Charalabidis***

- Professor **Spiros Cotsakis**, Degree in Mathematics, National and Kapodistrian University of Athens, M.Sc. in Astronomy, Ph.D. in Mathematical Physics and Cosmology, University of Sussex (Differential Geometry, Mathematical Relativity, Generalized Theories, Mathematical Cosmology).
- Professor **Stefanos Gritzalis**, Degree in Physics, M.Sc. in Electronic Automation, Ph.D. in Distributed Systems Security, National and Kapodistrian University of Athens (Information and Communication Systems Security, Privacy Protection).
- Professor **Agis Iliadis**, Degree in Physics, Aristotle University of Thessaloniki, M.Sc. in Electrical Engineering and Electronics, Ph.D. in Electrical Engineering and Electronics, University of Manchester Institute of Science and Technology (UMIST) (Semiconductors, Basic and Composite Materials for Semiconductors Construction).
- Professor **Euripidis Loukis**, Diploma in Mechanical Engineering, National Technical University of Athens, M.Sc. in Computers & Control, Imperial College, University of London, Ph.D. in Decision Support Systems, National Technical University of Athens (Information Systems, Decision Support Systems, e-Business, e-Government, Collaboration Support Systems, Information Systems Strategy and Investments).
- Professor **Lilian Mitrou**, Degree in Law, National and Kapodistrian University of Athens, Ph.D. in Law, Goethe-Universitat, Frankfurt (Legal Aspects of Information Society, Information Law, Individual Rights in the Information Society, Personal Data Protection).
- Professor **Charalabos Skianis**, Degree in Physics, University of Patras, Ph.D. in Informatics, University of Bradford (Computer Networks, Modeling and Performance Evaluation of Wireless and Mobile Communication Networks).
- Associate Professor **Yannis Charalabidis**, Diploma in Electrical and Computer Engineering, Ph.D. in Complex Software Systems, National Technical University of Athens (ICT enabled Collaborative Governance, Linked / Open Data, Social Participation Systems, Complex Societal Systems Modeling and Simulation, Enterprise Interoperability).
- Associate Professor **Georgios Kambourakis**, Degree in Applied Informatics, Athens University of Economics and Business, Master of Education (Ed.M.) degree, Hellenic Open University, Ph.D. in Mobile Systems Security, University of the Aegean (Mobile and Wireless Systems Security).

- Associate Professor **Ergina Kavallieratou**, Diploma in Electrical and Computer Technology Engineering, Ph.D. in Document Image Processing and Optical Character Recognition, University of Patras (Image Processing, Computer Vision, Pattern Recognition).
- Associate Professor **Spyros Kokolakis**, Degree in Informatics, Ph.D. in Information Systems, Athens University of Economics and Business (Information Systems, Information Systems Security).
- Associate Professor **Georgios Kormentzas**, Diploma in Electrical and Computer Engineering, Ph.D. in Traffic Control and Management of Broadband Networks using Abstract Information Models and Distributed Object Architectures, National Technical University of Athens (Computer Networks, Wireless Communications, Service Quality, Traffic Modeling and Analysis).
- Associate Professor **Manolis Maragoudakis**, Degree in Computer Science, University of Crete, Ph.D. in Artificial Intelligence, University of Patras (Data Mining, Privacy Preserving Data Mining, Machine Learning, User Modeling, Semantic Web, Databases, Bayesian Networks, Knowledge Engineering).
- Associate Professor **Charis Mesaritakis** (to be appointed), Diploma in Informatics and Telecommunications, National and Kapodistrian University of Athens, Master degree in Microelectronics and Integrated Circuit Design, Departments of Physics and Informatics/ Telecommunications of National and Kapodistrian University of Athens, Ph.D. in design and experimental-numerical investigation of ultra-fast photonic systems (quantum-dot devices) mainly for telecomm applications, Photonic Technology and Optical Communication Laboratory of Department of Informatics and Telecommunications, National and Kapodistrian University of Athens.
- Associate Professor **Efstathios Stamatatos**, Diploma in Electrical and Computer Technology Engineering, Ph.D. in Natural Language Processing, University of Patras (Natural Language Processing, Machine Learning and Computer Music).

- Associate Professor **Akrivi Vlachou** (to be appointed), Diploma in Informatics and Telecommunications, National and Kapodistrian University of Athens, M.Sc. in Advanced Information Systems, Department of Informatics and Telecommunications, National and Kapodistrian University of Athens, Ph.D. thesis entitled "Efficient Query Processing for Highly Distributed Data", Department of Computer Science, Athens University of Economics and Business (Databases).
- Associate Professor **Demosthenes Vouyioukas**, Diploma in Electrical and Computer Engineering, M.Sc. in Business Administration (MBA), Ph.D. in Wireless and Mobile Communications, National Technical University of Athens (Mobile and Satellite Communications, Digital Communication Systems, Propagation and Antennas, Broadband Networks).
- Assistant Professor (tenured) **Emmanouil Kalligeros**, Diploma in Computer Engineering and Informatics, M.Sc. in Computer Science and Technology, Ph.D. in Embedded Testing of Digital Circuits, University of Patras (VLSI Design and Test, Design for Testability, CAD Methodologies for VLSI Testing, Test-Data Compression and Built-In-Self-Test Architectures).
- Assistant Professor (tenured) **Alexis Kaporis**, Degree in Mathematics, Ph.D. in Threshold Phenomena in Combinatorial Problems, University of Patras (Algorithm Analysis, Probabilistic Techniques, Algorithmic Game Theory, Data Structures).
- Assistant Professor (tenured) **Maria Karyda**, Degree in Informatics, M.Sc. in Information Systems, Ph.D. in Information Systems Security Management, Athens University of Economics and Business (Information Systems, Information Systems Security, Privacy, Social Networks).
- Assistant Professor (tenured) **Elisavet Konstantinou**, Degree in Informatics, University of Ioannina, M.Sc. in Signal and Image Processing Systems, Ph.D. in Public Key Cryptography, University of Patras (Cryptography).

- Assistant Professor (tenured) **Asimakis Leros**, Diploma in Electrical Engineering, University of Patras, M.Sc. in Electrical & Computer Engineering, University of Massachusetts at Amherst, Ph.D. in Computer Engineering and Informatics, University of Patras (Estimation Theory, Parallel Algorithms, Digital Signal Processing, Systems Modeling and Simulation).
- Assistant Professor (tenured) T**heodoros Tzouramanis**, Diploma in Electrical and Computer Engineering, Ph.D. in Informatics, Aristotle University of Thessaloniki (Databases, Geographical Information Systems).
- Assistant Professor **Christos Goumopoulos**, Diploma in Computer Engineering and Informatics, Ph.D. in Distributed Software Systems, University of Patras (Parallel and Distributed Computing).
- Assistant Professor **Georgios Kofinas**, Degree in Physics, National and Kapodistrian University of Athens, M.Sc. in Theoretical Physics, University of Alberta, Ph.D. in Physics, National and Kapodistrian University of Athens (Relativistic Classical and Quantum Cosmology, Gravity in Higher Dimensions, Generalized Theories).
- Dr. **Irene Karybali**, Diploma in Computer Engineering and Informatics, M.Sc. in Signal and Image Processing Systems, Ph.D. in Digital Image Processing, University of Patras (Efficient Image Registration Techniques, Digital Image Watermarking).

Laboratory Teaching Personnel

- **Georgios Chrysoloras**, BEng in Information and Communication Systems Engineering, University of the Aegean. MSc in Advanced Information Systems, University of Piraeus.
- **Anastasia Douma**, BEng in Informatics, Department of Informatics of the Technological Educational Institute of Athens. MSc degree in Information and Communication Systems Security, Department of Information and Communication Systems Engineering, University of the Aegean. Phd Candidate in the Department of Information and Communication Systems Engineering, University of the Aegean.
- **Dr. Dimitrios N. Skoutas**, Diploma in Electrical and Computer Engineering, University of Patras, PhD in Communication Networks, University of the Aegean (Wireless and Mobile Networks, Communication networks and systems).
- **Christina Theocharopoulou**, Degree in Mathematics, University of the Aegean. MSc in Technologies and Management of Information and Communication Systems, University of Aegean.

Research Activities- Postgraduate Program

Basic and applied **research** is in the core of the transformation process of modern society into a **society of knowledge**. Basic research produces the knowledge, which will lead to the innovations of the future. Applied research is the answer to the constantly increasing demands for economic growth and progress, based on innovation for the benefit of the society and development of the country. The acceleration of social, economic and technological development created the need for rapid interaction between basic and applied research, particularly in the rapidly developing field of information technology and telecommunications.

Research requires robust planning, infrastructure supported by continuous investment, and, most of all, researchers with high expertise, broad and valuable knowledge base, inclination for participation in the research process and high-level collaborative view, practice and effectiveness. As a system of knowledge production, research is closely linked with education and technology.

In this context, investment in research is a primary objective and a key in the development of the Department of Information and Communication Systems Engineering. The Department invests in pioneering and important areas of basic and applied research, such us:

- Algorithms and Computational Complexity
- Information Retrieval
- Knowledge Representation
- Information and Communication Systems Security and Protection of Privacy
- Databases
- Information Law
- Intelligent Agents
- Intelligent Systems
- Applications of Differential Equations
- e-Commerce – e-Business – e-Governance
- Foundations of Computer Science
- Mathematical Physics
- Nanotechnology and Bioelectronics
- Legal and Regulatory issues of Personal Data Protection
- Multi-agent Systems
- Investment and Strategy of Information Systems

- Personal and Mobile Communications Systems
- Pervasive Computing Systems
- Decision Support Systems
- Privacy Enhancing Technologies
- Robotic Systems
- Communication Systems and Networks
- Computer Supported Collaboration
- Digital Integrated Circuits and Systems

The faculty members of the Department of Information and Communication Systems Engineering have extensive experience in designing and carrying out competitive research and development projects. Such projects have been funded by the European Commission and the European Committee for Standardization, through programs such as: FP7, FP6-STREP, FP6-IST, TEN / TELECOM, ISIS, Leonardo, ACTS, INFOSEC ETS II, ESPRIT / ESSI, Telematics Applications, ACTION 2, INFOSEC, ESPRIT LTR, BRITE EURAM, INNOVATION, RACE, VALUE II, LRE, ESPRIT, EURET / EURATN, AIM, etc..

The Department's faculty has similar experience in designing and carrying out national competitive research and development projects. Funders of such projects are: the Ministries of Interior, Foreign Affairs, Justice, Transparency and Human Rights, Finance, Education and Religious Affairs, Culture and Sports, Health, Public Order and Citizen Protection, Labor, Social Insurance and Welfare, Marine and the Aegean, as well as the General Secretariat for Research and Technology, the General Secretariat for Greeks Abroad, the National Centre for Vocational Orientation, the National Organization for Medicines, the Social Insurance Institute, the Greek State Scholarship Foundation, the Information Society SA, and many private organizations and enterprises.

Also, by taking advantage of the European Union financing capabilities through the ERASMUS / SOCRATES programs, the Department has developed and maintains educational and research collaborations with several European universities, including, among others, the following: Royal Holloway and Bedford New College (University of London), University of Plymouth, University College Dublin, Aston University, Kingston University, Trinity College Dublin, University of Stockholm, University of Lund, Chalmers Institute of Technology, Karlstad University, University of Hamburg, University of Essen, University of Regensburg, Catholic University of Leuven, University of Vienna, Technical University of Graz, University of Oulu, University of Rome "La Sapienza", University of Milano, Deusto University, University

of Malaga, Polytechnic University of Catalunya, and Copenhagen Business School.

Faculty of the Department of Information and Communication Systems Engineering offers from the academic year 2018-19 four Postgraduate Study Programmes and one Inter-university Programme in collaboration with the School of Electrical and Computer Engineering of National Technical University of Athens.

As far as the Postgraduate Program of the Department is concerned, its aim is to provide high quality education for University graduates in the cognitive area of Information and Communication Systems. It leads to the following Degrees:

- Master's Programme (MSc) in "Information and Communication Systems Security"
- Master's Programme (MSc) in "Internet of Things: Smart Environments in Next Generation Networks"
- Master's Programme (MSc) in "Electronic Governance"
- Master's Programme (MSc) in "Information and Communication Systems"
- Master's Programme (MSc) in "Digital Innovation and Startup Entrepreneurship"
- Doctor of Philosophy (Ph.D.) Degree

For more information please visit our web site: **http://msc.icsd.aegean.gr/**

Program Guide

Program of Study Structure – Courses

According to the Curriculum of the Department of Information and Communication Systems Engineering, in the first three years of study the students follow a program of compulsory courses, while in the fourth year they can choose courses belonging in the six scientific Cycles ("I**nformation and Communication Systems Security and Privacy**", "**Information Systems and Entrepreneurship**", "**Computer and Telecommunication Technologies**", "**Communication Systems and Networks**", "**Information Management and Intelligent Systems**" and "**Computer Science Foundations**"). The Diploma Thesis is prepared in the fifth year of study. In the last (10th) semester there are no courses so that students can be devoted to the preparation of their Diploma Thesis. The courses of the Department are divided in the following categories: "Compulsory Courses" (C), "Cycle Courses" (CC), "Optional Courses" (O), "Free Courses" (F).

