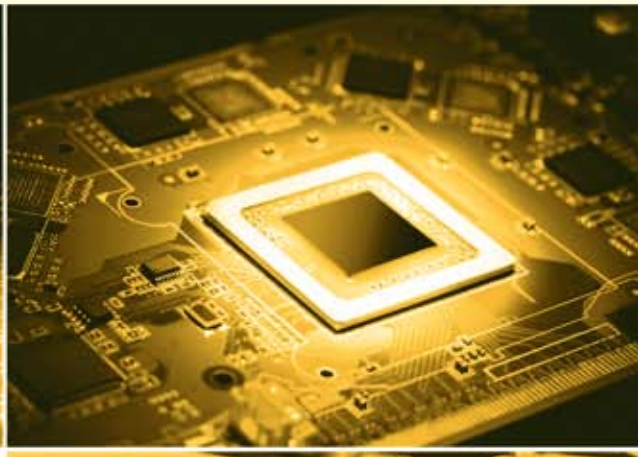
University of the Aegean

Department of Information and Communication Systems Engineering

Undergraduate Program Guide

Academic Year

2014-2015

Karlovasi - Samos

University of the Aegean

Department of Information and Communication Systems Engineering

Undergraduate Program Guide

2014-2015

University of the Aegean

DEPARTMENT OF INFORMATION AND COMMUNICATION SYSTEMS ENGINEERING

UNDERGRADUATE PROGRAM GUIDE

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KARLOVASI – SAMOS

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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.

Emporiki Sholi Building (Classrooms, Helpdesk)

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University of the Aegean

About University of the Aegean

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 sixteen (16) academic Departments, twenty eight (28) Postgraduate Programs and thirteen thousand (13,000) 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.

Student residences, Karlovasi

Schools and Departments

Currently the University of the Aegean comprises the following sixteen (16) Departments and Schools:

School of Sciences (Samos)
Dept. of Information and Communication Systems Engineering*
Dept. of Mathematics
Dept. of Product and Systems Design Engineering (Syros)*
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 Financial and Management Engineering*
School of Humanities (Rhodes)
Dept. of Primary Education
Dept. of Pre-School Education and Educational Design
Dept. of Mediterranean Studies

* The Engineering Departments will constitute the "School of Engineering" of the University of the Aegean, the founding of which has been already decided by the Greek Council for Higher Education.

Administration

The University of the Aegean is managed by the Senate, the Rector and the Vice Rectors, who, for the academic year 2014-2015, are:

Rector: Professor Stefanos Gritzalis

Vice Rectors: Professor Amalia Polydoropoulou
Department of Shipping, Trade and Transport

Associate Professor Alexandra Bounia
Department of Cultural Technology and Communication

Associate Professor Spyridon Syropoulos
Department of Mediterranean Studies

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

Samos

Karlovasi, Samos, GR 83200, Greece

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Computing Center	Aggeliki Parianou	Tel: +30-22730-82046 Fax: +30-22730-82049 Email: apr@aegean.gr Helpdesk Tel.: +30-22730-82166 Email: help@samos.aegean.gr
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Administrative Services	Manto Katsiani	Tel: +30-22730-82010 Fax: +30-22730-82008 Email: manto@aegean.gr
	Evina Vasmari	Tel.:+30- 22730-82022 Fax.: +30-22730-82009 Email: evina@aegean.gr
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Technical Services	Nikos Zacharis	Tel: +30-22730-82040 Email: nzar@aegean.gr

Chios	Rhodes
Michalon 8, Chios, GR-82100, Greece Tel. +30-22710-35000 Fax: +30-22710-35099	Demokratias Avenue 1, Rhodes, GR-85100, Greece Tel. +30-22410-99000 Fax: +30-22410-99009
Syros	**Lemnos**
Ermoupolis, Syros, GR-84100, Greece Tel. +30-22810-97000 Fax: +30-22810-97009	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

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


Provatari Building

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)
- Provatari 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 Club – Projection Hall
- 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)

Vathi

- Maniakeio Institute (Seminar Room, Faculty Offices)

Department of Information & 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.

Faculty

Head of Department: *Associate Professor Charalabos Skianis*
Vice Head of Department: *Associate Professor Euripidis Loukis*
Director of Postgraduate Studies: *Associate Professor Charalabos Skianis*

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).

Associate 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).

Associate 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).

Associate 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 ***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).

Assistant Professor (tenured) ***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).

Assistant Professor (tenured) ***Spyros Kokolakis***, Degree in Informatics, Ph.D. in Information Systems, Athens University of Economics and Business (Information Systems, Information Systems Security).

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) ***Theodoros Tzouramanis***, Diploma in Electrical and Computer Engineering, Ph.D. in Informatics, Aristotle University of Thessaloniki (Databases, Geographical Information Systems).

Assistant Professor (tenured) ***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 ***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 ***Georgios Kambourakis***, Degree in Applied Informatics, Athens University of Economics and Business, Master in Education, Hellenic Open University, Ph.D. in Mobile Systems Security, University of the Aegean (Mobile and Wireless Systems Security).

