University of the Aegean

POSTGRADUATE
program guide

DEPARTMENT OF INFORMATION AND
COMMUNICATION SYSTEMS ENGINEERING

2017–2018
Karlovasi – Samos

UNIVERSITY OF THE AEGEAN

DEPARTMENT OF INFORMATION AND COMMUNICATION SYSTEMS ENGINEERING

TECHNOLOGIES & MANAGEMENT
OF INFORMATION & COMMUNICATION SYSTEMS

RESEARCH
IN INFORMATION & COMMUNICATIONS SYSTEMS

TEACHING
INFORMATION & COMMUNICATION TECHNOLOGIES

INFORMATION AND COMMUNICATION SYSTEMS

Karlovasi, Samos

POSTGRADUATE
PROGRAM GUIDE
ACADEMIC YEAR
2017-2018

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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, forty (40) Postgraduate Programs and seventeen thousand (17,000) 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.

"The University of the Aegean is growing steadily and methodically"

Schools and Departments

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

Polytechnic School (*)

Dept. of Information and Communication Systems Engineering (Samos)

Dept. of Product and Systems Design Engineering (Syros)

Dept. of Financial and Management Engineering (Chios)

School of Sciences (Samos)

Dept. of Mathematics

Dept. of Statistics and Actuarial-Financial Mathematics**

School of Social Sciences (Lesvos)

Dept. of Social Anthropology and History

Dept. of Geography

Dept. of Sociology

Dept. of Cultural Technology and Communication

School of the Environment (Lesvos)

Dept. of Environment

Dept. of Marine Sciences

Dept. of Food Sciences and Nutrition (Lemnos)

School of Business (Chios)

Dept. of Business Administration

Dept. of Shipping, Trade and Transport

Dept. of Tourism Economics and Administration

School of Humanities (Rhodes)

Dept. of Primary Education

Dept. of Pre-School Education and Educational Design

Dept. of Mediterranean Studies

* Senate decision is expected for school's base.

**From 1/9/2018.

Administration

The University of the Aegean is managed by the **Senate**, the **Rector** and the **Vice Rectors**, who, for the academic year **2017-2018**, are:

Rector

- Professor **Stefanos Gritzalis**

Vice Rectors

- Professor **Amalia Polydoropoulou**,
  Department of Shipping, Trade and Transport

- Professor **Helen Thanopoulou**,
  Department of Shipping, Trade and Transport

- 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

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

Library	Vasiliki Gouvala	Tel.: +30-22730-82030 Fax: +30-22730-82039 Email: vgou@aegean.gr
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
Financial Services	Fotis Kyriakou	Tel.: +30-22730-82015 Email: fotisk@aegean.gr
Technical Services	Nikos Zacharis	Tel: +30-22730-82040 Email: nzar@aegean.gr

Chios

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

Rhodes

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

Syros

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

Lemnos

Mitropoliti Ioakeim 2, Myrina,
GR-81400, Γreece
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

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)

- "Former Papanikolaou" Building (Offices of Postgraduate Students)

- Middle Karlovasi School Group (Classrooms)

- Student Residences of the University Unit of Samos

- "Former Katsika" Building (Technical Services)

- "Former Psatha" Building (offices)

University of the Aegean and Postgraduate Studies

There are **forty** (40) **Postgraduate Programs** in more than **sixty** (60) **different fields of study** in the University of the Aegean (**www.aegean.gr**).

The Department of Information and Communication Systems Engineering, which is **based on the island of Samos** operates **four Postgraduate Programs**: *"Technologies and Management of Information and Communication Systems"*, *"Research in Information and Communications Systems"*, *"Teaching Information and Communication Technologies"* and *"Information and Communication Systems"*.

2 The Department of Information and Communication Systems Engineering

2.1 Orientation

Information and Communication Technologies (ICTs) constitute a very dynamic part of the economy. The rapid proliferation of these technologies led to the development of the **"New Economy"**. The term New Economy, as we move towards the Information Society, includes the redesign of the existing economic activities concurrently with the creation of new ones, as digital technology makes storage, processing, dissemination and utilization of information easier, faster, cheaper and more efficient. The huge amount of available electronic information changes significantly the way companies and markets work, leading to a redesign of their operational framework that aims at the creation of new added value by exploiting the available information.

In this New Economy, the efficiency and competitiveness of organizations, in both the public and the private sector, highly rely on the effective exploitation of ICTs.

In this context, both the Undergraduate and Postgraduate Programs of the Department of Information and Communication Systems Engineering (**www.icsd.aegean.gr**) aim at preparing highly educated and skilled engineers in the area of ICTs, who:

- will have sound fundamental, as well as specialized knowledge,
- will be distinguished for their analytic, synthetic, critical and creative spirit,
- will be able to work effectively in a collaborative environment,
- will be able to contribute from positions of responsibility to the effective exploitation of ICTs in companies and organizations of the public, private and social sector of the economy,
- will be able to take action in a collaborative environment, generating new knowledge through their participation in activities of basic and applied research and development.

2.2   Faculty

Head of Department	*Associate Professor **Charalabos Skianis***
Vice Head of Department	*Associate Professor **Spyros Kokolakis***
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).

▸ 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 **Yannis Charalabidis**, Diploma in Electrical and Computer Engineering, Ph.D. in Complex Software Systems, National Technical University of Athens (ICT enabled Collaborative Governance, Linked / Open Data, Social Participation Systems, Complex Societal Systems Modeling and Simulation, Enterprise Interoperability).

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

▸ Associate Professor **Ergina Kavallieratou**, Diploma in Electrical and Computer Technology Engineering, Ph.D. in Document Image Processing and Optical Character Recognition, University of Patras (Image Processing, Computer Vision, Pattern Recognition).