- Compulsory Courses (C). There are thirty six (36) Compulsory Courses (C) which must be successfully attended by all students. The distribution of the compulsory courses per semester is as follows:

Semester	1st	2nd	3rd	4th	5th	6th
Compulsory Courses	6	6	6	6	6	6

- **Diploma Thesis – English Language**. In addition to these compulsory courses, the Diploma Thesis and a successful examination in English language are also compulsory.

- **Cycle Courses (CC)**. In each of the 7th, 8th and 9th semesters and for each of the six Cycles, a number of courses is available. All students have to successfully complete a minimum of eight (8) courses that belong in groups of four (4) to at least two (2) Cycles, to satisfy the requirements for the award of the Diploma.

- **Optional Courses (O)**. These courses are not included in any particular Cycle, but they are taken into consideration for obtaining the Diploma and for the calculation of the Diploma's grade (see the relevant paragraph of the Program Guide section).
- **Free Courses (F)**. These courses are not taken into consideration for obtaining the Diploma or for the calculation of the Diploma's grade. The only exception to this rule (**only for the calculation of the Diploma's grade**) is the foreign language (see the relevant paragraph of the Program Guide section).

Course Declaration

All students ***can declare a maximum of nine (9) courses in each semester,*** except for the students in 9th and 10th semester, who can declare as many courses as they want. At least six (6) of these courses must belong to the semester which the student attends or in previous semesters, while a maximum of three (3) courses can be of later semesters (exceptions can be made only in special cases, which are evaluated by the General Assembly of the Department, upon request of the student). This rule applies only to students of the first three years. Students of the fourth year of study (semesters 7th and 8th) are also asked to declare up to nine (9) courses, but in any way they wish. For the students of the Department there is also the possibility during their studies, to declare courses from the programs of other Departments of the University Unit of Samos, which are deemed as *Optional Courses (O)*. It should be noted though that the maximum number of courses from programs of other Departments of the University Unit of Samos that can be taken into account as Optional Courses for the calculation of the Diploma's grade is three (3). In addition, these courses may not have content that overlaps with that of courses of the Department of Information and Communication Systems Engineering.

The courses of English Language (321-0121, 321-0131 and 321-0141) cover three levels of language skills. They are compulsory, they are not counted in the number of courses declared per semester and, as far as it regards their contribution to the Diploma's Grade, they are considered as a single course. The students, at the beginning of the first semester and after qualifying examinations, are distributed to the first (A) and second (B) level of

English language, depending on their level of knowledge. Their enrollment at the next level is possible only after successful examination of the level they attend. All students are expected to successfully attend the B and C level. The overall objective of English language courses is to ensure that students, at the end of their second year of study, will have the ability to study scientific texts of Informatics and Telecommunications in English, attend lectures and seminars and create their own oral and written presentations. Apart from the above mentioned compulsory courses of English language, the Curriculum of the Department also includes two free courses taught during the 7th and 8th semester respectively. Their purpose is to prepare the students who wish to pursue postgraduate studies in English-speaking universities, for participating in examinations that prove their ability to use the English language (TOEFL).

Similarly, the courses of the Foreign Language (321-0823, 321-0833, 321-0843 και 321-0853) cover four levels of skill and are not counted in the total number of courses declared per semester. All four levels are considered as a single free course. The students, after qualifying examinations, are distributed to the four levels, according to their knowledge of the foreign language. Their enrollment at the next level is possible only after successful examination of the level they attend. The overall objective of these courses is learning the foreign language to a sufficient level of communication, understanding and production of spoken and written speech. Furthermore, these courses, through the study of the appropriate material, enable students to read scientific texts, to attend lectures, seminars and present their own work in this specific language.

Graduation Requirements – Diploma's Grade

The following requirements must be fulfilled in order for a student to obtain their Diploma:

1. Successful examination in every Compulsory Course (C).
2. Successful examination in at least four (4) courses, two (2) different Cycles (jointly, i.e., at least eight (8) courses, four of which at least would belong to each of the two different Cycles).
3. Successful examination in a total of fifty-four (54) courses (excluding the English Language courses and the Diploma Thesis).
4. Successful examination in the compulsory English Language courses.
5. Successful defense of their Diploma Thesis.

The Diploma's Grade is calculated as follows:

Diploma's Grade = 0.15 x Diploma Thesis grade + 0.85 x Courses Grade

The Courses Grade is equal to the average of the grades in the courses required for a student to obtain their Diploma (54 courses plus a single grade for the compulsory English Language courses). If a student has successfully attended the Foreign Language course, then an additional single grade for this course can be taken into account for the calculation of the Courses Grade (i.e., the Courses Grade in this case is the average of 56 rather than 55 courses).

For the calculation of the Diploma's Grade, only a single grade is taken into account for the compulsory English Language courses (that is, the average of the grades of the courses with codes 321-0131 and 321-0141).

For the calculation of the Diploma's Grade, only a single grade is taken into account for the Foreign Language course. This grade is equal to the average of the grades obtained in the examinations of the various courses of Foreign language, which students have successfully attended (the number of these courses depends on the level at which they were initially placed, after the qualifying examinations). A student is considered to have successfully attended the Foreign Language course, only after having succeeded in the examinations of the Foreign Language 4 course (321-0853).

If a student has been successfully examined in more courses than those required for graduation, they can choose not to take into account the grades of some courses for the calculation of the Diploma's Grade, provided that requirements 1-3 above are still met.

It should be mentioned again that Free Courses (F) are not taken into consideration for obtaining the Diploma or for the calculation of the Diploma's grade. The only exceptions to that rule (only for the calculation of the Diploma's grade) are the free courses of Foreign Language.

Grade Improvements and Changes to Program of Study

Students, who have been successfully examined in a course and do not meet the graduation requirements, may request a repetition of the examination in order to improve their grade in the specific course, by submitting an application to the Department's Secretariat. The repetition of the examination takes place during the examination period of September and only for courses which have been declared by the student during the current academic year.

Especially for students who attend the fifth or higher year of their study, there is the possibility of repeating the examination of a maximum of five (5) courses, in which they have been successfully examined in previous years. In this case, the repetition of the examination takes place during the examination period of January for fall semester courses, during the examination period of June for spring semester courses and during the examination period of September for all courses. In all cases, the final grade is the greater of the two grades.

The Department's Curriculum undergoes frequent changes, in order to accommodate advances in scientific knowledge and the constantly changing needs of the market.

Learning outcomes

Upon the completion of their study, the graduates will have acquired the ability to:

- Recall, explain and present the basic principles of the Computer and Communications Science.
- Associate the theoretical background of the Computer and Communications Science with the design, integration and application of Information and Communications Technologies (ICT).
- Design, develop, manage, and assess information and communication system.
- Analyze users' requirements for information systems.
- Design, develop, and assess software applications..
- Design, develop, and assess databases.
- Design, develop, manage, and assess computer networks and telecommunications networks.
- Design and assess security of information and communication systems.
- Integrate and apply information systems security technologies and privacy enhancing technologies.

- Design, implement and assess digital circuits and systems.
- Describe, explain, and employ microprocessors and microcontrollers, as well as design and implement systems based on them.
- Design and apply artificial intelligence, information management, and big data technologies.
- Describe, analyze, and apply signal processing and multimedia technologies.
- Manage projects.
- Design, develop, and manage e-Commerce and digital businesses.
- Describe and analyze the legal and regulatory framework of ICT.
- Analyze ICT-related problems and create solutions.
- Create, present, and explain solutions for real-world ICT-related problems.
- Support the technological, social and economic development.

Courses per Semester

1st Semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-1204	Structured programming	3	4	5
321-1406	Introduction to Computer Science and Communications	3	–	3
321-2003	Logic Design	3	2	5
321-1501	Discrete Mathematics I	3	2	5
321-1106	Calculus	3	2	5
321-2052	Physics	3	2	5
321-0121	English Language 1	3	1	1

Free Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-0823	Foreign Language 1	3	-	1

2nd Semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-2105	Object-oriented Programming I	3	2	5
321-2551	Circuit Theory	3	2	5
321-2450	Discrete Mathematics II	3	2	5
321-3154	Linear Algebra	3	2	5
321-2402	Probability and Statistics	3	2	5
321-4103	Operating Systems	3	2	5
321-0131	English Language 2	3	1	1

Free Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-0833	Foreign Language 2	3	-	1

3rd Semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-3652	Object-oriented Programming II	3	2	5
321-8105	IT Project Management	3	2	5
321-3004	Data Structures	3	2	5
321-3354	Computer Architecture	3	2	5
321-3751	Stochastic Calculus	3	2	5
321-5502	Signals and Systems	3	2	5
321-0141	English Language 3	3	1	2

Free Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	v
321-0843	Foreign Language 3	3	-	1

Courses per Semester

4th Semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-3104	Information Systems Analysis and Design	4	-	5
321-4201	Algorithms and Complexity	4	2	5
321-3203	Advanced Topics of Programming Languages	3	2	5
321-3302	Databases I	3	2	5
321-4120	Computer Communications	3	2	5
321-2254	Differential Equations	3	2	5

Free Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-0853	Foreign Language 4	3	-	1

5th Semester

Every course in this semester is Compulsory

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-2304	Business Operations and Information Systems	4	2	5
321-6451	Computer Networks	3	2	5
321-3703	Databases II	3	2	5
321-3453	Telecommunications	3	2	5
321-4002	Software Engineering	3	2	5
321-6702	Theory of Computation	3	-	5

6th Semester

Every course in this semester is Compulsory

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-6503	Information Systems Management	4	-	5
321-3604	Artificial Intelligence	3	2	5
321-3404	Information and Communication Systems Security	3	2	5
321-7951	Distributed Systems	3	2	5
321-8810	Internet Programming	3	2	5
321-5205	Legal Framework for the Information Society	3	-	4

7th Semester

1. Cycle Information and Communication Systems Security and Privacy

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9703	Computer Network Security and Privacy Enhancing Technologies	3	2	5
321-5753	Privacy and Data Protection Law	3	-	5

2. Cycle Information Systems and Entrepreneurship

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8953	Electronic Entrepreneurship	3	-	5
321-5155	Information Systems Analysis and Design Methodologies and Tools	4	-	5

Courses per Semester

3. Cycle Computer and Telecommunication Technologies

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-10302	Digital Communications	3	2	5
321-7051	Digital Systems Design	3	2	5

4. Cycle Communication Systems and Networks

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8354	Network Management	3	-	5
321-6256	Internet Protocols and Architectures	3	-	5

5. Cycle Information Management and Intelligent Systems

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7754	Robotic Control	3	2	5
321-3553	Computational Logic and Logical Programming	3	2	5

6. Cycle Computer Science Foundations

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9454	Applied Topics in Data Structures and Databases	3	2	5
321-99002	Numerical Analysis	3	-	5

Free Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-0161	English Language (TOEFL)	3	-	2

8th Semester

1. Cycle Information and Communication Systems Security and Privacy

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8053	Cryptography	3	-	5
321-10753	Mobile and Wireless Networks Security	3	-	5

2. Cycle Information Systems and Entrepreneurship

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8504	Decision Support Systems – Business Analytics	3	2	5
321-5607	Human – Computer Interaction and Web Applications	3	2	5
321-7653	Systems Theory	3	-	5
321-11101	Electronic Government Technologies and Applications	3	-	5

Courses per Semester

3. Cycle Computer and Telecommunication Technologies

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7803	Wireless Communications	3	2	5
321-8752	Introduction to VLSI	3	2	5
321-9353	Digital Image Processing	3	2	5
321-7903	Microelectronics	3	-	5

4. Cycle Communication Systems and Networks

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7002	Performance Evaluation and Simulation of Computer Systems and Networks	3	2	5
321-7256	Mobile Communication Networks	3	2	5
321-11001	Networks and Cloud Technologies	3	2	5

5. Cycle Information Management and Intelligent Systems

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9253	Data Mining and Data Warehouses	3	2	5
321-10202	Information Retrieval	3	-	5

6. Cycle Computer Science Foundations

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8602	Information Theory	3	-	5
321-8001	Game Theory	3	-	5

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9855	Mathematical Modeling	3	-	5

Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-2630	Simulation of Communication Systems using Matlab	3	2	5
321-7602	Practice	-	-	5

Free Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-0151	English Language (TOEFL)	3	-	2

9th Semester

1. Cycle Information and Communication Systems Security and Privacy

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-99101	Regulatory and Social Issues in Information Society	3	-	5

2. Cycle Information Systems and Entrepreneurship

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-5403	Information Systems Strategy and Investment	3	-	5

Courses per Semester

3. Cycle Computer and Telecommunication Technologies

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-10652	Satellite Communications	3	2	5
321-6555	Multimedia	3	2	5

4. Cycle Communication Systems and Networks

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9404	Broadband Networks	3	-	5
321-9120	Design and Development of Mobile Computing Applications	3	2	5

5. Cycle Information Management and Intelligent Systems

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7406	Knowledge Engineering and Knowledge Systems	3	-	5
321-6606	Computer Vision	3	-	5

6. Cycle Computer Science Foundations

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9003	Advanced Data Structures	3	-	5
321-10001	Algorithms and Combinatorial Optimization	3	-	5

Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-2600	Risk Theory	3	-	5

10th Semester

Compulsory Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7102	Diploma Thesis	-	-	30

Syllabus and Learning Outcomes of Courses per Semester

(for each course, syllabus is shown first and learning outcomes follow)

1st Semester

321-1204 Structured programming

Introduction to programming and programming languages. The basic parts of C programming language. Variables and constants, Declarations, Operators, Expressions, Data input and output, conditional expressions, Functions, Tables, Pointers, Formatted input and output, Structures and Unions, Files and Dynamical structures.