Assistant Professor ***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 ***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 ***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).

Assistant Professor ***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 ***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).

Assistant Professor ***Manolis Maragoudakis***, Degree in Computer Science, University of Crete, Ph.D. in Artificial Intelligence, University of Patras (Data Mining, Pri-

vacy Preserving Data Mining, Machine Learning, User Modeling, Semantic Web, Databases, Bayesian Networks, Knowledge Engineering).

Assistant Professor ***Panagiotis Rizomiliotis***, Degree in Informatics and Telecommunications, M.Sc. in Electronics and Radioelectrology, Ph.D. in Pseudorandomness for Cryptography and Communications, National and Kapodistrian University of Athens (Cryptography, Information Theory, Systems Security, Provable Security, Cryptography and Complexity Theory).

Lecturer ***Dimitrios Drosos***, Degree in Computer Science, University of Crete, MBA International (specialization e-commerce), Ph.D. in Mobile Advertising Effectiveness, Athens University of Economics and Business (e-Business, Wireless Technologies for Business Applications).

Lecturer ***Christos Goumopoulos***, Diploma in Computer Engineering and Informatics, Ph.D. in Distributed Software Systems, University of Patras (Parallel and Distributed Computing).

Lecturer ***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).

Dr. ***Ifigenia Klaoudatou***, Degree in Mathematics, National and Kapodistrian University of Athens, M.Phil. in Astronomy, Cardiff University, Ph.D. in Applied Mathematics and Mathematical Physics, University of the Aegean (Mathematical Relativity and Cosmology).

Technical Laboratory Personnel

Dr. ***Dimitrios N. Skoutas***, Diploma in Electrical and Computer Technology Engineering, University of Patras, Ph.D. in Communication Networks, University of the Aegean.

Christina Theocharopoulou, Degree in Mathematics, University of the 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
- 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 Eu-

ropean 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.

As far as the Postgraduate Program in "Technologies and Management of Information and Communication Systems" 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 Degree (M.Sc.) in "Technologies and Management of Information and Communication Systems"
- Doctor of Philosophy (Ph.D.) Degree

The Master's Program in "Technologies and Management of Information and Communication Systems" of the Department of Information and Communication Systems Engineering consists of the following six Streams:

- Information and Communication Systems Security
- e-Government
- Intelligent Information Systems
- Communication and Computer Networking Technologies
- Information and Communication Systems
- Digital Innovation and Entrepreneurship

For more information about the possibilities of postgraduate studies please visit our web site:

http://msc.icsd.aegean.gr

Regulation of Studies

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 one of three Streams of the Department ("*Information Systems*", "*Computer, Telecommunication and Network Technologies*", "*Foundations and Applications of Computer Science*"). 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), "Stream Compulsory Courses" (SC), "Stream Optional Courses" (SO), "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.
- **Stream Compulsory Courses (SC).** These courses are compulsory only for those students who have chosen the specific Stream. The distribution of Stream Compulsory Courses (SC) per semester, for each of the three possible Streams, is as follows:

Semester	7th	8th	9th
Stream Compulsory Courses (per Stream)	3	3	2

- **Stream Optional Courses (SO)**. In each of the semesters 7th, 8th and 9th there is a number of optional courses offered for each of the three possible streams. All students are expected to choose and successfully attend a minimum of three (3) Stream Optional Courses (SO) of the stream they follow, in order to qualify for obtaining their Diploma.
- **Optional Courses (O)**. These courses are not included in any particular stream, but they are taken into consideration for obtaining the Diploma and for the calcu-

lation of the Diploma's grade (see the relevant paragraph of the Regulation of Studies).

- **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 exceptions to that rule (**only for the calculation of the Diploma's grade**) are the Free Courses (F) of French language (see the relevant paragraph of the Regulation of Studies).

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 French Language (321-0822, 321-0832, 321-0842 and 321-0852) 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 French. Their enrollment at the next level is possible only after successful examination of the level they attend. The overall objective of French language courses is learning the French 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 French.

Stream Selection Procedure

The students declare the Stream they wish to follow at the start of the fourth (4th) year of study, along with the declaration of courses for the 7th semester. If a student wishes so, they can change the stream that they selected with a new declaration, but only during the Stream declaration period of the next academic year. There is no limit to the number of times a student can change Streams during their studies, although no more than one Stream declaration can be submitted during the same academic year.

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 every Stream Compulsory Course (SC) of the Stream they have chosen.
3. Successful examination in at least three (3) Stream Optional Courses (SO) of the Stream they have chosen.
4. Successful examination in a total of fifty four (54) courses (excluding the English Language courses and the Diploma Thesis).
5. Successful examination in the compulsory English Language courses.
6. 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 free French Language courses, then an additional single grade for those courses 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 French Language courses. This grade is equal to the average of the grades obtained in the examinations of the various courses of French 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 French Language courses, only after having succeeded in the examinations of the French Language 4 course (321-0852).