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

- Associate Professor **Georgios Kormentzas**, Diploma in Electrical and Computer Engineering, Ph.D. in Traffic Control and Management of Broadband Networks using Abstract Information Models and Distributed Object Architectures, National Technical University of Athens (Computer Networks, Wireless Communications, Service Quality, Traffic Modeling and Analysis).

- Associate Professor **Manolis Maragoudakis**, Degree in Computer Science, University of Crete, Ph.D. in Artificial Intelligence, University of Patras (Data Mining, Privacy Preserving Data Mining, Machine Learning, User Modeling, Semantic Web, Databases, Bayesian Networks, Knowledge Engineering).

- Associate Professor **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).

- Associate Professor **Demosthenes Vouyioukas**, Diploma in Electrical and Computer Engineering, M.Sc. in Business Administration (MBA), Ph.D. in Wireless and Mobile Communications, National Technical University of Athens (Mobile and Satellite Communications, Digital Communication Systems, Propagation and Antennas, Broadband Networks).

- Assistant Professor (tenured) **Emmanouil Kalligeros**, Diploma in Computer Engineering and Informatics, M.Sc. in Computer Science and Technology, Ph.D. in Embedded Testing of Digital Circuits, University of Patras (VLSI Design and Test, Design for Testability, CAD Methodologies for VLSI Testing, Test-Data Compression and Built-In-Self-Test Architectures).

- Assistant Professor (tenured) **Alexis Kaporis**, Degree in Mathematics, Ph.D. in Threshold Phenomena in Combinatorial Problems, University of Patras (Algorithm Analysis, Probabilistic Techniques, Algorithmic Game Theory, Data Structures).

◗ Assistant Professor (tenured) **Maria Karyda**, Degree in Informatics, M.Sc. in Information Systems, Ph.D. in Information Systems Security Management, Athens University of Economics and Business (Information Systems, Information Systems Security, Privacy, Social Networks).

◗ Assistant Professor (tenured) **Elisavet Konstantinou**, Degree in Informatics, University of Ioannina, M.Sc. in Signal and Image Processing Systems, Ph.D. in Public Key Cryptography, University of Patras (Cryptography).

◗ Assistant Professor (tenured) **Asimakis Leros**, Diploma in Electrical Engineering, University of Patras, M.Sc. in Electrical & Computer Engineering, University of Massachusetts at Amherst, Ph.D. in Computer Engineering and Informatics, University of Patras (Estimation Theory, Parallel Algorithms, Digital Signal Processing, Systems Modeling and Simulation).

◗ Assistant Professor (tenured) P**anagiotis 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).

◗ Assistant Professor (tenured) T**heodoros Tzouramanis**, Diploma in Electrical and Computer Engineering, Ph.D. in Informatics, Aristotle University of Thessaloniki (Databases, Geographical Information Systems).

◗ Assistant Professor **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).

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

◗ Assistant Professor **Georgios Kofinas**, Degree in Physics, National and Kapodistrian University of Athens, M.Sc. in Theoretical Physics, University of Alberta, Ph.D. in Physics, National and Kapodistrian University of Athens (Relativistic Classical and Quantum Cosmology, Gravity in Higher Dimensions, Generalized Theories).

◗ Dr. **Irene Karybali**, Diploma in Computer Engineering and Informatics, M.Sc. in Signal and Image Processing Systems, Ph.D. in Digital Image Processing, University of Patras (Efficient Image Registration Techniques, Digital Image Watermarking).

Faculty

2.3 Laboratory Teaching Personnel

- **Georgios Chrysoloras**, BEng in Information and Communication Systems Engineering, University of the Aegean. MSc in Advanced Information Systems, University of Piraeus.

- **Dr. Dimitrios N. Skoutas**, Diploma in Electrical and Computer Engineering, University of Patras, PhD in Communication Networks, University of the Aegean (Wireless and Mobile Networks, Communication networks and systems).

- **Christina Theocharopoulou**, Degree in Mathematics, University of the Aegean. MSc in Technologies and Management of Information and Communication Systems, University of Aegean.

2.4 Research Activities

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
- Applications of Differential Equations
- Communication Systems and Networks
- Computer Supported Collaboration
- Cryptography
- Databases
- Decision Support Systems
- Digital Integrated Circuits and Systems
- e-Commerce – e-Business – e-Governance
- Foundations of Computer Science
- Information and Communication Systems Security and Protection of Privacy
- Information Law
- Information Retrieval
- Intelligent Agents
- Intelligent Systems

- Investment and Strategy of Information Systems
- Knowledge Representation
- Legal and Regulatory issues of Personal Data Protection
- Mathematical Physics
- Multi-agent Systems
- Nanotechnology and Bioelectronics
- Personal and Mobile Communications Systems
- Pervasive Computing Systems
- Privacy Enhancing Technologies
- Robotic 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, H2020, 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 and the General Secretariat for Research and Technology, General Secretariat for Greeks Abroad, the National Centre for Vocational Orientation, the National Organization for Medicines, the Social Insurance Institute, the Greek State Scholarship Foundation, the Information Society SA, and many private organizations and enterprises.

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

3 Postgraduate Programs

3.1 General Information

The objective of the Postgraduate Program of the Department of Information and Communication Systems Engineering is to provide high-level education and promote basic and applied research in the area of Information and Communication Systems. The Department offers the following Postgraduate Programs:

- Master's Programme (MSc) in "Technologies and Management of Information and Communication Systems"

- Master's Programme (MSc) in "Research in Information and Communications Systems"

- Master's Programme (MSc) in "Teaching Information and Communication Technologies"

- Master's Programme (MSc) in "Information and Communication Systems"

The programs offered **aim at creating scientists and executives with high-level education**, creative and critical, able to analyze real-life problems and take advantage of modern information and communication technologies for the design, development and management of information and communication in science, converging environment, technology, innovation and entrepreneurship.