Understanding the advantages and disadvantages of structured programming. Learning the basic features of the C programming language. The emphasis is on design and analysis of various computer algorithms and on software development.

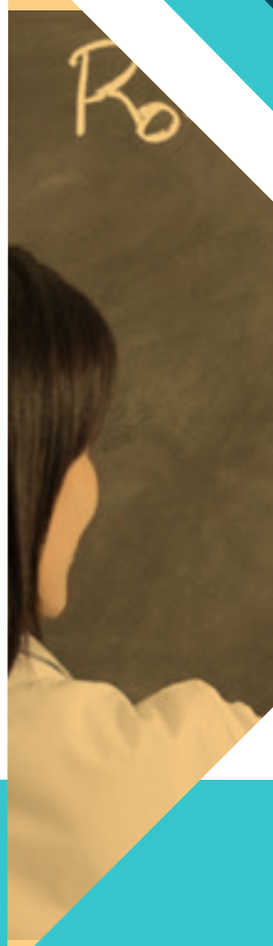
321-1406 Introduction to Computer Science and Communications

Introduction to Information Systems, conceptual framework. Categories of Information Systems and areas of application. Fundamental skills of Information & Communication Systems Engineers. Introduction to circuits. Introduction to Robotics. Introduction to Computer Architecture. Introduction to Computer Networks. Introduction to Internet and Web Technologies. Social and legal aspects of information and communication technologies. Current trends and challenges.

Understanding the fundamentals of computer science and telecommunications. Web development skills.

321-2003 Logic Design

Introduction: Analog and Digital Signals, Usefulness of Digital Signal Processing and Digital Circuits, Evolution of Digital Circuits. Digital Systems and Binary Numbers: Digital Systems, Binary Numbers, Number-Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic. Boolean Algebra and Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic



Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms of Boolean Functions, Other Logic Operations, Digital Logic Gates. Gate-Level Minimization: The Map Method, Three, Four and Five-Variable Maps, Product-of-Sums Simplification, Don't-Care Conditions, NAND and NOR Implementations, XOR Function. Combinational Logic: Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Tri-State Gates. Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure. Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters.

Knowledge of basic concepts of digital systems. Ability of analyzing and designing combinational and synchronous sequential circuits in logic level.

321-1501 Discrete Mathematics I

The sets theory, finite and infinite sets, multisets, the principle of inclusion and exclusion. Proof techniques, mathematical induction. Logic and propositions, propositional calculus, predicate calculus, inference rules. Computability and formal language theory, the paradox of Russell and non-computability, languages, phrase structure grammars, hierarchy types on the generative grammars and languages. Enumeration: samples, permutations, combinations, the binomial theorem, etc. The discrete probability. Relations and functions: a relational model for databases, binary relations, equivalence relations and partitioning, functions, etc. The pigeonhole principle.

The widening of the field of mathematics for the student through the examination of a series of concepts and issues, which represent the foundation of Computer Science and are not included in the General Applied Mathematical courses. Aiming at developing and deepening students' perception of related disciplines, such as the Foundations of Computer Science, the Sets Theory, the Formal Language Theory, the Probability Theory, the Theory of Algorithms, etc.

321-1106 Calculus

Mathematical induction. Completeness of the real numbers. Functions. Limits. Continuity, theorems of continuous functions. Uniform continuity. Differentiation, derivative of inverse functions, derivatives of trigonometric functions, differential. Applications of derivatives, extreme values of functions, concavity, curve sketching, Cauchy mean value theorem, L' Hopital rule, graphical method of solving autonomous differential equations, Newton's approximation method. Integral, indefinite, definite, techniques of integration. Volume of solids of revolution. Improper integrals. Transcendental functions. Separable, linear differential equations of first order. Taylor's formula.

The purpose of the course is to give a complete and working knowledge of differential and integral calculus. It covers and expands material presented in the last years of high school, including functions, basic calculus, limits, derivatives and integrals. One objective of the course is to provide a solid background to the analysis of functions of a single variable and to expose the mathematical rigor through the proofs of most of the theorems and propositions. For example, one of the goals is to introduce the student to the definitions of the concept of the limit of a function or that of the continuity, so that concrete examples of functions can be treated using these definitions. At the same time, the course also focuses on direct applications of the covered material to a number of problems from everyday life, from geometry (areas, volumes) or from physics. The student should realize that beyond the terse formalities used in the proofs, there is a very vivid and practical aspect in calculus. Similarly, the definition of the definite integral as summation should be understood, but at the same time a variety of integration techniques should be taught for practically computing complicated integrals. More advanced topics such as improper integrals or solving simple differential equations or a presentation of Taylor theorem should also be understood.

321-2052 Physics

Scalar, vector quantities. Kinematics. Relative motion. Forces, torques, centre mass. Dynamics, friction in a liquid, bodies with changing mass, angular momentum. Work, energy, potential, conservative forces, central forces. Electrostatics: Coulomb's law, electric field, potential, flux, Gauss's law, Poisson equation, potential energy, boundary conditions, method of images, electric dipole, multipole expansion, conductors, capacity, dielectrics, polarization, electrical displacement. Electric current, continuity equation, steady current, Ohm's law. Magnetostatics: Laplace's force, Lorentz, force on a current-carrying wire, magnetic dipole,

Biot-Savart's law, Ampere's law, vector potential, field of a magnetic dipole, magnetic materials, magnetization. Ampere-Maxwell's equation, Faraday's equation, scalar potential of EM field, mutual inductance, self inductance, RL, RC, RLC circuits, Maxwell's equations, energy/momentum conservation theorems, equations of potentials in Coulonb, Lorentz gauges, elements of electromagnetic waves.

The course covers and expands topics in mechanics and electromagnetism which are familiar to some degree from high school but using higher mathematics. Differential calculus, elements of vector analysis and simple differential equations are being introduced in the description of the basic laws of mechanics and are used for solving problems. Using integrals the student should be able to compute the kinematical quantities of an arbitrary motion in a straight line, in a general curvilinear motion, or to find the orbit of a point particle from Newton's law, e.g. inside a Keplerian gravitational field. Given a force field one should be able to determine if this is conservative or not and to find the potential energy when this exists. Another objective is the use of integration techniques to compute the centre-mass. Concerning electromagnetism, one of the basic goals is to introduce the students to the use of differential calculus and vector analysis to the study of the laws of electrostatics, magnetostatics and electromagnetism. Using integrals the student should be able to compute the electric field and potential of various distributions of charge which have some symmetry in their geometry or respectively the magnetic field of moving charges and currents. Various theorems and equations (e.g. Gauss, Biot-Savart, Ampere, Faraday, Maxwell's equations) should be understood in their general form and not just in their simplified versions exposed in high school textbooks. Beyond that, one of the objectives of the course is the physical and mathematical study of more sophisticated topics of electricity and magnetism, such as the method of images, the electric dipole, the dielectrics, the magnetic materials, the scalar and vector potentials of electromagnetism, the energy/momentum conservation theorems and elements of electromagnetic waves.

321-0121 English Language 1

The course includes comprehension activities on written and spoken texts, along with vocabulary exercises, grammar theory and practice, and speaking/writing exercises (e.g. letter, email, paragraph, summary). In addition, students are introduced to computing terminology.

Students who successfully complete the course will be familiar with basic concepts of English grammar and syntax, will have practised in understanding generic texts and will have developed their writing and speaking skills in English.

321-0823 Foreign Language 1

Basic knowledge of the foreign language (grammar, syntax), descriptions of persons and objects, exchange of simple information, suggestions and views that enable communication in familiar, everyday situations.

Ability to use the foreign language in the cases mentioned in the syllabus of the course.

2nd Semester

321-2105 Object-oriented Programming I

Object-oriented programming, Classes, Object Oriented Analysis and Design, Objects, Recursion, Constructor, Destructor, Member Functions, const Functions, Inline functions, Complex Classes, Input / Output in C++, Output to file, Input from file, Control loops, Pointers, Memory Allocation, References, Derived class, Inheritance, Overriding, Overloading vs. Overriding, Virtual functions, Abstract classes, Polymorphism, Virtual Inheritance.

The course aims to introduce object-oriented programming to the students using C++. It targets three areas; the student should be able to: 1) identify the potential classes and their structure from a brief description, 2) understand existing code, and 3) develop a system in C++.

321-2551 Circuit Theory

Basic principles of electric circuits – levels of functional abstraction, Resistive network analysis techniques, Equivalent circuits and transformations, Digital logic – noise margins, the MOSFET switch – design of digital gates, Input - Output behavior of digital gates, Capacitors, inductors and first-order circuits, Physical structure of the MOSFET, Propagation delay of digital gates, Energy and power in digital circuits – CMOS logic.

Knowledge of main methodologies for circuits' analysis. Knowledge of basic MOSFET characteristics. Familiarity with key features of digital circuits like the structure and function of digital gates, noise margins, propagation delay and power dissipation.

321-2450 Discrete Mathematics II

Graph theory: basic terminology; paths and circuits; minimum paths; Euler and Hamilton paths and circles; the travelling salesman problem. Trees: basic notation; rooted trees; binary search trees; minimum span trees. Finite state machines. Real sequences and generating functions. Combinatorial problems. Recursive relations and recursive algorithms. Linear recurrence equations with constant coefficients: homogeneous solution; partial solution; total solution; solution using generating functions. Sorting algorithms.

Usage of elemental mathematical tools in problem solving, with emphasis on computer science problems.

321-3154 Linear Algebra

Complex numbers, conjugate, absolute value, Argand diagram, Euler relation, De Moivre theorem, powers, roots, factorization of a polynomial. Vector spaces, subspaces, sum of subspaces, subspace generated by a set of vectors, linear independence, basis, dimension. Matrices, operations, inverse, transpose, composite matrices, row space, rank, row echelon form, triangular, symmetric, hermitian, orthogonal matrices, trace, similar matrices, row equivalence, change of basis, linear systems. Determinants, properties, Laplace expansion formula, determinant of a triangular matrix, adjoint-inverse, Cramer's rule. Characteristic polynomial, Cayley-Hamilton theorem, eigenvalues-eigenvectors (properties for symmetric, orthogonal matrices), functions of matrices. Linear mappings, kernel, image, matrix associated with a linear map, rotations, change of basis of a linear map. Diagonalization of a matrix, functions of diagonalizable matrices, diagonalization of a hermitian matrix, quadratic forms.

The purpose of the course is to introduce the first year students to the concepts of linear algebra which usually have not been met before. After an introduction to the complex numbers, one main objective of the course is to provide a complete and working knowledge of the theory of linear spaces. The notions of linear independence, linear superposition, basis and dimension should be well understood. Another goal is the study of the theory of matrices, of row equivalence and of the solution of a linear system of equations. Techniques for computing trivial and non-trivial determinants should be discussed. Students must also understand more advanced topics of linear algebra, such as eigenvalues-eigenvectors, linear mappings and diagonalization.

321-2402 Probability and Statistics

Axiomatic definition of probability, independent events, conditional probabilities, Bayes theorem, combinatorial analysis, discrete and continuous random variables, distribution functions, distributions of special interest: Bernoulli, binomial, Poisson, uniform, exponential, normal, Gamma, Weibull. Joint distribution functions, independent random variables, conditional distributions, moment generating functions, limit theorems, central limit theorem, strong law of large numbers. Descriptive statistics.

Comprehension of basic notions of combinatorial analysis and probability theory. Familiarity with the basic categories of random variables.

321-4103 Operating Systems

Introduction to Operating Systems: Basic Concepts, History, Operating System Structure. Processes: The Process Model and Implementation of Processes, Interprocess Communication, Process Scheduling. Threads: The Thread Model and Thread Usage, Implementation of Threads in User Space and in the Kernel, Hybrid Implementations, Pop-up Threads, Making Single-Threaded Code Mulithreaded, Thread Scheduling. Deadlocks: Detection and Recovery, Deadlock Avoidance, Deadlock Prevention. Memory Management: Swapping, Virtual Memory, Page Replacement Algorithms, Modeling of Page Replacement Algorithms, Segmentation. Input/Output (I/O): Principles of I/O Hardware, Principles of I/O Software, I/O Software Layers, Disks. File Systems: Files and Directories, File System Implementation, Security and Protection Mechanisms.

Understanding the modern computer systems' complexity and the usefulness of operating systems. Knowledge of the most important resource-utilization issues arising in a computer system. Learning of the most popular solutions adopted by modern operating systems.

321-0131 English Language 2

See course 321-0121.

321-0833	Foreign Language 2

Acquisition of communication skills through simple dialogues on familiar and contemporary issues, understanding of written and oral language, writing paragraphs, letters, CVs, announcements.

Anything mentioned in the syllabus of the course.