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 1-5 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 French 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.

Courses per Semester

1st semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-1203	Introduction to 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
321-1105	Calculus	3	2	5
321-2353	Physics I	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
321-0822	French Language 1	3	–	1

2nd semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-2103	Programming Methodologies and Languages I	4	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
321-2051	Physics II	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
321-0832	French Language 2	3	–	1

3rd semester

Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-3651	Programming Methodologies and Languages II	3	2	5
321-3551	Computational Logic and Logical Programming	3	2	5
321-3004	Data Structures	3	2	5
321-3354	Computer Architecture	3	2	5
321-3751	Stochastic Calculus	3	2	5
321-4155	Applied Mathematics	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	ECTS units
321-0842	French Language 3	3	–	1

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	Databases I	3	2	5
321-3302	Computer Communications	3	2	5
321-4102	Operating Systems	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
321-0852	French 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
321-5501	Signals and Systems	3	2	5
321-4002	Software Engineering	3	2	5
321-8104	IT Project Management	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
321-3603	Artificial Intelligence	4	2	5
321-3404	Information and Communication Systems Security	3	2	5
321-7951	Distributed Systems	3	2	5
321-3452	Telecommunications	3	2	5
321-5204	Information Law	3	–	4

7th semester

Stream **Information Systems**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-5154	Information Systems Analysis and Design Methodologies and Tools	4	–	5
321-9702	Computer Network Security and Privacy Enhancing Technologies	3	2	5
321-5752	Privacy and Data Protection Law	3	–	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8952	Internet Entrepreneurship	3	–	5
321-9453	Advanced Methods for Data Management	3	2	5

Stream **Computer, Telecommunication and Network Technologies**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7802	Wireless Communications	3	2	5
321-11000	Networks and Cloud Technologies	3	–	5
321-7902	Microelectronics	3	2	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8353	Network Management	3	–	5
321-9702	Computer Network Security and Privacy Enhancing Technologies	3	2	5
321-9304	Digital Signal Processing	3	–	5

Stream **Foundations and Applications of Computer Science**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-6701	Theory of Computation	3	–	5
321-9854	Mathematical Modeling	3	2	5
321-7752	Pattern Recognition and Applications in Robotics	3	2	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-10000	Algorithms and Combinatorial Optimization	3	–	5
321-9453	Advanced Methods in Data Management	3	2	5
321-11000	Networks and Cloud Technologies	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

Stream **Information Systems**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8502	Decision Support Systems	3	2	5
321-88102	Internet Programming	3	2	5
321-8205	E-Commerce Technologies and Applications	3	2	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7652	Systems Theory	3	–	5
321-10201	Information Retrieval	3	–	5
321-8052	Cryptography	3	–	5
321-9252	Data Mining and Data Warehouses	3	2	5
321-3504	Compilers	3	–	5
321-10601	Geographic Information Systems	3	2	5
321-11100	Electronic Government Technologies and Applications	3	–	5

Stream **Computer, Telecommunication and Network Technologies**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-88102	Internet Programming	3	2	5
321-7001	Performance Evaluation and Simulation of Computer Systems and Networks	3	2	5
321-7255	Mobile Communication Networks	3	2	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-9352	Digital Image Processing	3	2	5
321-10601	Geographic Information Systems	3	2	5
321-8751	Introduction to VLSI	3	2	5
321-8601	Information Theory	3	–	5
321-10752	Mobile and Wireless Networks Security	3	–	5

Stream **Foundations and Applications of Computer Science**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8601	Information Theory	3	–	5
321-9252	Data Mining and Data Warehouses	3	2	5
321-10201	Information Retrieval	3	–	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-88102	Internet Programming	3	2	5
321-8000	Game Theory	3	–	5
321-8052	Cryptography	3	–	5
321-3504	Compilers	3	–	5
321-88151	Dynamical Systems	3	2	5
321-6353	Parallel and Distributed Computing	3	–	5
321-9352	Digital Image Processing	3	2	5

Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
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

Compulsory Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7102	Diploma Thesis	–	–	See 321-7102, Semester 10th

Stream **Information Systems**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-5402	Information Systems Strategy and Investment	3	–	5
321-7405	Knowledge Engineering and Knowledge Systems	3	–	5

2. Stream Optional Course

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-5605	Human - Computer Interaction	3	–	5

Stream **Computer, Telecommunication and Network Technologies**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-6255	Internet Protocols and Architectures	3	–	5
321-10651	Satellite Communications	3	2	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-6554	Multimedia	3	2	5
321-7852	Microprocessors	3	1	5
321-9402	Broadband Networks	3	–	5

Stream **Foundations and Applications of Computer Science**

1. Stream Compulsory Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-7405	Knowledge Engineering and Knowledge Systems	3	–	5
321-9002	Computational Complexity	3	–	5

2. Stream Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-6605	Computer Vision	3	2	5
321-90001	Numerical Analysis	3	–	5
321-6554	Multimedia	3	2	5

Optional Courses

Course Code	Course Title	Teaching Hours	Lab Hours / Review-Problem Session Hours	ECTS units
321-8552	Language Engineering	3	–	5
321-99100	Regulatory and Social Issues in Information Society	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

321-1203 Introduction to Programming

Introduction to programming, programming languages, The C programming language, Variables and constants, Declarations, Operators, Expressions, Data input and output, conditional expressions, functions, Matrices, Pointers, Formatted input and output, Complicated structures, File manipulation, Dynamical structures, The C preprocessor, Error handling.