3.2 Degrees that can be obtained through the Postgraduate Program

The Postgraduate Program of the Department of Information and Communication Systems Engineering leads to the following Degrees:

⤲ Master's Degree (M.Sc.) in "Technologies and Management of Information and Communication Systems" with the following directions – streams:

- *Stream I: Information and Communication Systems Security*
- *Stream II: Electronic Government (e-Government)*
- *Stream III: Intelligent Information Systems*
- *Stream IV: Communication and Computer Networking Technologies*
- *Stream V: Digital Innovation and Entrepreneurship*

⤲ Master's Degree (MSc) in "Research in Information and Communications Systems»

⤲ Master's Degree (MSc) in "Teaching of Information and Communication Technologies"

⤲ Master's Degree (MSc) in "Information and Communication Systems"

⤲ Doctor of Philosophy (Ph.D.) Degree

4 Master's Degree Program (MSc) in "Technologies and Management of Information and Communication Systems"

4.1 Scope and Objectives

The purpose of the Master's Degree program, apart from providing high-level education and promoting basic and applied research in the area of Information and Communication Systems, is also to study and exploit methodologies and tools in this vital area.

The objective of the Master's Degree program is to train University graduates so as to **provide scientists with advanced knowledge**, skills and specialization, thus being able to:

❱ promote science through their participation in basic and applied research and development activities in the area of Information and Communication Systems,

❱ meet the needs of companies and organizations of the public, private and social sectors of the economy for specialized personnel in the areas of analysis, design, implementation, management and evaluation of Information and Communication Systems.

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 five streams:

❱ **STREAM I:** Information and Communication Systems Security

❱ **STREAM II:** Electronic Government

❱ **STREAM III:** Intelligent Information SystemsSystems)

❱ **STREAM IV:** Communication and Computer Networking Technologies

❱ **STREAM VI:** Digital Innovation and Entrepreneurship

4.2 Stream I

Information and Communication Systems Security

4.2.1 Scope and Objectives

The aim of the "Information and Communication Systems Security" Stream is to educate the postgraduate students on all aspects pertaining to the development, management and evaluation of a secure Information and Communication System. In particular, this Stream will offer all the knowledge and skills required for:

❯ analyzing, designing, developing, managing and evaluating the security level of an Information and Communication System, in close analogy to the "real" operational environment of a typical organization,

❯ creating new knowledge, by participating in research and development activities in the area of Information and Communication Systems Security.

4.2.2 Courses per Semester

The "Information and Communication Systems Security" Stream offers eight (8) courses. The titles as well as the distribution of the courses per semester are presented below. All eight courses of this Stream are compulsory and students are expected to successfully attend all of them.

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-100100	Computer and Communication Networks Security	7,5
323-100200	Cryptography	7,5
323-100300	Database Systems Security	7,5
323-100400	Future Internet Security and Privacy	7,5

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-110100	Ειδικά Θέματα Κρυπτογραφίας & Ασφάλειας	7,5
323-110200	Θέματα Δικαίου της Πληροφορίας	7,5
323-110300	Διοίκηση Ασφάλειας Πληροφοριακών Συστημάτων	7,5
323-110400	Ασφάλεια Ασύρματων και Κινητών Δικτύων Επικοινωνιών	7,5

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-000000	**M.Sc. Thesis**	**30**

4.2.3 Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

4.2.3.1 Computer and Communication Networks Security

Introduction to Computer Network Security: Threats, Vulnerabilities, Countermeasures, Assurance. PKI Technologies and Services. Authentication Authorization and Accounting (AAA). 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 and Next Generation Firewalls. Applications. Distributed Authentication Systems: Kerberos. Intrusion Detection and Prevention Systems. Privacy Enhancing Technologies. Censorship on the Web. Secure Electronic Payment Systems. Middleware Security. Intellectual Property Rights Security. Electronic Voting Systems Security.

This course focuses on advanced topics of network security. The learning objectives of this course are as follows: To understand how network security is perceived and materialized; to understand the various ways in which networks can be attacked and realize the tradeoffs in protecting networks; to provide students with a deep understanding of the architecture, risks, vulnerabilities and penetration testing techniques in both single and multi-domain networks; to articulate informed opinion about security by design vs. security as afterthought. The structure of the module follows the OSI/ISO architecture of network security and more specifically that of the Internet model. Case studies and student projects are an important component of the course. Their aim is to provide students with the knowledge and skills necessary to design and support network security, meaning to design and implement secure networks that streamline accessibility while minimising exposure or susceptibility to security risks. The aforementioned objectives are accomplished through course lectures, paper readings, and extensive laboratory exercises.

4.2.3.2 Cryptography

Introduction to number theory, prime numbers, finite fields, modular arithmetic, Chinese remainder theorem, one-way functions, historical cryptographic algorithms, one-time pad, public key cryptography (RSA, Rabin, ElGamal, elliptic curves), key management, Diffie-Hellman key agreement, stream ciphers, block ciphers, hash functions, digital signatures with appendix, digital signatures with message recovery.

Deep knowledge of the basic elements of number theory and familiarity with the most well known cryptographic algorithms.

4.2.3.3 Database Systems Security

Discretionary and mandatory access control; security and privacy protection using capabilities of the SQL language; role-based access control; multilevel secure database management system architectures. Digital watermarking and fingerprinting in relational databases. Surviving information warfare attacks on databases, intrusion detection, data corruption and database recovery. Database models, architectures, mechanisms and policies that ensure data security, privacy preservation, confidentiality protection, integrity and availability. Translucent and encrypted databases, retrieval of encrypted data. Security in statistical, object-oriented, distributed and medical databases. Big data security. Data security and privacy protection in online social networks. Case studies: Oracle Database, Microsoft SQL Server, IBM DB2, MySQL, etc.