3rd Semester

321-3652	Object-oriented Programming II

Introduction to OOP and UML. Java Language Fundamentals: Data types, Variable declarations, Operators and Assignment, Control structures, Strings, Arrays, Collections, Wrapper classes. Java as an OOP language: Classes, Constructors, Access modifiers, Packages, Interfaces, Garbage collection, Encapsulation, Cohesion, Coupling. Exception Handling: Basics, Exception Hierarchy, The Throwable class, Unchecked and checked exceptions, Exception and Inheritance, User defined Exceptions, Redirecting and Re-throwing Exceptions. Lambdas. Concurrent programming and Multithreading: Introduction, Thread Creation, Thread Life cycle, priorities and scheduling, Synchronization, Communication of Threads. Files and I/O Streams: File Input stream and File output stream, Serialization. AWT: Basics, The Graphics class, Class hierarchy of AWT, Layout Managers, Java 2D API. Swings: Introduction, Swing packages, Hierarchy of swing classes, Advanced layout Managers. Networking with Java: Introduction, Stream Socket Connections.

This course covers the fundamentals of Object Oriented Programming (OOP) using Java. The main learning objectives for this course are: To build and develop OOP thinking: Learn to think in objects; to familiarize students with the basic features of the language API and knowing how to use them correctly and efficiently; to cover the usage principles of encapsulation, coupling, cohesion, inheritance, polymorphism and method overloading/overriding; to create Java applications using sound OOP practices and program structuring; to develop analytical programming thinking and reasoning skills. The aforementioned objectives are achieved through course lectures and extensive laboratory exercises.

321-8105 IT Project Management

Introduction to IT Project Management. Basic concepts and objectives. Structured project management. Framework for IT project management. IT Project life-cycle. Breaking down projects into activities. Scheduling activities. Managing resources. Managing time with PERT and CPM methods. Managing time and cost. Major risks and IT projects and how to mitigate them. Managing human resources. Exercises.

Students will learn the basic principles of IT project management and will be able to apply fundamental methods for managing the cost and duration of IT projects.

321-3004 Data Structures

Introduction - Basic concepts of algorithms and data structures, Abstract Data Types (ADT), Performance Algorithm, Analysis of algorithms, Asymptotic notations, Arrays (multidimensional, special forms, sparse), Lists (simply connected, circular, doubly linked), Stacks (with implementation table with a list implementation, applications), tails (realization with a round table with a list implementation, applications), Trees (quantitative data, representation of arrays and pointers, cross), priority Queue, heap Structure, Search (linear, binary, with interpolation), Sort (with option to import, bubble, quicksort, heap with merger), binary search trees, weighted search tree, red-black trees, B-trees, hash (dictionary function and hash table, collisions, fragmentation chains, linear and double fragmentation), Graphs (a reconstruction table / list of neighborhood, breadth-first search, depth-first search).

The design or selection of appropriate data structures for specific programming problems. The implementation and evaluation of different structures. Basic algorithmic techniques.

321-3354 Computer Architecture

Historical data on the evolution of computers. Architecture Von Neumann. Main memory. Auxiliary memory. Cache (Cache memory). Virtual Memory (Virtual Memory). I / O modules. Evaluation of Computer. Forms of representation of numerical data (both fixed and floating point). Structure and characteristics of the instruction set that supports the CPU. Machine language commands. Types of machine language commands. Types and data size. Simple computers (RISC) and complex instruction set (CISC). Support high-level programming languages. Organization and operation of the Central Processing Unit (CPU). Parallel

processing. Multi-processor systems (MIMD, SIMD). Implementation of arithmetic. Channels. Technologies and methodologies for design of computer memory. Behavior management and multi-level memory hierarchy. Virtual Memory. Addressing modes for data management and from memory. Ways of addressing memory. Memory technology. Semiconductor memories. Static direct access memories, dynamic random access memory directly. Semiconductor memories accessible by content (Content Addressable Memories, CAM). Magnetic Memories. Memories of magnetic disks. Memories of magnetic tape. Optical Memories.

Comprehension of the basic architectural elements of a computer system.

321-3751 Stochastic Calculus

Discrete and continuous random variables, expectation of functions of random variables, joint distribution functions, independent random variables, moment generating functions, limit theorems, conditional probability and conditional expectation, the exponential distribution, definition of stochastic processes, the Poisson process, simulating discrete and continuous random variables, simulating stochastic processes, Markov chains, Chapman-Kolmogorov equations, classification of states, limiting probabilities, mean time spent in transient states.

Comprehension of the notion of stochastic processes and familiarity with the basic families of them (i.e., Poisson processes and Markov chains).

321-5502 Signals and Systems

Basic definitions of signals and systems, impulse function, linear systems, Linear Time Invariant systems, stability, causality, linear convolution. Fourier transform, properties and application to the study of linear systems. Fourier Series. Laplace transform, properties and relation to the Fourier transform. Use of the Laplace transform in the analysis of linear systems and the study of their stability. State space, state, observability, controllability. Z transform, study of discrete signals and systems. Sampling theory. Discrete Fourier Transform.

Knowledge of basic techniques of signals and systems analysis and study. Knowledge of transformations (for continuous and discrete signals and systems) and their properties. Understanding fundamental relations and meanings, such as the relation that associates the output with the input of a system and the notions of stability and causality. Use of the above for solving problems.

321-0141	English Language 3

See course 321-0121.

321-0843	Foreign Language 3

Understanding and participation in discussions of issues of everyday life, oral and written presentation of information and texts in a variety of topics. Expression of feelings, opinions, arguments, conclusions, cultural elements (everyday life, education, work in France).

Anything mentioned in the syllabus of the course.

4th Semester

321-3104	Information Systems Analysis and Design

Information systems concepts and terms. Types of information systems and their role in the organization. Factors affecting the successful development of information systems. The role and challenges of the systems analyst. Requirements elicitation methods (interviews, questionnaires, JAD method, documents analysis, STRuctured Observation of the Business Environment – STROBE). Information Systems lifecycle. Data Flow Diagrams. Data dictionaries. Process specification. Data specification and analysis with Entity-Relationship Diagrams. Object-oriented analysis and design with UML (CRC cards, Use Case diagrams, Class diagrams, Sequence diagrams, Activity diagrams, etc.). Quality management and the development of information systems.

Basic knowledge of system analysis techniques. Systems analyst skills.

321-4201 Algorithms and Complexity

Combinatorial optimization problems. Divide-conquer algorithms. FFT. Dynamic programming. Greedy algorithms. Graph algorithms. Minimal spanning trees & algorithms. Maximum flow. Randomized algorithms. Approximation algorithms.

Knowledge of the most important algorithms of the theory of computation.

321-3203 Databases I

Introduction to Databases and Database Systems. Advantages of using a Database System. Database Systems architecture. Database users. Schemas and instances. The principle of data independence. The entity-relationship, the relational and the object-relational model. Integrity constraints and Database update operations. Relational Database design by entity-relationship to relational model mapping. Database languages: relational algebra; tuple and domain relational calculus; the QBE language. SQL as a query language: queries, views, update statements. Introduction to primary file organizations and indexes. Presentation of Database Management Systems.

The foundation of Database Science and, more precisely, developing students' knowledge of the principle of conceptual and logical modeling and designing of Databases, the Database programming languages, as well as of the options for implementation that are nowadays made available by Database Management Systems.

321-3302 Computer Communications

Introduction to computer communication. Network achitecture and protocols. Network Design. The OSI reference model from ISO. Transmission media (coaxial cable, fiber optics). Principles of data transfer. Local and metropolitan networks. Static and dynamic channel allocation. The ALOHA protocol. The CSMA protocol. The family of IEEE 802 for local networks (Ethernet, Token bus, Token Ring). The optical FDDI network. Design and analysis of data link layer. Error detection and correction. Flow control. The wireless IEEE 802.11. Networking devices (switches, routers, etc.).

Introduction to the physical layer, data link layer and Medium Access Control sublayer of modern communication systems. Engineering skills on communication systems and technologies.

321-4120 Advanced Topics of Programming Languages

Types of programming languages. Variables, expressions and commands. Datatypes and type definition systems. Scope and time of memory binding. Procedures. Exception handling. Concurrency. Object-oriented programming languages. Introduction to the organization and operation of compilers. Lexical analysis. Syntax directed translation. Basic detection techniques. Symbol tables. Intermediate code.

Understand the essential aspects of programming languages. Understand basic issues of compilers from both theoretical and practical terms.

321-2254 Differential Equations

Examples of differential equations. The differential equation of first order. Second order linear differential equations with constant coefficients. Integral curves. Fixed point theorems and successive approximations. Existence and uniqueness theorem. Solutions with power series. Numerical solutions of differential equations.

The student should be able to construct a differential equation that describes a simple physical system and solve it either analytically or numerically.

321-0853 Foreign Language 4

This course aims at a high level of knowledge of the Foreign language by assigning creative, academic projects. It enables recognition of advanced level of the Foreign language usage from official organizations and companies. It helps students who wish to pursue postgraduate studies at higher educational institutions and many Foreign language speaking countries. It enables the acquisition of Foreign language proficiency certificate.

Ability to participate in exams for acquisition of the Foreign language proficiency certificate.

5th Semester

321-2304 Business Operations and Information Systems

Introduction. Basic functions of a firm. Structure of the information system of a firm. Enterprise Resource Planning (ERP) systems. Commercial functions: sales, procurement, inventory management - basic concepts, implementation processes and functionality (capabilities) of the corresponding ERP modules. Financial statements - General Accounting: accounts, entries (credits/debits) for basic events and transactions, functionality of General Accounting module. Analytical Accounting - Costing: cost categories, cost centers, cost allocations, functionality of relevant modules. Production function: production planning and monitoring, Master Production Schedule - MPS, Materials Requirements Planning - MRP, functionality of production ERP modules. The laboratory of this course includes basic familiarization with the above modules of Microsoft Navision ERP system.

Gaining an understanding of the basic functions of a firm (commercial, financial and production), and also of the capabilities to support them through modern Enterprise Resource Planning (ERP) Systems.

321-6451 Computer Networks

Reference Model TCP/IP and the OSI. IP Layer. Addressing. Algorithms and routing protocols. IPv6 and mobile IP. Congestion Control. Methods open (shaping, leaky backet etc.) and closed loop (blocking etc.). Internetworking, virtual networks, firewalls. Transport Layer. TCP & UDP Protocols. Multimedia applications and networks.

Familiarity with the basic elements of networks and data transport. Development of network engineering skills.

321-3703 Databases II

Introduction to Database Design. Quality criteria for designing relational schema. Normalizing database schema. Relational Decomposition. Query processing. Query optimization.

Transaction processing, time schedules and serialization. Concurrency control. Database recovery techniques, ARIES. Distributed databases and Internet databases. Interoperability between databases and user applications (ODBC, JDBC, etc). Introduction to design and implementation of Object-Oriented Databases.

Students will gain understanding and practical experience of the development life cycle of a Database System. The intention is to train students to conduct data analysis, database modeling and database application development, using a suitable database management system. The course will concentrate on methodologies for good database design and will give the student practical experience in designing and implementing standalone database systems. The student will gain skills so that they can understand and discuss with computing professionals, participate in project development teams, and effectively develop a database system for small to medium size business. At the end of this course, the student will be able to: a) clearly explain his/her knowledge of database technology, its importance, its architectures, and the central role Database technology plays in Information Systems, b) understand and apply appropriate development methodologies of data analysis, and to design and use appropriate modeling techniques for databases, and c) administrate transaction, recovery, optimization and concurrency issues in modern DBMS.

321-3453 Telecommunications

Transmission methods, telecommunication system model. Statistics and stochastic processes in telecommunications. Hilbert transformation. Baseband transmission and band-pass signals. Analog Modulation AM, FM and PM, spectrum analysis, noise. Signals and Systems in Telecommunications. Fourier series and transform. Filters' classification, Distortion free transmission, Noise, Analog and/or digital data transmission over analog and/or digital systems. Sampling and quantization. Bandwidth, Nyquist and Shannon theorems. PAM and PCM modulations. Digital modulations (ASK, PSK, FSK, M-QAM).

This course covers a large part of the telecommunication systems aiming at understanding the basic principles of analog and digital communication systems, which rely on wireless transmission of information. In particular, an introduction to the basic principles of analysis and design of telecommunication systems is considered, along with the transmission technologies of the physical layer. The theoretical and laboratory section of the course

is a detailed presentation of all the necessary technical data, definitions and standards that are essential for understanding Analog Communication Systems, a presentation of basic analog and digital modulation, coding techniques and effects of noise to the signals. Upon completion of this course, the student will be able to understand the propagation of information and its techniques, as well as techniques necessary to implement basic data transmission telecommunication systems.

321-4002 Software Engineering

Introduction to Software Engineering (History, Motivation, Team Programming, The Software Process). Software Lifecycle Models (Waterfall, Rapid-Prototype, Incremental, Spiral). Requirements (Functional and Non-Functional Specifications, Requirements Planning and Scheduling, CASE Tools, Software Requirements Specification Document). Design (Data Centric design, Object centric design, Service centric design). Implementation and Integration (Coding Standards and Practices, Configuration Control, Team Organization). Testing (white box and black box, validation and verification). Modern methods and prototype (Agile programming, MSF, extreme programming).

The students get an overall view of software engineering methods and tools. Through their demo-prototype development in teams, they get initial experience in running and managing small software development projects.

321-6702 Theory of Computation

Regular languages, finite automata, pumping lemma for regular languages. Grammars for context free languages, pushdown automata, pumping lemma. Turing machines, computability and Church-Turing thesis. Non computability, halting problem. Time complexity, class P, Cook-Carp Thesis. NP completeness and time reductions. Space complexity and Savitch's theorem.