The student should become fluent in C programming language.

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. MOS transistors and logic gates. 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. 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

Sets, set operations, the principle of inclusion and exclusion. Logic and propositions, propositional calculus, predicate calculus, inference rules. Proof techniques, mathematical induction. Computability and formal language theory, the N.Chomsky Hierarchy on the generative grammars and languages types. Enumeration (samples, permutations, etc.). The probability theory. Relations and functions, binary relations, properties of binary relations, equivalence relations, partial and total orders. Graph theory. Basic definitions and terminology, bipartite graphs, connectivity, Eulerian graphs, Hamiltonian graphs. Trees, spanning trees, rooted trees, binary search trees, breadth-first search, depth-first search.

The widening of the field of mathematics for the student by examining 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 Theory of Algorithms, the Formal Language Theory, the Probability Theory, the Graph Theory, the Theory of Computation, the Data Structures, etc.

321-1105 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 objec-

tive 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.

321-2353 Physics I

Scalar, vector quantities. Kinematics. Relative motion, rotation of the earth. Forces, torques, centre mass, equilibrium of rigid body. Dynamics, friction in a liquid, bodies with changing mass, angular momentum. Work, energy, potential, conservative forces, central forces. Dynamics of a system of particles, two body problem, collisions. Dynamics of rigid body, moments of inertia. Gravity, motion in the gravitational field. Oscillations. Special relativity.

The course covers and expands in an intense and quick manner, topics in mechanics which are known from high school, but with the use of higher mathematics. Differential calculus, elements of vector analysis and simple differential equations are introduced in the description of the basic laws of mechanics and 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, the student should be able to determine if this is conservative or not and to find the potential energy when this exists. Another objective of the course is the use of integration techniques to compute the centre-mass, the moments of inertia and the gravitational field of an extended body. More advanced topics such as the dynamics of a system of particles and special relativity should also be understood.

321-0121 English Language 1

Development of skills needed in oral and written students' projects. Basic computer vocabulary from the book "Oxford English for Computing". Basic terminology of

Mathematics from the book "English for Mathematics", including: geometry, the number system, mathematical operations, mathematical symbolism, matrices, equations, proportion, functions, real analysis, complex numbers, sequences, series, curves and surfaces, differentiation, integration, vectors, elementary statistics, probability, group theory, logic.

Enabling the students to study scientific books and papers in English, as well as to prepare and present their own work.

321-0822 French Language 1

Basic knowledge of French 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 French language in the cases mentioned in the syllabus of the course.

2nd Semester

321-2103 Programming Methodologies and Languages 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

Binary relations; equivalence relations. Combinatorial analysis; orderings, permutations, combinations. Real sequences and series; summation formulas. Generating functions; applications in summations and combinatorics. Solution of linear difference equations. Introduction to the analysis of algorithms. Formal languages and regular expressions. Finite state automata.

Correct usage of mathematical formalism, language, and notation. Mathematical formulation and solution of elementary theoretical computer science problems. Capability to follow a mathematical proof. Correct usage of proof techniques.

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.

321-2051 Physics II

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 material which is normally presented in the last years of high school, but with the use of higher mathematics. One of its basic goals is to introduce the students to the use of differential calculus and vector analysis for the study of the laws of electrostatics, magnetostatics and electromagnetism. 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.

321-0131 English Language 2

See course 321-0121.

321-0832 French 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

321-3651 Programming Methodologies and Languages II

Introduction to OOP and UML. Java Language Fundamentals: Data types, Variable declarations, Operators and Assignment, Control structures, Arrays, Strings, 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 Rethrowing Exceptions, Concurent 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 so as to use it 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.

321-3551 Computational Logic and Logical Programming

Propositional logic: Syntax and semantics, Propositional entailment, Truth tables and formal proofs (inference rules, axiom schemata, provability, soundness and complete-

ness). 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.

321-3004 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).

321-4155 Applied Mathematics

Euclidean spaces. Curves. Scalar fields. Vector fields. Double, triple, and multiple integrals, applications of multiple integrals. Set functions and integration, formula of change of variables in multiple integrals. Coordinate systems, change of coordinates, vectors and tensors.

The student should acquire fluency with functions of several variables.

321-0141 English Language 3

See course 321-0121.

321-0842 French 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: rela-

tional 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.

321-4102 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.

321-2254 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.

321-0852 French Language 4

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

Ability to participate in exams for acquisition of French 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.