In this course, the students learn about challenges and threats, in their most serious form, against data security and privacy in modern database systems, and about the most effective countermeasures developed to protect data and ensure that legitimate and authorized users retain safe access to these data for processing.

4.2.3.4 Future Internet Security and Privacy

Future Internet security. Foundations of Information Privacy. Privacy Enhancing Technologies. RFID technology: Security and privacy protection. Sensor networks security. Cloud Computing models. Risks and vulnerabilities. New security solutions. Security and privacy protection for smart environments, implantable devices and embedded systems.

Learning of advanced design and development technology topics for the protection of privacy and the achievement of safety in the Future Internet.

4.2.3.5 Advanced topics in Cryptography and Security

New Cloud Computing cryptographic protocols. Secure data outsourcing. Secure computation outsourcing. Oblivious RAM. Functional encryption. Identity based encryption. Attribute based encryption. E-voting schemes. Electronic payment systems. Micropayments. Fair exchange protocols.

Learning of advanced design and development technology topics used in applied cryptography.

4.2.3.6 Information Law

ICTs and Society – ICT as a new Paradigm and the relationship of society, law and technology. Privacy, Confidentiality/Secrecy and the relation to Information and Systems Security. Specific issues of data security and data protection: Employees' monitoring, surveillance in public place, privacy protection in the Web (search engines, social networking, etc.). Data Protection and Privacy Enhancing Technologies / Privacy by Design. Freedom of speech, rights and powers in the Information Society – Blogs/forums, filtering and censorship. Intellectual property in the Information Society: software and database protection, open source, licenses, issues relating to peer to peer. Cybercrime and Computer crime: ethical, social, legal and economic aspects. Penal law and Information and Communication Technologies. Computer/Internet Forensics. E-democracy, e-governance and e-voting.

The aim of this course is to offer to the students of the Postgraduate Program the opportunity and the possibility to gain an overview of the legal and institutional issues, which pertain to the Information and Communication Technologies (ICTs) in their socio-economic environment. 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 on the one side they enhance the inter-disciplinary knowledge and approach, and on the other side they provide the students with a wider range of skills, which prove to be useful for their professional course.

4.2.3.7 Information Systems Security Management

Introduction to Information Systems Security Management. Information Security Policies. Risk Analysis and Management. Developing the security program. Security management models and practices. Standardization and international information security standards. Awareness and training. Organizational aspects and personnel issues.

Ability to design and manage an Information Security System. Knowledge of fundamental issues of Information Systems Security Management, with emphasis in ISO 2700X standard series. Knowledge of administrative/organizational security issues. Knowledge and application of risk analysis.

4.2.3.8 Wireless and Mobile Networks Security

Mobile network security: GSM and UMTS security architecture, UMTS access security, Mutual authentication procedures, Authentication vectors, Periodic authentication, User identity management, UTRAN protocol structure (physical layer, link layer, network layer), UTRAN encryption, Protection of C-plane and associated treats, Vulnerabilities and attack vector, Interworking, 3G core network domain security, UMTS IMS subsystem security issues. Introduction to EPS (SAE/LTE/LTE-Advanced) architecture, Interfaces, Authentication, Key hierarchy, protection of U-plane/C-plane (AS, NAS strata). Advanced IEEE 802.11 and 802.16 security: Protocols, Vulnerabilities and attack description, Defensive strategies, Authentication and Authorization. State-of-the-art: Heterogeneous wireless network security. Privacy preserving methods in 4G: Framework, technologies and case studies.

This course addresses security and privacy issues in wireless systems, including cellular (2G/3G/4G) and wireless LAN and MAN networks. Topics include confidentiality, integrity, availability, privacy, and control of fraudulent usage of wireless networks. The learning objectives of this course are: To impart state-of-the-art technologies and protocols of wireless network security; to identify and investigate both early and contemporary threats to mobile and wireless network security; to apply proactive and defensive measures to deter and repel potential threats, attacks and intrusions; to develop an understanding of security architecture issues towards 5G. The emphasis is on security problems of MAC and upper layers. Case studies and student projects are an important component of the course. The aforementioned objectives are accomplished through course lectures, paper readings, and extensive laboratory exercises.

4.2.4 Research Activities

The research areas of interest of the 7 faculty members and the more than 34 collaborating researchers of the Laboratory of Information and Communication Systems Security (Info-Sec-Lab), which supports the "Information and Communication Systems Security" postgraduate Stream, include, among others:

- Secure Wireless and Mobile Computing

- Theory and Development Practices of Public Key Infrastructure

- Mobile Devices Security

- Voice over IP Security

- Legal and Regulatory Issues of Personal Data Security and Privacy

- Privacy Enhancing Technologies

- Formal Methods in Security and Protection of Privacy

- Technologies and Applications of Smart Cards

- Forensics and Digital Investigation

- Security in the grid environment

- Information Systems Security Policies

- Applied Cryptography

- Trust Management

- Information Systems Risk Assessment Methodologies

- Intrusion Detection Systems

- Social Networking Security and Privacy

- Security in Future Internet

- Security in Cloud Computing

- Technical and Legal Issues of Secure e-Government

- Technical and Legal Issues of Secure e-Voting

- Secure e-Commerce and e-Business

- Secure e-Learning

- Health Information Systems Security

- Security and Privacy Preservation Economics

- Security Education

The Info-Sec-Lab members have participated in numerous research and development competitive projects supported by EU programs (e.g., IST, CRAFT, Telematics for Administrations, ESPRIT, European Trusted Services ETS I & ETS II, ISIS, INFOSEC, Healthcare Telematics, RACE, ACTS, AIM, VALUE, STAR, ORA, H2020, Socrates / Erasmus, etc.), by the European Standardization Committee (CEN), or by the Greek Government (GSRT, ministries, public organizations, etc.). Indicatively, during 2009 to 2017, Info-Sec-Lab researchers have been involved in in more than 25 international and 53 national research projects with a total budget of approximately 4.5 MEUR. Moreover, several members of the lab have been participated in several committees for the evaluation of major projects of the Hellenic public sector.