To understand the limits of computation through the study of simple and complex computing machines.

6th Semester

321-6503 Information Systems Management

Enterprise information systems. Applying IS into businesses. Gaining competitive advantage through IS. Information technology infrastructure (software, hardware, communications and Internet). Business Intelligence. Enterprise applications. Electronic commerce. Enhancing decision support. Knowledge management. Ethical and social issues.

Students will learn about the basic applications and the role of information systems into organizations. They will also learn about the necessary technological infrastructure.

321-3604 Artificial Intelligence

Intelligent agents (basic concepts). Search in a state space for problem solving: Blind (but systematic) search, Guided search and heuristic methods, Search cost, Local search. Constraint satisfaction problems: Basic principles and algorithms. Planning: Basic principles and algorithms, Hierarchical planning. Machine learning: Introduction, Inductive learning, Machine learning algorithms.

Ability to define an intelligent agent and familiarity with the types of intelligent agents. Ability to represent a problem so that it can be solved via state space search. Familiarity with blind search algorithms. Familiarity with heuristic search algorithms. Understanding of the properties of heuristic functions. Familiarity with local search algorithms. Ability to represent a problem as a constraint satisfaction problem. Familiarity with algorithms of solving constraint satisfaction problems. Understanding of planning methods and the algorithm of partial-order planning. Familiarity with the basic principles and algorithms of machine learning. Ability to develop programs that use artificial intelligence algorithms.

321-3404 Information and Communication Systems Security

Semantic foundation of terms on Information and Communications Systems security. Identification and authentication. Access Control. Policies and formal security models. OS security, use case: Unix. Malware. Analysis, evaluation and management of information

systems risks. Information systems security policies. Elements of applied cryptography: classical cryptographic methods, symmetric and asymmetric cryptosystems, message authentication codes, digital signatures, Certification authorities, Public Key infrastructure, Legal framework in Greece. Network security. Threats and vulnerabilities. Internet Model Security: Internet layer security, Transport layer security, Application layer security, over the Application layer security. Applications.

The course offers an introduction to Information and Communication Systems security. The undergraduate student will be able to attend more advanced security and cryptography related courses.

321-7951 Distributed Systems

Basic notions and principles of Distributed Systems. Model of customer-server. Communication models, threads, processes, sockets. Race conditions, deadlocks, Banker's algorithm. Byzantine agreement. Leader's Election problem. Logical and physical time, logical clocks. Mutual exclusion.

The development of ways to think and manipulate problems in a distributed fashion, in contrast to acting in a centralized manner.

321-88103 Internet Programming

Introduction in internet technologies and web programming. Application, systems and services architecture and multi-tier layering. Content programming (HTML, XML, CSS). Client-side programming methods and tools (JavaScript, DOM, DHTML). Server-side programming (Java Servlets, PHP, MySQL database access, PHP sessions, JSP). Service oriented architectures (SOA) and web service infrastructures. Higher level content management platforms. Interoperability, security and authentication issues. Laboratory demo-prototype development.

Students get the basic knowledge and laboratory experience in web programming technologies, tools and methods. They also become acquainted with programming techniques for developing content and information management applications and services.

321-5205	Legal Framework for the Information Society

Law in Information Society. Electronic acts/contracts and electronic commerce/ Electronic/ Digital Signatures: regulatory framework and legal issues. Consumer Protection in Information Society. Intellectural Property in Information Society. Software protection and SSL Agreements. Domain Names: Regulatory framework and legal issues. Computer Crime, Cybercrime and Penal Law in Information Society. Legal Issues of Electronic Communications Sector: secrecy and confidentiality, consumer protection, services and licences, universal service.

The objective of this course is to offer to the students the opportunity and the possibility to gain an overview of the legal and institutional issues which pertain to the Information and Communication Technologies (ICTs). The knowledge and understanding of the regulatory context of ICTs and of the main legal rules and principles allow the students to integrate their technical knowledge in a wider social, economical and institutional context. The knowledge and the understanding of these issues, the requirements of the socio-economic environment and the regulatory system are of major importance as they enhance the inter-disciplinary knowledge and approach.

7th Semester

Cycle Information and Communication Systems Security and Privacy

321-9703	Computer Network Security and Privacy Enhancing Technologies

Introduction to Computer Network Security: Threats, Vulnerabilities, Countermeasures, Assurance. PKI Technologies and Services. OSI/ISO Network Security Architecture: Security Services, Security Mechanisms. Internet Model Security Architecture: Network layer security, Internet layer Security, Transport layer Security, Application layer Security. Applications. Firewalls: Capabilities and Limitations, Design issues, Firewalls Architectures, Network level Firewalls, Application level Firewalls, Hybrid Firewalls. Applications. Distributed Authentication Systems: Kerberos. Intrusion Detection Systems. Privacy Enhancing Technologies. Censhorship on the Web. Secure Electronic Payment

Systems. Security Services and Products Assurance and Evaluation.

This course provides a broad-spectrum introduction to the fundamental principles of network security and privacy. The main learning objectives of this course are as follows: To obtain an understanding of network security and its changing nature; to understand how network security is perceived and carried out; to analyze the various categories of threats, vulnerabilities, countermeasures and repelling strategies; to conceptualize the challenges of network security. The structure of the module follows the OSI/ISO architecture of network security and more specifically that of the TCP/IP model. Also, the students will become familiar with the basic terminology and technologies of data privacy in networking environment and examine typical applications and use-cases. The aim of the laboratory projects is to provide students with the knowledge and skills necessary to design and support network security and privacy. The aforementioned objectives are met through course lectures, paper readings, and laboratory exercises.

321-5753 Privacy and Data Protection Law

Privacy and Data Protection in Information Society. European and national data protection regulatory framework. Privacy and Data Protection in the electronic communication sector and in Internet. Anonymity in Internet. Specific issues of data protection: data protection and e-government. Personal data protection and online social networks. Personal Data protection in workplace. Data Protection and Privacy Enhancing Technologies.

The knowledge and understanding of the principles and basic legal rules referring to privacy and personal data protection are of major importance for studying, planning, designing and operating an information system. The planning and designing of information systems presuppose the knowledge of the regulatory framework and the respective legal barriers of data protection. The knowledge and the understanding of the issues concerning data protection and privacy are especially important as they are strictly co-related with the field of information systems and data security.

Cycle Information Systems and Entrepreneurship

321-5155 Information Systems Analysis and Design Methodologies and Tools

Information Systems (IS) Development Methodologies. SSADM, RUP, SSM, Prototyping, Agile Methods. Rapid Application Development. CASE tools. Criteria for adopting an IS Development Methodology. Current trends.

To understand and apply information systems development methodologies. To develop systems analyst's skills. To apply analytical and systemic thinking.

321-8953 Electronic Entrepreneurship

Electronic Business principles (E-business). Online retail stores. Internet and consumer market research. Marketplaces and B2B E-Commerce. Design and implementation of the e-shop. Digital marketing and advertising. Basic functions and types of electronic markets. Intra and inter-organizational e-systems and processes. Online auctions. Other e-business types (e-government, mobile commerce, etc.), e-business strategy.

Understanding all the principles, types and potential of electronic business. The student, at the end of the course, will be able to design and elaborate a successful and fully implementable business plan for a digital business.

Cycle Computer and Telecommunication Technologies

321-10302 Digital Communications

Elements of a digital communications system. Characteristics of communication channels. Mathematical models of communication channels. Coding for discrete information sources. Coding for analog sources: pulse code modulation (PCM), differential PCM, adaptive PCM, delta modulation. Representation of digitally modulated signals: PAM, PSK, QAM, FSK, CPFSK, MSK. Spectral characteristics of digitally modulated signals. Optimum receiver for signals corrupted by additive white Gaussian noise. Performance (probability of error) of the optimum receiver for different digital modulation techniques. Carrier and symbol synchronization. Intersymbol interference. Spread spectrum digital communications. Spread spectrum signals: direct sequence, frequency-hopped.

To provide an understanding of the components of digital communication systems and to analyze error performance.

321-7051 Digital Systems Design

Application Specific Integrated Circuits (ASICs) and programmable devices (PLAs, PLDs, FPGAs), Hardware Description Languages (HDLs): Verilog and VHDL. Introduction to Verilog HDL, designing digital circuits with Verilog, Verilog syntax, modules and ports, structural modeling, behavioral modeling, dataflow modeling, tasks and functions. Finite State Machines (Mealy and Moore), Verilog for synthesis, design of sequential modules. Timing and delays in Verilog, Computer Aided Design (CAD) tools, logical simulation and timing verification. Random Access Memories (RAMs) and memory interfaces. Design prototyping.

Students who successfully fulfill the course requirements will know: the differences between programmable devices and ASICs, the main features of FPGAs structure, how to use Verilog HDL for designing combinational and sequential digital circuits, how to write testbenches in Verilog, how to write Verilog for synthesis, how to simulate their designs, the structure of RAMs and how to use them in digital systems, how to use prototyping boards for transferring their designs in hardware.

Cycle Communication Systems and Networks

321 8354 Network Management

Management of TCP/IP based networks. SNMP protocol. Database of Information Management. Abstract transmision syntax. Management of OSI networks. CMIP protocol. Tree of Information management. Comparison of management of OSI and TCP/IP systems. Management of bridged networks. Spanning tree algorithms. TMN prototype. Modern technics/methods of management WBM, CORBA, Java-based

Familiarity with Network Management aspects. Development of advanced engineering skills and experience on network management systems and associated tools and techniques.

321-6256 Internet Protocols and Architectures

Introduction, Historical background. Theoretical foundations, Elements of Cognitive Psychology. Man and computer as interaction elements. Structural elements and interaction styles. Analysis Levels of Interaction. Dialogue Modeling. Human-centric design on interactive systems. Requirement analysis. Scenario based design. Prototyping techniques. Design rules and directives. Evaluation Techniques (interviews, focus groups, cognitive walkthrough, etc.). Experimental evaluation at the laboratory. Hypothesis formulation. Intelligent Interfaces.

Upon successful completion of this course, students should be able to: design, implement and evaluate effective and usable graphical computer interfaces, describe and apply core theories, models and methodologies from the field of Human – Computer Interaction (HCI), describe and discuss current research in the field of HCI, implement simple graphical user interfaces using the Java Swing toolkit, describe special considerations in designing user interfaces for older adults.

Cycle Information Management and Intelligent Systems

321-7754 Robotic Control

Propositional logic: Syntax and semantics, Propositional entailment, Truth tables and formal proofs (inference rules, axiom schemata, provability, soundness and completeness). Propositional resolution and search strategies. Predicate logic: Syntax and semantics, Entailment, Herbrand method, Proofs in predicate logic (inference rules, axiom schemata, soundness and completeness). Unification and Resolution in Predicate logic. PROLOG: syntax and program structure, control mechanism, fail and negation, applications.

Understanding of syntax and semantics of propositional logic. Ability to apply semantic methods to prove a clause given a set of premises. Familiarity with formal proof methods. Understanding and application of the resolution method in propositional logic. Understanding of syntax and semantics of predicate logic. Familiarity with the application of the Herbrand method. Ability to apply the algorithm of transforming an expression of predicate logic to conjunctive normal form. Understanding and application of the unification method and the algorithm of finding the most general unifier of two clauses in predicate logic. Understanding of the resolution method in predicate logic. Understanding of the basic strategies to apply the resolution method. Familiarity with the main principles of logic programming. Ability to write programs in PROLOG to solve practical problems.

321-3553 Computational Logic and Logical Programming

Overview of the course, definitions, applications for robotics, challenge, historical highlights. Why robots need sensing - Factors that affect sensing capability. Effectors and Actuators. Mechanisms for acting. Degrees of freedom and mobility. Methods of locomotion: wheels, legs and beyond. Methods of manipulation: arms, grippers. Methods of actuation & choices. Introduction & 3D coordinate systems, forward & inverse kinematics. Configuration space, sequential & parallel mechanisms. Specifying robot positions. Why robots need self-sensing. Proprioception in biological systems. Proprioception in robots. Odometry. Navigating with beacons. Haptic perception. Robot Control, the control problem, linear dynamic models. Open-loop Control. Feedback control. Proportional error control. Proportional Integral error control - PID control. Robot architectures.

Understanding robotic control issues. Design and development of robotic systems.

Cycle Computer Science Foundations

321-9454 Applied Topics in Data Structures and Databases

File Organization; analysis of files structures and fundamental methods for data indexing; query processing. Data hashing issues. Semistructured data analysis; data graphs analysis; other relative specialized applications. Introduction to Computational Geometry and Geospatial Data Science. Functional dependencies and normalization theory; Axioms of Armstrong and relational schema design optimization. Specialised topics on data protection and data compression. New research directions in Data Science.

Understanding fundamental concepts of Data Science applied topics.

321-99002 Numerical Analysis

Errors, Computer Arithmetic, Error method and algorithm, Linear Systems, Method of Gauss, Gauss-Jordan, factorization LU, Method Choleski, Iterative method of Jacobi, Gauss, Gauss-seidel, SOR, Nonlinear equations and systems, partition method, fixed point, Newton-Raphson, secant, Interpolation and Approximation of Lagrange, Newton, Hermite, functions, spline, Numerical Differentiation and Integration type Lagrange, Taylor, Richardson, rule rectangle, trapezoid, Simpson, type Newton-Cotes, Numerical solution of ordinary differential equations, partial differential equations.