321-5501 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, control-

lability. 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.

321-4002 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.

321-8104 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.

6th Semester

321-6503 Information Systems Management

Enterprise information systems. Applying IS into businesses. Gaining competitive advantage through IS. Information technology infrastructure (software, hardware, communi-

cations 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.

321-3603 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. Com-

munication 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.

321-3452 Telecommunications

Transmission methods, telecommunication system model. Statistics and stochastic processes in telecommunications. Hilbert transformation. Baseband transmission and bandpass 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.

321-5204 Information Law

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

321-5154 Information Systems Analysis and Design Methodologies and Tools

The role of methodologies in information systems development. Selecting the appropriate methodology. Structured methodologies. SSADM (Structured Systems Analysis and Design Method). Object-oriented analysis and design. Prototyping. RUP (Rational Unified Process). Specialized methodologies: ETHICS - Effective Technical and Human Implementation of Computer-based Systems, SSM - Soft Systems Methodology. Agile Methods: XP (eXtreme Programming), RAD (Rapid Application Development), FDD (Feature Driven Development). CASE Tools. Current issues and trends in Information Systems Development.

Basic knowledge of current information systems development methodologies. System analyst skills. Analytical and systems way of thinking.

321-9702 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, Security Management. 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. Censorship 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 Internet 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.

321-5752 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.

321-8952 Internet 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.

321-9453 Advanced Methods for Data Management

New data management models for semi-structured and XML data, for biological data, for data streams, for big data. Data management methods for temporal, spatial, spatio-

temporal and multimedia data. Data management for decision support: data warehouses and data mining. Data security, confidentiality and privacy protection. Search engines, data querying and personalization on the web. Indexing methods for non-traditional data. New research directions in the field of data management.

An introduction to emerging data management technologies such as data mining; managing significant amounts of non-traditional data; security and privacy protection; and databases on the web. The students get an insight into data management research and some of the most popular topics that attract the data management research community today.

321-11000 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.

321-7802 Wireless Communications

Electromagnetic waves in space. Introduction to antenna theory and radiation mechanism. Antenna radiation regions. Field and power antenna patterns. Basic antenna parameters (gain, directive gain, directivity, temperature, etc.). Antenna equivalent circuits (transmission and reception). Reciprocity theorem and far-field radiation. Linear, loop and aperture antennas. Antenna polarization and loss factor. A generic methodology for the calculation of radiated fields. Basic antenna examples (Hertz dipole, longer dipoles, λ/2 dipole, small loops, etc.). Linear, planar and circular arrays. Noise and antenna noise temperature. Tropospheric and ionospheric waves. Ground waves. Basic wireless propagation equations (Friis, reflection, scattering, diffraction). Applications and antenna measurements.

The course aims at understanding the electromagnetism theory and its applications in transmission of electromagnetic signals and the antennas. This course provides the necessary knowledge to understand the basic principles of the propagation of electromagnetic waves in free space and the antennas, which are the means of transmission in wireless communications, through an extensive presentation of their basic characteristics and the electromagnetic waves they produce. Thus, the students become familiar with the wave propagation phenomena caused in a real environment and the measurement methods used in practice.

321-9304 Digital Signal Processing

Discrete time (DT) signals. Autocorrelation and cross-correlation. Description of linear DT systems by linear difference equations. Convolution sum, impulse response. The Z transform and its application in the analysis of DT systems. The discrete Fourier transform; efficient computation algorithms. Design of linear digital filters. Implementation of DT linear systems. Sampling and analog-to-digital coversion. Linear prediction and optimal linear filters; the Wiener, Kalman, and Lainiotis algorithms.

Understanding of major Digital Signal Processing (DSP) applications, mainly in telecommunications and audio/acoustics. Exposure to the design of digital filters.

321-7902 Microelectronics

Nonlinear elements and circuits, Analysis of nonlinear circuits, Diodes, Dependent sources and the notion of amplification, Actual MOSFET characteristics – the Switch Unified (SU) MOSFET model, MOSFET amplifiers, Large-signal analysis, Small-signal analysis, The Operational Amplifier (Op Amp), Circuits with Op Amps, Analog-to-Digital and Digital-to-Analog conversion.

Familiarity with nonlinear elements, circuits and their analysis methods. Familiarity with analog transistor behavior, analog electronic circuits, their analysis methods and amplifiers.

321-8353 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.

321-9702 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, Security Management. 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. Censorship 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 Internet 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.

321-6701 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.

321-9854 Mathematical Modeling

Complex numbers, the Riemann sphere, complex functions, calculus with complex variables, Laurent series, residues, applications of complex functions, Fourier series, applications to partial differential equations and boundary value problems.

The aim of this course is to familiarize the students with complex analytic methods which have proven especially useful in a broad spectrum of engineering applications as well as partial differential equations and boundary value problems.