In the framework of these projects, collaboration has been developed with more than 160 organizations, universities, research centers, private companies and public institutions from Greece, country members of the European Union and the USA. Doctoral and postgraduate students of the "Information and Communication Systems Security" postgraduate Stream perform high quality research by participating in the research and development activities of national and international competitive programs.

Members of the Info-Sec-Lab have participated as authors of books or book chapters, book editors or editors of conference proceedings, authors of invited journal papers, and authors of scientific journal or international conference articles, in more than 600 publications on Information and Communication Systems Security and Privacy Protection.

Furthermore, members of the Info-Sec-Lab have served more than 900 times as Conference General Chairs, Program Chairs, Program Committee Members, Members of Organizing

Committees, referees in scientific journals and international conferences, in the area of Information and Communication Systems Security and Privacy Protection.

The number of citations (from non co-authors) to the scientific work of the Info-Sec-Lab members exceeds 8,000.

Also, more than 80 international scientific conferences have been organized in the last fifteen years, many of them at Samos, under the scientific and organizing supervision of Info-Sec-Lab members. Among them are the following: [1996]: IFIP/SEC-1996. [1997]: IFIP/CMS-1997. [1999]: IPICS European Summer School 1999. [2000]: ACM/CCS-2000. [2001]: IPICS European Summer School 2001. [2002]: IPICS European Summer School 2002. [2003]: IFIP/SEC-2003. [2004]: EuroPKI2004. [2005]: IEEE ICPS 2005 – SecPerU 2005, INC 2005, IPICS European Summer School 2005. [2006]: CRITIS 2006, IEEE ICPS 2006 – SecPerU 2006, IFIP NETWORKING 2006 – SecPri_MobiWi 2006, ISC 2006, TRUSTBUS 2006. [2007]: IEEE ICPS 2007 – SecPerU 2007, IFIP EUC 2007 – TRUST 2007, TRUSTBUS 2007, WDFIA 2007. [2008]: ChinaCom 2008 – MUSIC'08, CRITIS 2008, IEEE ICPS 2008 – SecPerU 2008, IEEE WiMob 2008 – SecPri_WiMob 2008, Mobiquitous 2008 – SMPE 2008, MUE 2008, PCI 2008, SMPE 2008. [2009]: CSA 2009, CRITIS 2009, IEEE ICC 2009, IEEE WiMob 2009 – SecPri_WiMob 2009, ISA 2009, MCIS 2009, MINES 2009, MPIS 2009, OTM IS 2009, SCC 2009, SECURWARE 2009, SMPE 2009, TRUSTBUS 2009. [2010]: CHINACOM 2010, EuroPKI 2010, FutureTech 2010, IPICS European Summer School 2010, MINES 2010, OTM 2010, SCC 2010, SecIoT 2010, TSP 2010. [2011]: EUREKA! 2011, IEEE CloudCom 2011, MINES 2011. [2012]: SecIoT 2012, FCST 2012, IEEE GLOBECOM ManSec CC 2012. [2013]: FutureCyber 2013, SMPE 2013, FTRA-MUE 2013, NCS 2013, IEEE/IFIP EUC 2013, IPICS European Summer School 2013. [2014]: FTRA-STA 2014, IPICS European Summer School 2014. [2015]: MCIS 2015, PCI 2015, IPICS European Summer School 2015. [2016]: SpaCCS 2016, DFIS 2016, MCIS 2016. [2017]: SpaCCS 2017, SPIoT 2017, MOBILITY 2017, ISSR 2017, SECPRE 2017.

Detailed information about all the above issues is available at the webpage of Info-Sec-Lab (**http://www.icsd.aegean.gr/info-sec-lab**).

4.2.5 Honors – Graduates' Impressions

All doctoral and a significant number of postgraduate students of the "Information and Communication Systems Security" postgraduate Stream have presented original papers in scientific journals and international conferences in Europe and the USA. Detailed information about these publications is available at the webpage of Info-Sec-Lab.

In addition, groups of students of this specific Stream, in collaboration with faculty members and other teaching staff, have implemented high quality software for the academic community, such as the MILC (**http://milc.samos.aegean.gr/**) and Pandora (**http://pandora.samos.aegean.gr/**) services. Specialized software applications implemented during the courses have been awarded in important contests. **Such an example is the EARTH application, which received the second prize in the National Contest of HTC Hellas for the development of applications in the Android platform.** Also, students of the "Information and Communication Systems Security" postgraduate Stream participate in prestigious international contests in the area of information systems security (see **http://www.appsecresearch.org/uni-challenge/**).

Doctoral students, in collaboration with faculty members, have created extended, high quality, open to the research community datasets for use with machine learning algorithms with the purpose of assisting network intrusion detection or detection of electronic fraud. More information about these datasets can be obtained from http://icsdweb.aegean.gr/awid/ και http://emscad.samos.aegean.gr/.

Furthermore, many graduates of the "Information and Communication Systems Security" Stream, immediately after their graduation, have been employed by leading companies in Informatics and Telecommunications, working mainly on information systems' and network security issues.