Comprehension of the basic numerical methods to solve problems in Science and Technology.

321-0161 English Language (TOEFL)

In this course students will be able to: (1) Learn more about what the TOEFL test is and how they can register for it. (2) Get familiar with the test's format and tasks. (3) Practise reading, listening, writing and speaking skills in English that are required for the test. (4) Practise with questions and tasks that simulate the real exam.

The purpose of this course is to prepare students to participate in the TOEFL examinations, which certify their ability to use the English language.

8th Semester

Cycle Information and Communication Systems Security and Privacy

321-8053	Cryptography

Introduction to cryptography and cryptanalysis, historical cryptographic algorithms, basic notions of number theory, modular arithmetic, one-way functions, the definition of perfect secrecy, Shannon's theorem, Vernam's cryptosystem, public key cryptography (RSA, Rabin), symmetric algorithms, DES and AES, hash functions, digital signatures.

Comprehension of basic notions of number theory and understanding of the operation of well-known cryptographic algorithms.

321-10753	Mobile and Wireless Networks Security

Introduction to wireless networks security: Wired vs. wireless network security, categories of Threats and the OSI model, Vulnerabilities, Countermeasures, Security architectures. IEEE 802.11 standard security issues: Authentication and authorization mechanisms, Confidentiality and Integrity, pre-RSNA protocols (WEP), TSNs (TKIP), RSNA (802.11i), Key management, Threat analysis and case studies. Mobile networks security (3GPP): GSM/GPRS/UMTS/LTE security issues, Network access and Authentication mechanisms, Key hierarchy and administration, Encryption, Integrity and user Privacy, Inter and Intra-network security, classification of attacks.

This course covers the major security and privacy topics in wireless and mobile networking. The main learning objectives of this course are: To conceptualize the wireless terrain idiosyncrasies in terms of security and privacy; to impart state-of-the-art technologies of wireless network security; to analyse the various categories of risks, threats, vulnerabilities, and countermeasures in the area of wireless and mobile networking; to familiarize students with the issues and technologies involved in designing a wireless system that is robust against attack; To provide the students with an understanding of the architectures and penetration testing techniques in the use of mobile and wireless networks. The course considers basic security topics and technologies in the following standards: 3GPP GSM/UMTS/LTE, IEEE 802.11. Security problems of MAC and especially upper layers will be emphasized. The aforementioned objectives are fulfilled through course lectures, paper readings, and extensive laboratory exercises.

Cycle Information Systems and Entrepreneurship

321-8504 Decision Support Systems – Business Analytics

Introduction. Types of decisions in modern enterprises. Business Analytics. Types of decision support systems and business analytics. Architecture of a decision support system. Descriptive Analytics. Report Generators. Basic concepts, structure and design of data warehouses – star, constellation and snowflake schemas. Structure and capabilities of data warehousing software tools. Predictive Analytics. Regression Analysis. SPSS data analysis software tool. The R data analysis language. Prescriptive Analytics. Analysis of decision problems with discrete alternatives. Influence diagrams – decision trees. Models creation, solution, risk profiles and sensitivity analysis. Estimation of perfect and imperfect information business value. Analysis of multi-criteria decision problems. Structure and capabilities of software tools supporting the analysis of decision problems with discrete alternatives. Analysis of decision problems with continuous ranges of alternatives – Linear Programming. Models creation, solution and sensitivity analysis. Structure and capabilities of software tools supporting the analysis of decision problems with continuous ranges of alternatives. The lab of this course includes familiarization with the abovementioned types of decision support software tools.

The basic learning objectives of this course are:

1. Understanding the basic methods of supporting decisions of firms and public organizations using information systems, and the basic types of business analytics (descriptive, predictive and prescriptive).
2. Familiarization with software tools supporting the above-mentioned in 1.
3. Acquisition of competences for selecting the most appropriate methods of decisions' support using information systems, and types of business analytics, for a particular firm or public organization, and formulation of a plan for their gradual development.
4. Acquisition of competences for modelling important decision problems of a firm or public organization, and then for solving these models, performing sensitivity analysis of their results, and final formulation of conclusions and proposals.

321-5607 Human – Computer Interaction and Web Applications

Introduction, historical background in HCI. Man and computer as interaction elements. Structural elements and interaction styles. Interactivity levels. Dialogue Modeling. Human-

centric design on interactive systems. Requirement analysis. Scenario based design. Design norms and guidelines. Evaluation Techniques (interviews, focus groups, cognitive walkthrough, etc.). Develop web applications in the laboratory.

Upon successful completion of this course, students should be able to: design, implement and evaluate effective and usable graphical computer interfaces, describe and apply core theories, models and methodologies from the field of Human – Computer Interaction (HCI), describe and discuss current research in the field of HCI. Students will also be asked to design and implement a fully operable web application.

321-7653 Systems Theory

How science evolves: Scientific paradigms and scientific revolutions. Information systems epistemology. Taxonomy of systems. Information Systems as Human Activity Systems. Methodologies for systems. Soft Systems Methodology. General Systems Theory. Cybernetics and Control Systems. Structured and unstructured problems. The Viable System Model. Systems Dynamics. Applications for Information Systems.

Students will learn about epistemological issues and will be able to apply basic methods of systems thinking into problem understanding and problem solving.

321-11101 Electronic Government Technologies and Applications

Introduction to e-Government domain – key issues and topics. The Public sector – structure and operations. G2C, G2B, G2G services. Business Process Management in the public sector and local administration. Enterprise Architecture for Government Systems. Key infrastructures and government services. Local Government. World, European and National status (e-government indexes). Issues and principles of open and collaborative governance. Systems and methods for electronic participation and electronic democracy. Open governmental data: administrative processes and relative ICT tools. Social media in the public sector, for provision of services towards citizens and businesses. National and Local Government cases. Team Project: Development of innovative e-government services and solution prototypes.

The students will acquire knowledge on the principles, the processes and the tools of electronic government, with the support of information and communication technologies.

Cycle Computer and Telecommunication Technologies

321-7803 Wireless Communications

Elements of a digital communications system. Characteristics of communication channels. Mathematical models of communication channels. Coding for discrete information sources. Coding for analog sources: pulse code modulation (PCM), differential PCM, adaptive PCM, delta modulation. Representation of digitally modulated signals: PAM, PSK, QAM, FSK, CPFSK, MSK. Spectral characteristics of digitally modulated signals. Optimum receiver for signals corrupted by additive white Gaussian noise. Performance (probability of error) of the optimum receiver for different digital modulation techniques. Carrier and symbol synchronization. Intersymbol interference. Spread spectrum digital communications. Spread spectrum signals: direct sequence, frequency-hopped.

To provide an understanding of the components of digital communication systems and to analyze error performance.

321-7903 Microelectronics

Nonlinear elements and circuits. Analysis of nonlinear circuits: analytical solutions, graphical analysis, piecewise linear analysis, incremental analysis. Diodes: semiconductor diode characteristics, analysis of diode circuits, method of assumed states. Dependent sources and the notion of amplification. Actual MOSFET characteristics – the Switch Unified (SU) MOSFET model. The MOSFET amplifier: biasing the MOSFET amplifier, the amplifier abstraction and the saturation discipline. Large-signal analysis, operating point selection. Small-signal analysis. The Operational Amplifier (Op Amp): the Op Amp model, the non-inverting Op Amp, the voltage follower, inverting Op Amp, simplified method for analyzing circuits with Op Amps, adder, subtracter, differential amplifier. Analog-to-Digital and Digital-to-Analog conversion.

This is an introductory course on analog electronics. It aims at familiarizing the students with nonlinear electrical elements and circuits, as well as their analysis methods. It also introduces the students to the concepts of analog transistor behavior, analog electronic circuits, their analysis methods and amplifiers. A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to identify nonlinear electrical elements and circuits, and to analyze them by applying various analysis methods, namely, analytical solutions, graphical analysis,

piecewise linear analysis and incremental analysis.

2. An ability to understand the semiconductor diode characteristics and perform analysis of diode circuits by applying the method of assumed states.

3. An ability to understand the actual behavior of MOS Field Effect Transistors (MOSFETs) and define the Switch Unified (SU) MOSFET model.

4. An ability to understand how the MOSFET operates as an amplifier, what is amplifier biasing and how it is achieved, and what is the saturation discipline.

5. An ability to apply the appropriate type of analysis (large signal or small signal) for determining the behavior of amplifiers depending on the magnitude of the swing of their input signals.

6. An ability to understand the basic concepts of Op Amps and analyzing simple Op Amp circuits.

7. An ability to understand the basic concepts of Analog-to-Digital and Digital-to-Analog conversion.

321-8752 Introduction to VLSI

Introduction: MOS transistors, CMOS logic, basic gates and memory elements, CMOS fabrication and layout. MOS transistor theory: ideal (long-channel) I-V characteristics, C-V characteristics, non-ideal I-V effects, DC transfer characteristics. Delay: RC delay model, linear delay model – Logical Effort, transistor sizing. Power dissipation: dynamic power, static power, energy-delay optimization, low-power circuit design. Interconnect: wire geometry, metal layers, wire modeling, delay, energy, noise, wire engineering. Process and environmental variations. Scaling. Combinational circuit design: circuit families, circuit pitfalls. Sequential circuit design: circuit design of latches and flip-flops, max-delay constraints, min-delay constraints, time borrowing, clock skew. Semiconductor memories.

Knowledge of the accurate (non-ideal) MOS transistor behavior. Understanding of the parameters that affect the speed and power consumption of modern CMOS VLSI digital circuits. Knowledge of main methodologies for designing CMOS VLSI circuits. Layout design ability of CMOS VLSI circuits. Knowledge of the advantages and disadvantages of main CMOS circuit families. Knowledge of the sequencing methodologies of static CMOS circuits. Knowledge of the structure and function of semiconductor memories.

321-9353	Digital Image Processing

Introduction: what is Digital Image Processing (DIP), fields of using DIP. Digital image fundamentals: elements of visual perception, light and electromagnetic spectrum, image sensing and acquisition, sampling and quantization, mathematical tools used in DIP. Intensity transformation functions. Histogram processing. Spatial filtering, smoothing and sharpening spatial filters. Filtering in the frequency domain: sampling and the Fourier transform of sampled functions, 2-D Discrete Fourier Transform and its properties, filtering in the frequency domain, smoothing and sharpening frequency domain filters. Image restoration: noise models, restoration in the presence of noise only, linear position-invariant degradations, estimating the degradation function, inverse filtering, Minimum Mean Square Error (Wiener) filtering. Image compression: fundamentals (coding, spatial and temporal redundancy, irrelevant information, measuring image information, etc.), basic compression methods (lossy and lossless). Color image processing: color models, pseudocolor and full-color image processing, image segmentation based on color, noise in color images, color image compression.

Knowledge of the theoretical background needed for Digital Image Processing (DIP). Understanding in depth DIP methods used for image improvement, restoration and compression. Skills of developing and implementing DIP techniques.

Cycle Communication Systems and Networks

321-7002	Performance Evaluation and Simulation of Computer Systems and Networks

Quantitative analysis of system performance, with emphasis on computer systems and networks, by both mathematical models and methods, and simulation tools. Poisson arrivals. Markov processes and their application in performance evaluation. Queueing analysis: M/M/1, M/M/c, M/M/1 loss, machine repairman, and more general models. Queueing networks, Jackson networks, BCMP. Discrete event simulation; generation of random variates; generation of arrival processes; simulation of Markov chains. Simulation software. Applications and case studies.

Basic understanding of mathematical and statistical models of computers and networks. Understanding of major building blocks of simulation software. Capability of statistical analysis and interpretation of simulation results.

321-7256 Mobile Communication Networks

Introduction to wireless systems and networks. Evolution of wireless mobile communication systems. Propagation and path-loss in wireless communication. Analytical and empirical propagation path-loss models. Types of fading and channel characterization. Radio planning principles for cellular systems. Types of interference. Mobility management and handover process. Techniques for efficient allocation and management of radio resources. Digital modulation techniques for mobile communication systems and channel capacity. Medium access control protocols and multiple access techniques FDMA, TDMA, CDMA and OFDMA as well as how they are implemented in the respective wireless cellular systems GSM, GPRS/EDGE, UMTS, LTE, LTE-A.

The course offers introduction to mobile communication networks. In this context the basic operating principles of these systems are examined. Specifically, the operating principles, the architecture and features of popular mobile systems i.e. GSM, GPRS, UMTS, LTE and LTE-A are analyzed. Upon completion of this course, the students will be familiar with the concepts of cellular radio coverage, cellular planning and radio resource management in advanced mobile systems.

321 -11001 Networks and Cloud Technologies

Advanced technologies for access and core networks (e.g., IEEE 802.1X, 802.21, 5G, DSL, Gigabit Ethernet), architectures (eg. MPLS, Diffserv, IntServ), protocols (eg. RSVP, Mobile IP, IPv6, OSPF, BGP) and services (WebTV, IPTV, P2P, V2V). Cloud computing technologies, types of services (NaaS, IaaS), development models (private, public, hybrid), tools (openflow), virtualization of networking services and functions (SDN, NFV).

Learning advanced topics of alternative access technologies, infrastructure and cloud services and virtualization. Developing of advanced knowledge in engineering networks and communications.