321-7752 Pattern Recognition and Robotic Applications

Patterns and Features - Classifiers - Bayes classifier - The curse of dimensionality - Fea-

ture extraction - Features - Filters, Serial algorithms, Exponential algorithms, Random algorithms - Deviation and variance - Unsupervised learning - Mixture models - Non-parametric unsupervised learning - Proximity Measures, algorithms k-means, ISODATA, Hierarchical clustering, dendrogram - SVM – HMM – Robotic Applications – Robot localization –Robot locomotion - Control.

The course intends to familiarize the students with Pattern Recognition Systems, known methodologies and applications of the field. Moreover, it demonstrates the robot localization, locomotion and control through the use of pattern recognition techniques.

321-10000 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.

321-0161 English Language (TOEFL)

The purpose of this course is to prepare students, who wish to pursue graduate studies in English-speaking universities, to participate in the TOEFL examinations for certifying their ability to use the English language.

Ability to participate in TOEFL examinatio

8th semester

321-8502 Decision Support Systems

Introduction. Categories of decisions in modern firms. Architecture of a Decision Support System. Analysis of decision problems with discrete options. Influence Diagrams - Decision Trees - Creation of models, solution, risk profiles and sensitivity analysis. Role and value of perfect and imperfect information - Bayes decision making. Multi-criteria decision making. Analysis of decision problems with continuous ranges of options - Lin-

ear Programming - Creation of models, solution and sensitivity analysis. Basic concepts, structure and design of Data Warehouses. Techniques of Data Mining for extraction of knowledge from data and decision support. The laboratory of this course includes familiarization with software tools for the analysis of both discrete options and continuous ranges of options decision problems, and also data warehousing and data mining tools.

Understanding of some basic ways of supporting decision making with information technologies, and gaining skills of using relevant software tools.

321-88102 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.

321-8205 E-Commerce Technologies and Applications

Basic principles of e-Commerce and e-Business (Electronic Market, EDI, Internet). Digital products and services. E-Commerce vs. e-Business. Business models for electronic markets (e-shops, e-malls, e-procurements, e-auctions, third party marketplaces, virtual communities, collaboration platforms, information brokerages). Development of a prototype e-Business application using a higher level content management and transaction management platform.

The understanding of e-Business and e-Commerce business models, main applications and services. The blending of enterprise models with programming techniques, for developing working prototypes of e-Business service platforms.

321-7652 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 The-

ory. 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.

321-10201 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.

321-8052 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.

321-9252 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.

321-3504 Compilers

Architecture processors, registers, programming at the machine, show commands. Assembly language and high level language implementation. Programming tools, compilers, linker, metaergaleia. Finite automata and regular expressions. Verbal analysis, verbal units, regression, the metaergaleio lex. Syntactic trees, automatic stacking, grammar, symbolism. Syntactic analysis, retrospective analysis of descent, the metaergaleio yacc. Tables of symbols, structures, range. Production of intermediate and final code optimization. Work of the course (compiler implementation in groups).

Familiarity with the process of designing and implementing a compiler using lexical and syntax analysis description languages.

321-10601 Geographic Information Systems

Introduction to Geographic Information Systems. Geographic data: data types; advantages and disadvantages of using geographic data. Collecting, cleaning and correcting geographic data. Geographic and spatial databases, spatial analysis of data, spatial interpolation methods. Location-based navigation and tracking systems. Visualising geographic data using electronic maps.

The understanding of the basic characteristics of the Geographic Information Systems (GIS) and the acquisition of the expertise for putting to use geographic data in several scientific and real-life applications.

321-11100 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.

321-7255 Mobile Communication Networks

Introduction to wireless systems and networks. Evolution of wireless communication systems. Wireless environment. Propagation and path-loss. Analytical and empirical models of propagation path-loss. Types of fading and channel characterization. Basic principles and design of cellular systems. Telecommunications traffic. Types of interference. Spectral efficiency. Improving wireless capacity. Digital techniques for mobile communications. Coding, digital modulation techniques, spread spectrum and diversity. Channel capacity. Techniques of wireless resource management. Medium access control protocols and multiple access techniques FDMA, TDMA, CDMA. Functional and physical architecture and radio coverage. Cellular networking. Handover process. Mobility management. Communication management. Technologies of wireless cellular systems, GSM, GPRS / EDGE, UMTS. Wide Area Networks. Technologies of wireless local area networks and IEEE 802.11 WiMAX.

The course offers introduction to mobile and personal communications networks. The basic operating principles of these systems are examined. Specifically, issues such as wireless transmission conditions in different environments, propagation of radio channels, cellular systems design techniques, etc., are discussed in detail. Also, the operating principles, the architecture and features of popular mobile systems like GSM, GPRS, UMTS are analyzed. Upon completion of this course, the students will be familiar with

the concepts of propagation, cellular radio coverage and design, and will have experience in advanced mobile systems and technologies.

321-9352 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.

321-7001 Performance Evaluation & Simulation of Computer Systems & 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.

321-8751 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.

321-8601 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.

321-8000 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.