Finally, note the possibility for postgraduate students to stay for four months in one of the several collaborating European Universities through the Erasmus / Socrates program, in order to work on their M.Sc. Thesis.

Hara Vassileiadou, *Sales Director, Census S.A. (M.Sc.)*

The specialized scientific knowledge gained upon successful completion of the «Information and Communication Systems Security» Stream of the Master's Program of the Information and Communication Systems Engineering Department, University of the Aegean, Samos, created the conditions for me to be hired immediately after my graduation, in one of the largest IT and Telecommunication companies in Greece, working as a security consultant. Today, I am employed at Census S.A., an independent, privately funded company that offers a range of specialised IT security services.

Dimitris Geneiatakis, *Joint Research Centre (JRC), Ispra (M.Sc., Ph.D.)*

Completing my postgraduates studies (M.Sc., Ph.D.) at the Information and Communication Systems Engineering Department, University of the Aegean, I acquired the basic knowledge and skill development for my professional and academic career. The direct contact with my professors helped me to understand the theoretical and applied research problems in the field of Information Systems Security. For almost 5 years I am with the E.U. Joint Research Center of the European Union

Dimitrios Damopoulos, *Teaching Assistant Professor, Stevens Institute of Technology, Hoboken, NY, USA (M.Sc., Ph.D.)*

The successful completion of both the "Information and Communication Systems Security" Stream of the Master's and PhD Program of the Information and Communication Systems Engineering Department, University of the Aegean provided me with all the required knowledge, experience and skills in order to be able to remain at the forefront of the international research arena.

Constantinos Kolias, *Research Assistant Professor, George Mason University, Virginia, USA (M.Sc., Ph.D.)*

My postgraduate studies (M.Sc., Ph.D.) at the department of Information and Communication Systems Engineering of the University of the Aegean, Samos, offered me invaluable knowledge and experience toward competing and overcoming with great success the challenges I have to face as an Engineer and researcher in the international academic and research landscape.

4.3　Stream II

Electronic Government (e-Government)

4.3.1 Scope and Objectives

Information and Communication Technologies (ICT) offer enormous potential for improving the function of Public Services, reducing costs, improving citizen service and generally offered value to society, and also help achieve better and closer communication and cooperation between the Government and citizens with transparency. However, previous experience in our country, but also internationally, shows that the use of such opportunities is a difficult task that requires close collaboration between different scientific fields (technical and administrative) from both the internal environment of the public sector and from the external (IT companies, advisory services, etc.). The needs that arise in this area are significant, as are the markets opened for related business.
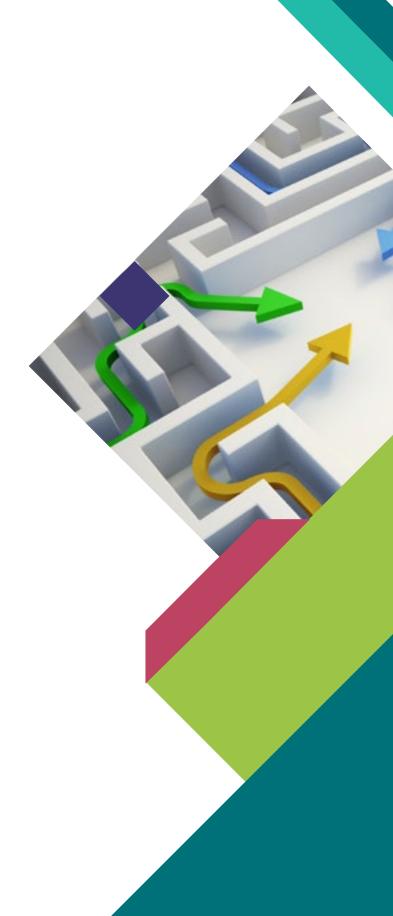
The "e-Government" Stream offers a unique opportunity for participants to develop a high level of knowledge and skills in this critical area of digital government on a variety of forms of Information Systems that can be developed in the public sector (e.g. Information Systems of internal support, providing electronic information to citizens, electronic trading between citizens and the state, e-democracy, participation and consultation, utilizing social networks (social media), open government data, interoperability, etc.). This will enable creative and meaningful participation in development projects for various forms of Information Systems in public sector with various roles.

The "e-Government" Stream is based upon the vast experience of our department in numerous national and international R&D projects for various forms of Information Systems in the public sector and the large network of partnerships with major European universities, research centers and multinational companies. Specialized, experienced executives from the

above institutions will participate as invited speakers in courses, as well as supervisors in projects and dissertations.

This Stream is aiming at a wide range of graduates (universities and technological institutes), both of technological background (e.g. ICT, school of engineering / science), and non-technological background (e.g. financial, administrative), and graduates of the National School of Public Administration, who are already involved or interested in participating in future e-Government development, and development projects on various forms of Information Systems in public sector, with various roles (from the side of the public or the private sector).

Graduates of the "e-Government" Stream would gain significant and substantive knowledge and skills for a career, whether in the public or private sector, in the area of technological support projects and services in public administration and local government, as well as in communication and collaboration with citizens. Distinguished graduates will have the opportunity to discuss possible collaboration with affiliated companies and organizations in Greece and abroad.

4.3.2 Courses per Semester

The titles as well as the distribution of the courses per semester for this Stream are the following:

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-200100	e-Government I: Services and Infrastructure	7,5
323-200200	Information Systems	7,5
323-200300	Information Systems Security and Privacy Enhancing Technologies	7,5
323-600100	Digital Business Management	7,5

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-110200	Information Law	7,5
323-210100	e-Government II: Open and Collaborative Government	7,5
323-610700	Greek Interoperability Framework	7,5
CODE	**OPTIONAL COURSES***	**ECTS**
323-210200	Research Methods and Current Research Topics	7,5
323-610100	Digital Services and Technologies	7,5
323-610200	Enterprise Resource Planning (ERP) Systems	7,5

Students are expected to choose and successfully attend one (1) of the above optional courses.