Cycle Information Management and Intelligent Systems

321-9253 Data Mining and Data Warehouses

Introduction to Data Mining Techniques: a) data, b) problems, c) applications, d) general analysis and processing techniques. Data pre-processing: a) data cleansing, b) data transformations, c) dimension reduction techniques. Clustering, Part I: a) introduction to clustering, b) proximity measures, c) k-means and its variations, d) hierarchical clustering. Clustering, Part II: a) DBSCAN, b) cluster validity, c) BIRCH. Association Rules I: a) problem definition, b) a-priori algorithm, c) frequent itemsets. Association Rules II: a) advanced methods for finding frequent itemsets, b) FP-Growth, c) association rules validation. Classification I: a) introduction, b) Decision Trees (entropy, Gini Index, classification error). Classification II: a) Bayesian classifiers, b) Support Vector Machines, c) KNN, d) rule-based classifiers, e) overfitting. Data Warehouses and OLAP: a) definitions, ROLAP, MOLAP, HOLAP, b) cuboid, c) cuboid implementation.

Critical awareness of current problems and research issues in Data Mining. Comprehensive understanding of current advanced scholarship and research in data mining and how this may contribute to the effective design and implementation of data mining applications. Ability to consistently apply knowledge concerning current data mining research issues in an original manner and produce work which is at the forefront of current developments in the sub-discipline of data mining. Proficiency with leading data mining software, including RapidMiner, Weka and Business Intelligence of MS SQL server. Understanding of how to apply a wide range of clustering, estimation, prediction and classification algorithms, including k-means clustering, BIRCH clustering, DBSCAN clustering, classification and regression trees, the C4.5 algorithm, logistic Regression, k-nearest neighbor, multiple regression, neural networks and support vector machines. Understanding of how to apply the most current data mining techniques and applications, such as text mining, mining genomics data, and other current issues. Understanding of the mathematical/statistics foundations of the algorithms outlined above.

321-10202 Information Retrieval

Introduction to information retrieval systems. Information retrieval/filtering and browsing. Modeling: Set theoretic models, Algebraic models, Probabilistic models. Text processing and compression. Zipf's law and Heaps' law. Introduction to markup languages. Indexing methods: inverted files, suffix trees and arrays, signature files. Online search methods. Evaluation of information retrieval systems. User feedback and query expansion. Web search: search engines, web crawling techniques, link-based methods.

Understanding of the distinction between data retrieval and information retrieval. Familiarity with the architecture of an information retrieval system. Understanding of the properties of

the Boolean, Vector-space, and Probabilistic models for information retrieval. Familiarity with the basic principles of text processing and basic properties of text corpora. Understanding of the most popular indexing methods used in information retrieval systems. Ability to evaluate information retrieval systems. Familiarity with user feedback and query expansion methods. Understanding of the properties of web information retrieval. Familiarity with web crawling techniques.

Cycle Computer Science Foundations

321-8602 Information Theory

Discrete information sources, alphabets. Entropy. Source coding: Huffman codes, Lempel-Ziv, arithmetic codes. Channel capacity. Second Shannon's theorem. Binary symmetric channel. Source modeling with Markov chains. Modulation and channel restrictions. Sequences (d, k) and codes RLL. Linear error detection and error correction codes. Codes representation in a binary vectorial space. Hamming distance. Decoding of linear codes. Codes Hamming: design, binary code, extended Hamming codes. Performance bounds of linear codes. ARQ protocols.

This course offers an introduction to the theory of information and its applications to communication systems. Emphasis is given on the design, analysis and application of error detection and correction codes.

321-8001 Game Theory

Introduction to game theory, definition of equilibrium notions, examples. Pure and mixed Nash equilibriums. Price of anarchy. Non zero sum games. Lemke-Howson's algorithm. The complexity of computing equilibriums and Brower's fixed point. The PPAD class. The PLS class. Approximate equilibriums. Stackelberg strategies. Braess's paradox.

Trying to model the interaction of rational entities, with respect to antagonistic or cooperative nature.

321-9855 Mathematical Modeling

The concept of mathematical modeling and its applications, modeling of stochastic systems

and simulation of random variables, random number generators and properties, simulation methods for continuous and discrete random variables, synthesis method, simulation of Poisson processes with constant / changing rate, Monte Carlo simulation, statistical tests.

The aim of the course is to familiarize students with methods of simulation of random variables using Matlab, as well as their application to engineering problems. In addition, students will be able to understand the basic properties and applications of pseudo-random sequences and to simulate stochastic processes of discrete and continuous time.

Optional Courses

321-7602 Practice

Practice in a real business environment. Familiarity of the student with the conditions and requirements of real working environments.

321-2630 Simulation of Communication Systems using Matlab

Introduction to Matlab, performance evaluation metrics of communication systems. Signals and linear systems, representation and analysis of signals in time and frequency. Stochastic process, generation of random variables, probability distribution functions. Modeling of a digital transmitter, modulation and coding techniques. Modeling of a digital receiver, demodulation and decoding, performance evaluation of the receiver. Wireless propagation, free-space loss models. Shadowing, multipath propagation, Rayleigh fading, transmit and receive diversity. Capacity and outage probability of a wireless channel, Shannon's formula. Cooperative relaying without and with power control. Cooperative relaying with interference mitigation, performance evaluation of interference mitigation techniques. Capacity and outage probability in networks with secrecy constraints, performance evaluation of secrecy techniques. Simulation of a Multiple-Input Multiple-Output (MIMO) antenna system, channel models of MIMO systems, modulation and coding for MIMO systems.

The goal of this module is to familiarize students with the Matlab software and to simulate various types of communication systems. The student is introduced to using Matlab and to producing fundamental signals, variables and transmission channels. Moreover, the module allows the students to develop their skills in performance evaluation of communication systems using Matlab and to understand the meaning of significant performance metrics of digital communication systems. Finally, by simulating modern communication systems (cooperative relaying, MIMO), the students will acquire a deep understanding of their operation.

Free Course

321-0151	English Language (TOEFL)

See course 321-0161.

9th Semester

Cycle Information and Communication Systems Security and Privacy

321-99101	Regulatory and Social Issues in Information Society

Information as a good. Law/Regulation in Information Society. Law, Regulation and technological neutrality. Subjects, communities and actors in WEB 2.0. Cyberspace as space. Governance in Information Society. Information, Computer Science and social discourse. Social responsibility in Information Society. Social gap and challenges. Trust in Information Society. Social and Legal issues of identity management. Digital speech and freedom of speech in Information Society.

The objective of this course is the discussion and the closer examination of issues concerning the conceiving, understanding and dealing with information and communication technologies and their application by users, society and economic, technological and political organizations.

Cycle Information Systems and Entrepreneurship

321-5403	Information Systems Strategy and Investment

Introduction and basic concepts of business strategy and information systems strategy. Analysis of external macro and industry environment. Porter's model - structural analysis of an industry. The impact of information and communication technologies. Analysis of internal environment - Resources and Capabilities. Value chain. The role of information systems. Strategies for competitive advantage. Products-services portfolio strategies. Formulation of information systems strategy. Internet exploitation strategy. Each of the above sections of this course includes the analysis of relevant case-studies.

Skills of creating information systems strategic plan in a firm, for the support and enrichment (e.g., new products, services, geographical regions) of its overall strategy.

Cycle Computer and Telecommunication Technologies

321-10652 Satellite Communications

Introduction to satellite-link subsystems and examination of the geometrical theory of geosynchronous and geostatic satellites. Orbit mechanics. Specialized topics on the satellite channel (e.g. satellite antennas) and analysis of the satellite link in terms of radiated and received power, signal-to-noise ratios, and random effects. Analog and digital modulation and multiple access techniques and their implementation in satellite communication systems. Emphasis on the matched filter and calculation of the probability of error in digital communication systems. Detailed examination of the satellite transponder. Emphasis on transponder signal processing and the effects of nonlinearities in satellite amplifiers. Development of satellite networks based using multiple access techniques. Digital Video Broadcasting and applications.

This lesson aims at understanding the methods of analysis and design of satellite communication systems. This course provides the necessary knowledge of the basic principles and characteristics of satellite communication networks, and the field of their efficient application. The course enables analysis and design of satellite links for various types of services and familiarity with the terms and techniques related to performance evaluation and the availability of such links. Upon completion of this course, the students will have acquired the background to understand the principles of analysis and design of satellite systems and be able to analyze and design elementary links and satellite orbits in system level.

321-6555 Multimedia

Basic concepts. Interaction. Hypertext. Interactive multimedia. User interface. Methodology of developing multimedia applications. Multimedia information representation. Data sampling, coding and compression techniques. Text, graphics, animation, digital video, sound. Architecture of hypertext systems. Communication networks for multimedia. Tools for multimedia applications development. Programming languages and multimedia. Multimedia and the Internet.

Understanding of basic meanings concerning the representation, coding and transmission of multimedia data. Skill of analyzing the individual features of the different multimedia data (e.g., image, sound, video). Skill of developing multimedia applications.

Cycle Communication Systems and Networks

321-9404 Broadband Networks

Introduction to wideband networks, wired and wireless wideband communications and services. Analysis and design of fiber-to-the-x (FTTx) networks. Passive Optical Network (PON), Wavelength Division Multiplexing (WDM). Digital Subscriber Line (DSL) Very high bitrate DSL (VDSL) networks and services. Gigabit Ethernet, Power over Ethernet (PoE) technologies. Wireless Local Area Network – WLAN. Cooperative Communications. Fourth Generation (4G) cellular networks, Long Term Evolution (LTE) protocol. Millimiter Waveband (mmWave) networks, transmission techniques, channel model, combination with RF networks. Free Space Optical (FSO) networks, transmission techniques, channel model, combination with RF networks. Visible Light Communications (VLC), transmission techniques, channel model, gains over RF networks. Digital video broadcasting (DVB), terrestrial (DVB-T) and satellite (DVB-S) networks, modulation and coding techniques, services. Heterogeneous Networks (HetNets), topologies, combination of RF, mmWave, FSO and VLC networks.

The goal of this module is to familiarize students with various types of wideband networks. Through theory, the student will gain knowledge on various topics of wired and wireless wideband networks. Furthermore, the student will acquire deep knowledge of the design and the architecture of wideband networks. Moreover, the module provides user requirements and the ways that modern wideband networks satisfy these requirements. Finally, the student will be educated on how wideband networks can interconnect and complement each other targeting the provision of robust wideband services.

321-9120 Design and Development of Mobile Computing Applications

Introduction to mobile computing, emerging mobile technologies and applications, issues and challenges, smartphone applications and services, mobile computing software platforms, mobile Web, responsive web design, geolocation, context-aware applications, Android platform architecture, programming in Android environment, case studies

Learning of the basic principles of application development for mobile devices. Understanding and appreciation of the issues involved in designing and developing context-aware applications for mobile devices. Understanding the architecture of the Android platform and the process of developing applications for mobile devices.

Cycle Information Management and Intelligent Systems

321-7406 Knowledge Engineering and Knowledge Systems

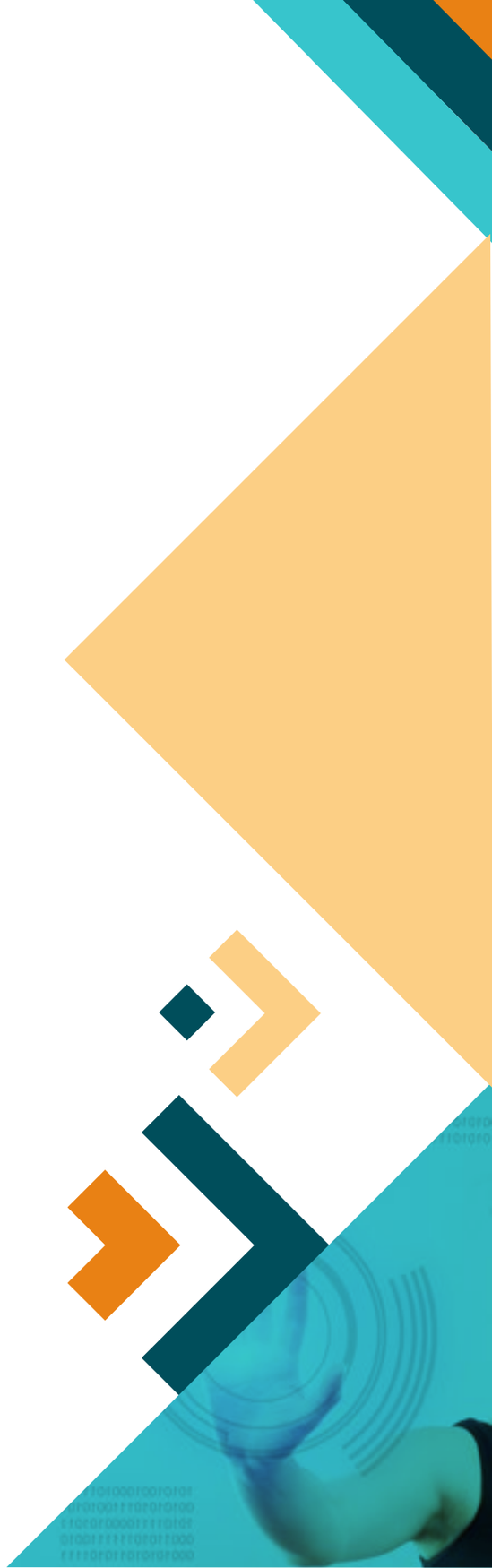
Systems that represent, organize and utilize knowledge. Semantic Networks, Systems that use frames, systems that use rules, reasoning using rules (forwards and backward chaining), Rete algorithm, design and implementation of rule-based systems. Case-based reasoning. Reasoning under uncertainty. Application of knowledge systems: configuration, design, diagnosis and classification. Introduction to Semantic Web technologies: Structuring XML documents, describing resources using RDF, Ontology Web Language. Logic and reasoning: Rule markup in XML, Applications (Data integration, Information retrieval, Portals, e-Learning, Web Services, etc.). Protégé, an environment for deploying ontologies, Pellet reasoning engine.