321-88151 Dynamical Systems

Linear systems, linearization of nonlinear dynamical systems, Newtonian systems, Lagrangian dynamics, Hamiltonian systems, canonical transformations, Hamilton-Jacobi theory, physical and geometric principles of relativity, Einstein equations, field theory, space-time variations, dynamics of cosmological models, special topics.

Ability to solve any central force problem. Ability to analyze systems through lagrangian and hamiltonian methods. Basic properties of solutions to the Einstein equations. Variational structure of physical and geometric fields. Analysis of cosmological models.

321-6353 Parallel and Distributed Computing

Introduction and classification by Flynn. Performance measures. Distribution Calculations. Law Amdahl. Study of various parallel algorithms and complexity. Planning, identifying, analyzing, evaluating performance, comparison and classification of various parallel algorithms. Topologies of parallel algorithms: tables, trees, meshes of trees, hypercubes. Also methods of parallel applications to various problems: classification, arithmetic, operations on tables, Partial Differential Equations.

Familiarity with the process of analyzing and transforming a problem into a parallel program using the C programming language and MPI.

321-10752 Mobile and Wireless Networks Security

Introduction to wireless networks security: Wired vs. wireless network security, Threat categories 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), RSNA (802.11i), Key management, Threat analysis and case studies. Mobile networks security: GSM/GPRS/UMTS security issues, Network access and Authentication mechanisms, Key administration, Encryption, Integrity and user Privacy, Inter and Intra-network security, classification of attacks. State-of-the-art: Heterogeneous wireless network security, IEEE 802.16 standard security: PKM Protocol, Key hierarchy, Key Management.

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 analyze the various categories of threats, vulnerabilities, 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. The course considers basic security topics and technologies in the follow-

ing standards: UMTS (3GPP), IEEE 802.11, IEEE 802.16. Security problems of MAC and especially its upper layers will be emphasized. The aforementioned objectives are fulfilled through course lectures, paper readings, and extensive laboratory exercises.

321-7602 Practice

Practice in a real business environment.

Familiarity of the student with the conditions and requirements of real working environments.

321-0151 English Language (TOEFL)

See course 321-0161.

9th semester

321-7102 Diploma Thesis

Complete an original development and/or research project.

Deeper approach in a field of the student's interest. Familiarity with the process of addressing and solving complex problems.

321-5402 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.

321-7405 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.

321-5605 Human – Computer Interaction

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.

321-6255 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.

321-10651 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.

321-9402 Broadband Networks

Client-server model vs. P2P model, BOOTP and DHCP protocols, The Domain Name System (DNS), Differentiated Services (DiffServ) protocol and Resource ReSerVation Protocol (RSVP), Virtual Private Networks (VPN), Mobile IP and mobility management in Next Generation networks, Software-Defined Networking – SDN, Network

Function Virtualization – NFV, Cloud Infrastructures and Services, Multicasting and Network coding, Data transmission over power line transmission networks, Visible Light Communication Networks, Machine to machine M2M networks over internet, Green Technologies In Next-Generation Networks, Fiber Optic Internet Technologies.

Students will develop familiarity with advanced topics of internet protocols and architectures.

321-6554 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.

321-7852 Microprocessors

Introduction: number systems and basic digital circuits. Microprocessor architecture: basic principles of microprocessor-based systems, control unit, register file, arithmetic-logic unit, microprocessor state, microprocessor categories. Example: MIPS architecture. Machine and assembly languages. Memories and addressing modes: organization and function of static and dynamic RAMs, programmable ROMs, memory systems, addressing modes. Input/ Output (I/O): Buses, program controlled I/O, polling, interrupts, interrupt systems, Direct Memory Access (DMA). Case studies of advanced microprocessors.

Knowledge of the internal architectural parts of a microprocessor, as well as of the basic principles and elements of microprocessor-based systems. Ability to interconnect a microprocessor to memories and peripheral devices. Ability of advanced assembly programming.

321-99001 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.

321-6605 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.

321-9002 Computational Complexity

Time and space complexity classes. Relations between complexity classes. Reduction. Approximation algorithms. Probabilistic complexity classes. The factorization problem.

This course will give an overview of advanced topics in computational complexity including the P versus NP problem, randomness, and applications of NP-complete problems.

321-8552 Language Engineering

Introduction to language engineering. Morpho-syntactic parsing. Context-free grammars. Part-of-speech tagging. Text chunking. Stochastic grammars. Semantic analysis. Sentence meaning representation. Language resources (text corpora, dictionaries, thesauri). Pragmatic analysis, reference resolution. Applications: information extraction, machine translation, natural language generation.

Familiarity with the basic principles of language engineering. Ability to apply morpho-syntactic parsing method. Ability to develop stochastic grammars. Familiarity with semantic and pragmatic analysis methods. Ability to use available language resources. Understanding of approaches to practical applications including information extraction, machine translation, and natural language generation.

321-99100 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.

10th Semester

321-7102 Diploma Thesis

Complete an original development and/ or research project.