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-000000	**M.Sc. Thesis**	**30**

4.3.3 Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

4.3.3.1 e-Government I: Services and Infrastructure

Introduction to the Electronic Government domain – key issues and topics. The Public sector – structure and operations. Service Definition. 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. Models for e-Government development and assessment. World, European and National status (e-government indexes). National and Local Government cases. Team Project: Analysis of National e-Government Infrastructures / Proposals for innovative services and solutions.

Learning outcomes: The acquaintance of knowledge on the principles, the processes and the tools of governance, with the support of information and communication technologies.

4.3.3.2 Information Systems

Introduction to Information Systems (IS), Organisational Strategy and IS, Data and Knowledge Management, Telecommunications and networking, Decision Making and Business Intelligence Applications, Social Computing, E-Business and E-commerce applications, Wireless, mobile and pervasive computing, IS within organisations, Customer Relationship Management Systems, Supply Chain Management Systems, Acquiring IS, Business process management and reengineering, Cloud computing, Intelligent Systems, IT project management, Ethics and Privacy in IS.

Learning outcomes: Comprehension of IS' role in organizations-businesses. Knowledge of the characteristics and operation modes of various ISs. Ability of recording and replanning of business processes by using applications. Knowledge of IS acquisition and management processes.

4.3.3.3 Information Systems Security and Privacy Enhancing Technologies

Conceptual foundations of information systems security. Identification and Authentication. Access Control. Malware. Risk Analysis and Assessment. Security Policies. International Security Standards. Elements of Applied Cryptography. Digital Signatures and Certificates. Public Key Infrastructure. Network Security. Internet Security. Foundations of Information Privacy. Privacy Enhancing Technologies.

Learning outcomes: Learning of security concepts and technologies. Ability of risk analysis and composition of policies and technologies in the context of an integrated IS security plan.

4.3.3.4 Digital Business Management

See subsection 4.6.3.3

4.3.3.5 Information Law

See subsection 4.2.3.6

4.3.3.6 e-Government II: Open and Collaborative Government

Issues and principles of open and collaborative governance. Systems and methods for electronic participation and electronic participation/democracy. Policy modelling for impact assessment, societal simulation, and evidence-based decision making in the public sector. Open governmental data: administrative processes and relative ICT tools. Social media in the public sector, for provision of services towards citizens and businesses. Smart Cities: infrastructures and advance mobile government applications. ICT support for tackling large societal challenges (financial crisis, immigration, climate change repercussions, under-development, etc). Case studies: open applications of collaborative governance.

Learning outcomes: Familiarization with "after the services" e-government, in topics of participative democracy, decision-making, modeling of political and open government.

4.3.3.7 Greek Interoperability Framework

Definitions and main impact of interoperability. Interoperability in information systems in Greece, European Union and Internationally (metrics, indices, current status). Organisational, semantic, technical and legal interoperability. Interoperability infrastructures and standards for electronic government and electronic business. Interoperability policy initiatives at National and EU level. Interoperability Assessment. The Greek National Interoperability Framework. Research issues and certification of skills in interoperability. Interoperability impact assessment. Case studies: electronic services for businesses and citizens in Greece and European Union.

Learning outcomes: The acquaintance with the major challenges of interoperability at technical, semantic and organizational level. The study and understanding of the Greek National Interoperability and Electronic Government Framework.

4.3.3.8 Research Methods and Current Research Topics

Principles of epistemology. Literature review and research questions formulation. Categories of research methodologies. Qualitative research methodologies: Case study, action research, ethnographic, etc. Collection and analysis of qualitative data. Quantitative research methodologies. Collection of quantitative data, design of questionnaires. Quantitative data analysis (descriptive statistics, correlation analysis, X^2 tests, t-tests, analysis of variance (ANOVA), regression). Organization of research projects. Writing research proposals, papers and dissertations.

Learning outcomes: Comprehension of research methodologies. Research projects planning and implementation skills development. Quantitative and qualitative research performing skills development. Scientific papers and thesis writing skills development.

4.3.3.9 Digital Services and Technologies

See subsection 4.6.3.5

4.3.3.10 Enterprise Resource Planning (ERP) Systems

See subsection 4.6.3.6

4.3.4 Research Activities

The effective integration and utilization of information and communication technologies in a modern enterprise, their rational administration/management, security policies planning, the redesign of processes and organizational structures based on the capabilities offered by the information and communication technologies, and, ultimately, the production of the highest possible value from them, are now critical issues for all enterprises. The faculty members and instructors of the "e-Government" postgraduate Stream, in collaboration with postgraduate students, conduct high level scientific research in this specific cognitive field, combining elements (perspectives, models, variables, etc.) from computer science, as well as the management, social and economic sciences, a fact that makes such research especially interesting and creative. The main axes of this research activity include the generation of Value Flow Models, which depict the entire mechanism of creating value from information systems, the administration/management of information systems security in organizations, Information Systems Investment, their impact on business performance and their synergies with complementary actions, as far as it regards organizational changes, innovation, human resources, etc., Enterprise Resource Planning (ERP) Systems, e-Government, e-Democracy, and e-Participation. Specifically, the instructors of this postgraduate Stream have been active in the following research areas:

- Enterprise Information Systems
- Information Systems Evaluation
- Value Flow Models
- Information Systems Security Management
- Information Systems Management
- Enterprise Resource Planning – ERP Systems
- Information Systems Investment
- Information Systems Strategy
- Medical Decision Support Systems
- e-Government, e-Governance
- e-Democracy, e-Participation
- e-Business
- e-Learning