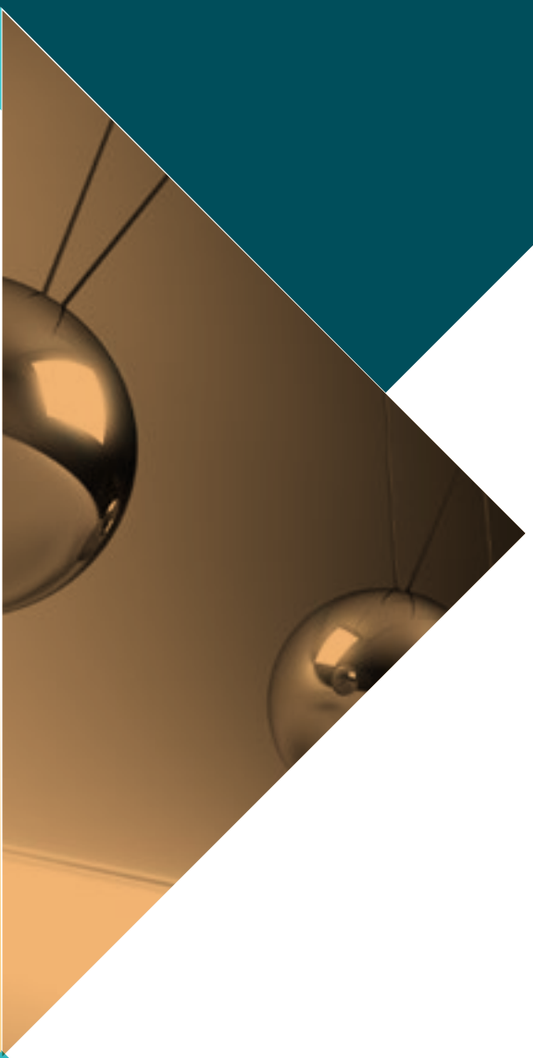
On completion of this module, students are expected to be able: to explain the role of knowledge engineering within Artificial Intelligence, to identify and explain the various stages in the development of a knowledge based system, to design and develop a rule-based knowledge based system, to design and develop a case-based knowledge based system, to design and Develop Bayesian reasoning systems, to understand the mathematical foundations of Bayesian networks, to compare and contrast rule- and case-based knowledge based systems, to design and develop Semantic Web concepts and ontologies, to compare and contrast Semantic Web markup Technologies, and to build Ontologies and Reasoning systems in Protégé.

321-6606 Computer Vision

Image formation - Feature-based image alignment - Structure from motion - Computational photography - Feature detection and matching - Dense motion estimation - Image stitching - Stereo correspondence – Recognition

The course provides basic knowledge for understanding and using computer vision systems. The student learns the basic principles and common techniques for the designing and development of computer vision systems..





Cycle Computer Science Foundations

321-9003 Advanced Data Structures

Hash functions, cuckoo hashing. Hierarchical structures and applications. Merkle trees. Data structures (lists, dictionaries) based Cloud Computing security. Combining data structures with error correction codes. Solving the millionaires' problem. Private Information Retrieval Characterization of the NP complexity class using Probabilistic Checkable Proofs (PCP) and Span Programs. Computation verification.

Students must comprehend the design principles and capabilities of advanced data structures.

321-10001 Algorithms and Combinatorial Optimization

Mathematical modeling of combinatorial optimization problems, in the realm of areas such as Biology, Networks, time-dependent processes, resources allocation, game theory, etc. Study of techniques to tackle such problems, as branch and bound, heuristics, probabilistic techniques. Exploiting the limitations of these techniques and case study of resent developments. Dynamic programming and approximation algorithms. Polynomial time approximation schemes. Local search methods, PLS-completeness, neighborhood structures. Local search methods in the perspective of game theory.

Mathematical modeling of combinatorial optimization problems from a variety of areas and how to tackle these via algorithms.

Optional Course

321-2600 Risk Theory

Historical background of the 'risk theory'. Presentation of the problem "Crashing systems". Basic distributions with heavy tails that are used in situations of extreme events. The risk theory for distributions with heavy tails. The Cramer- Ludberg model. The law of large numbers. The central limit theorem. The Brownian motion in the analysis of extreme events.

The generalized distributions of extreme values. Generalized Pareto distribution. Statistical methods to analyze extreme events. Parametric estimation in generalized distributions. Programme languages for the parametric analysis.The theory of large deviations on extreme events. Applications of large deviations in the renewal model.

The course aims at dealing with the principles of external events theory. The stochastic models that can predict the collapse of large systems, such as computer systems are presented in an analytical and interactive way. It stimulates students to further research on computational methods using programming languages such as C ++ or mathematical package as Matlab. Using data, students will be able to estimate the system parameters (such as averages or variations) of the distributions that we use in extreme events.

10th Semester

321-7102	Diploma Thesis

Complete an original development and/or research project. Deeper approach in a field of the student's interests and specialty. Familiarity with the process of addressing and solving complex problems. The student submits his/her thesis to a three-member board of professors and mandatorily presents his/her work to a public audience. The final evaluation of the submitted thesis is done by the three-member committee.

The dissertation must follow the layout specified below:

- Front page and accompanying pages. These should include names of Institution, School, Department, dissertation title, full name of the author(s), full name of dissertation adviser and committee members (if a committee has been set up).

- Acknowledgements. This includes thanking the people who contributed to the completion of the dissertation.

- Abstract in Greek (about 300 words). It should briefly describe the topic, the purposes, the methodology, and the basic conclusions of the dissertation.

- Abstract in English.

- Table of contents with a maximum of 3 numbering levels.

- List of figures, list of tables, list of acronyms.

- Dissertation body

Chapter 1: Introduction. It includes a short introduction to the topic and its significance, the motivation for and purpose of the dissertation, the methodology followed, and the dissertation layout. It doesn't include results or conclusions.

Chapter 2, 3 … Their contents depend on the dissertation topic. If, for example, the dissertation discusses the development of a software system and its laboratory evaluation, it should include separate chapters discussing the theoretical background (previous knowledge, literature), the methodology that was followed, the results, and the analysis-evaluation of the results.

Chapter X – Conclusions: This is the last chapter of the dissertation. It summarizes and discusses the dissertation's main findings. The conclusions must be clear and closely connected to the topic's development in the previous chapters. Suggestions for future research should also be included.

- References. Full list of the resources that were used for writing the dissertation, as well as of the in-text references. The references should follow one format: APA, MLA, or Harvard.

- Appendices, if there are any. These include extra information, which is not necessary for the dissertation's development or understanding. The author can provide further information to the reader in order to improve understanding and/or provide evidence of the results.

STUDENT SUPPORT

Student Services

The following services are provided for the students of the Department:

- Full medical and hospital care, which includes: medical examination, hospital examination, pharmaceutical care, clinical examinations, examination at home, births, physiotherapy, dental care and orthopedics.
- Discount tickets for public transport, including ferry, for traveling inside the country, according to the law. The discount is interrupted throughout periods of possible suspension of study, military service, loss of student status or upon graduation or completion of six years of study.
- Free meals under conditions which relate to individual and family financial situation. Free meals stop when a student successfully completes their studies, or after six (6) years from registration, regardless of whether they have completed their studies.
- Student loans depending on students' financial situation and their performance in their studies. 50% of the amount of the loan awarded to each student is a scholarship and the remaining 50% is an interest-free loan.

Scholarships

Scholarships are awarded to students **based on their academic performance and financial condition**. The Greek State Scholarship Foundation awards scholarships and prizes to students who excelled: a) in the examinations for entering the Department and b) in semesters' examinations for each academic year. The scholarships are granted according to the students' economic situation and academic performance. For awards, which consist of a written certificate and a grant, only the performance of the student is taken into account. In addition to the above scholarships, institutions such as the City Samos, the North Aegean Administrative Division and other local organizations award students with some scholarships based on their performance in studies.

As far as the prerequisites, supporting documents, and application periods for the various scholarships are concerned, the students are advised to contact the Department's Secretariat.

More information is available on the Department's website:
http://www.icsd.aegean.gr.

Student Club

Students' parallel activities are part of their academic life and contribute positively to the development of their personality. The main venue for such activities is the Student Club. The purpose of the Student Club is entertainment, sports and the development of the artistic inclinations of the students. The University seeks to extend the activities of the Club and encourages the establishment of new committees.

Student Association – Student Groups

The Student Association supports sporting, recreational, artistic, academic and other activities through student groups that operate independently. Student groups are open to all undergraduate and postgraduate students of the Department, while there is always the possibility of setting up new groups.

Currently there exist the following groups:

Student Group	Contact
Men and Women Sports Teams	Euripides Gerontis, Faculties of Science and Engineering Trainer egerontis@aegean.gr
IEEE Student Branch – University of the Aegean	http://www.icsd.aegean.gr/ieee ieee@aegean.gr
Artistic group	artsam@aegean.gr
Music group	musicteam@aegean.gr
Astronomy group	aristarchos@samos.aegean.gr
University of the Aegean Juggling club	jugglingc@aegean.gr
Cycling club	bike_club@samos.aegean.gr
Faculties of Science and Engineering Football Club (participates in the local championship of the Greek Football Federation)	samos_sthe_fc@aegean.gr
Chess group	skaki@samos.aegean.gr
Students cafeteria – "Algorithm of Taste"	flesxi@aegean.gr
Students magazine – "Φ" *("Phi")*	f@samos.aegean.gr
Students Radio Station "Choros" *("Space")* 94.2 FM	http://xoros.samos.aegean.gr xoros94.2@samos.aegean.gr
Dancing group	samosdance@aegean.gr

SUPPORTING SERVICES

Library

The Library of the University Unit of Samos is housed in a **renovated neoclassical building** of 1903, the "**Chatzigianneio**". It is an annex of the Central Library of the University of the Aegean, which is located in Lesvos (Mytilene). It operates as a lending library and the opening hours are 8:30-15:00 daily, while, during the winter and spring semester, is some days open until 20:00, depending on the available administrative staff. The library has:

- **24.000 volumes of books.** The largest part of the collection is related to the scientific disciplines of Computer Science, Mathematics, Technology and Natural Sciences, in order to serve the teaching and research needs of the Departments of the University Unit of Samos. There are also literary books, essays, etc.
- **360 foreign and Greek journal titles**. Some of these journals are available in electronic form or in microfilm.
- **Access to Electronic Scientific Databases,** which offer the capability of scientific articles search, up to the level of full text.
- **Informational material** (encyclopedias, dictionaries, etc.)
- **Doctoral Dissertations, Master and Diploma Theses.**
- **Audiovisual material** which includes disks, CDs, videotapes, cassettes, CD-ROMs, DVD-ROMs.

All the services of the Library (Lending, Orders, Cataloguing, catalog search, journals, etc.) are automated. The search can be done from the website: http://www.lib.aegean.gr

Computing Center - Laboratories

The primary purpose of the Computing Center is the development and maintenance of the **necessary telecommunication and network infrastructure**, for serving the teaching and research needs of the Departments of the University Unit of Samos.

In this context, the Computing Center helps and supports users during working hours, assists in software installation, develops and supports new applications as well as telecommunication and network connections that are created in Samos, and takes care of supplying, upgrading and monitoring of equipment and software. Meanwhile, students can use the specialized laboratories of the Department (Laboratories ALKMINI, ELECTRA, PHAEDRA, DORYSSA, and ARTEMIS), which have modern computer systems, software products and hardware instruments, for supporting the teaching and research needs the Department. Additionally, in Emporiki building, there is a fully equipped teleconference room.

ACADEMIC CALENDAR

WINTER SEMESTER 2018 - 2019

Beginning of courses: 01.10.2018
End of courses: 11.01.2019
Semester duration: 13 weeks
Examination period: From 14.01.2019 to 08.02.2019

Holidays:

National Holiday:	Sunday 28.10.2018
Polytechnion Anniversary:	Saturday 17.11.2018
Christmas Holidays:	22.12.2018 – 06.01.2019
Religious Holiday (Trion Ierarhon):	Wednesday 30.01.2018

SPRING SEMESTER 2018 - 2019

Beginning of courses: 11.02.2019
End of courses: 24.05.2019
Semester duration: 13 weeks
Examination period: From 27.05.2019 to 21.06.2019

Holidays:

Monday, the first day of Lent:	Monday 11.03.2019
National Holiday:	Monday 25.03.2019
Easter Holidays:	22.04.2019 – 05.05.2019
First of May Holiday:	Wednesday 01.05.2019
Religious Holiday (Holy Spirit):	Monday 17.06.2019
Students' elections:	*Exact date to be announced*

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