Deeper approach in a field of the student's interest. Familiarity with the process of addressing and solving complex problems.

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

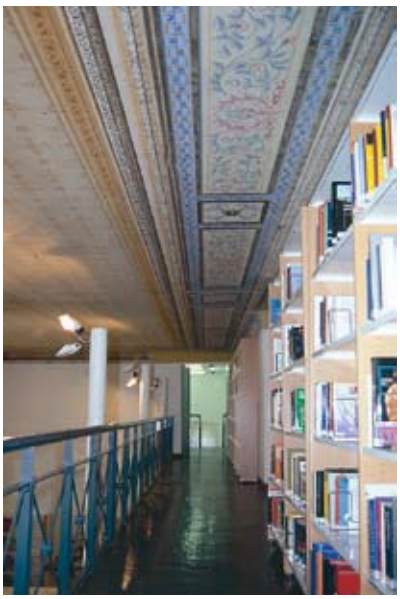
The Student Association supports sporting, recreational, artistic, academic and other activities through student groups that operate independently. Student groups are open to all undergraduate and postgraduate students of the Department, while there is always the possibility of setting up new groups.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

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



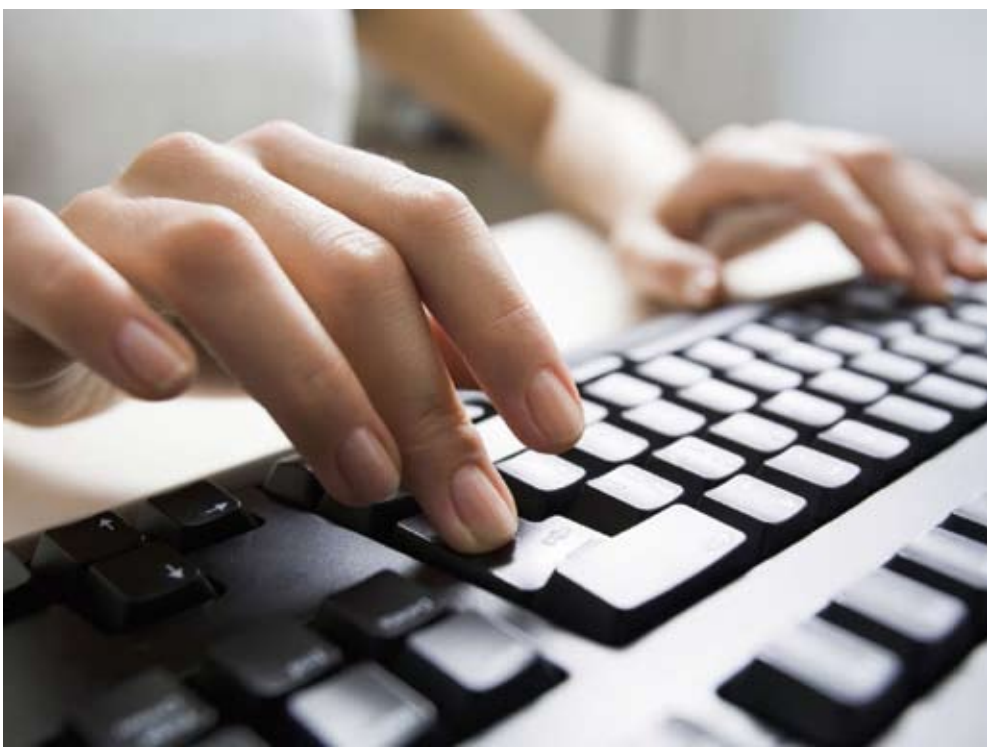
- 24.000 volumes of books. The largest part of the collection is related to the scientific disciplines of Computer Science, Mathematics, Technology and Natural Sciences, in order to serve the teaching and research needs of the Departments of the University Unit of Samos. There are also literary books, 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 and 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 and DORYSSA, ARTEMIS), which have modern computer systems, software products and hardware instruments, for supporting the teaching and research needs of the Department. Additionally, in Emporiki building, there is a fully equipped teleconference room.



Academic calendar 2014-2015

WINTER SEMESTER

Beginning of courses	29.09.2014
End of courses	16.01.2015
Semester duration	13 weeks
Examination period	From 19.01.2015 to 13.02.2015
Holidays	28.10.2014: National Holiday 17.11.2014: Polytechnion Anniversary 22.12.2014-06.01.2015: Christmas Holidays 30.01.2015: Religious Holiday (Trion Ierarhon)

SPRING SEMESTER

Beginning of courses	16.02.2015
End of courses	29.05.2015
Semester duration	13 weeks
Examination period	From 2.06.2015 to 26.06.2015
Holidays	23.02.2015: Monday, the first day of Lent 25.03.2015: National Holiday 6.04.2015-17.04.2015: Easter Holidays 01.05.2015: First of May Holiday Students' elections: *the exact date has not yet been decided* 01.06.2015: Religious Holiday (Holy Spirit)

University of the Aegean

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