The instructors of the "e-Government" postgraduate Stream, in collaboration with postgraduate students have published their research results in high level international scientific journals, such as "Electronic Markets – The International Journal" (Taylor &

Francis), "Journal of Enterprise Information Management" (Emerald), "Computers and Security Journal" (Elsevier), "Telematics and Informatics Journal" (Elsevier), "Artificial Intelligence and Law" (Springer Verlag), "Information Management and Computer Security" (Emerald), etc., and international conferences such as "European Conference of Information Systems", "TrustBus – International Conference on Trust, Privacy, and Security in the Digital Business", "EGOV – International e-Government Conference", "European Conference on Information Warfare and Security" (ECIW), "IFIP Conference on e-Commerce, e –Business, and e-Government", etc.

Furthermore, significant research collaborations have been developed with high-level organizations such as the European Commission, the General Secretariat for Research and Technology, the Swiss Federal Institute of Technology (ETH) Zürich, the Darmouth College, USA, the University of Leuven, Belgium, University of Koblenz, Germany, the National Technical University of Athens, University of Patras, the Athens University of Economics and Business, ICAP SA (Greece), European Dynamics SA (Greece), Athens Technology Center (ATC), and more. Moreover, the instructors of the "e-Government" postgraduate Stream have significant experience of successful participation in international research projects such as the following:

- PADGETS ("Policy Gadgets Mashing Underlying Group Knowledge in Web 2.0 Media"), Framework Programme 7, European Commission

- ENGAGE ("An Infrastructure for Open, Linked Governmental Data Provision towards Research Communities and Citizens"), Framework Programme 7, European Commission

- NOMAD ("Policy Formulation through non moderated crowdsourcing"), Framework Programme 7, European Commission

- LEX-IS "Enabling Participation of the Youth in the Public Debate of Legislation among Parliaments, Citizens and Businesses in the European Union", eParticipation Trial Project, Oct. 2006

- Affiliated institution in "DEMO-net", Network of Excellence in e-Participation, project IST FP6-2004-27219, European Commission

- ERMIONE "E-learning Resource Management Service for the Interoperability Network in the European Cultural Heritage Domain", eTEN Program of the European Union, e-TEN C517357

- "Factors increasing the productivity of IT and Communication expenses of Greek enterprises – international comparisons", PENED 2003, Greek General Secretariat for Research and Technology, Ministry of Development

- "i-Learn: Research and development of optimized methodology, procedures and specifications of an integrated software platform for high-standard education and

training through the Internet", PAVET Program – NE 2004, Greek General Secretariat for Research and Technology, Ministry of Development

- "ICTE-PAN: Methodologies and Tools for Building Intelligent Collaboration and Transaction Environments for Public Administration Networks", project IST-2001-35120, European Union

Detailed information about all the above issues is available at the webpage of Information Systems Lab (**http://www.icsd.aegean.gr/is-lab/**).
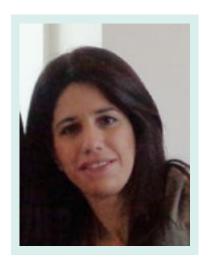
4.3.5 Honors - Graduates' Impressions

All doctoral and a significant number of postgraduate students of the "e-Government" postgraduate Stream have presented original papers in peer-reviewed scientific journals and international conferences. Detailed information about these publications is available at the webpage of Information Systems Lab (students' names in italics):

Alexopoulos, C., Loukis, E., Charalabidis, Y., Zuiderwijk, A. (2013) "An Evaluation Framework for Traditional and Advanced Open Public Data e-Infrastructures", Proceedings of the ECEG Conference 2013.

Alexopoulos, C., Spiliotopoulou, L., Charalabidis, Y. (2013) "Open Data Movement in Greece: A Case Study within the Financial Crisis", Proceedings of the PCI Conference 2013.

Loukis, E., Charalabidis, Y., *Diamantopoulou, V.* (2012) "Different Digital Moderated and non-Moderated Mechanisms for Public Participation" , European, Mediterranean and Middle Eastern Conference on Information Systems, 7-8 June, 2012, Munich, Germany.

Charalabidis, Y., Lampathaki, F., *Alexopoulos, C.*, Kokkinakos, P., Koussouris S. (2012) "A Classification of Future Internet Enterprise Systems Projects", Proceedings of the I-ESA Conferences, 2012, Volume 5, Part 5, 249-258 – Book "ENTERPRISE INTEROPERABILITY V", Springer, London.

Alexopoulos, C., Loukis, E., Charalabidis, Y., *Tagkopoulos, I.* (2012) "A Methodology for Evaluating PSI e-Infrastructures Based on Multiple Value Models", 16th Panhellenic Conference on Informatics with international participation, 5 – 7 October 2012 Piraeus, Greece.

Charalabidis, Y., Loukis, E., *Androutsopoulou, A.* (2012) "A System Dynamics Approach for Complex Government Policies Design. Application in ICT Diffusion", International Conference on Modeling, Simulation and Visualization Methods 2012 (MSV'12), July 16-19, 2012, Las Vegas, Nevada, USA.

Charalabidis, Y., Loukis, E., *Androutsopoulou, A*. (2011) "Enhancing Participative Policy Making through Modelling and Simulation: A State of the Art Review", European Mediterranean Conference on Information Systems, 30-31 May 2011, Athens, Greece.

Charalabidis, Y., Loukis, E., *Diamantopoulou, V.* (2011), 'Support of Processes Forming Public Policies by use of Social Media', at I. Apostolakis (Ed.), 'Cooperative Network & Society' Papazisis Publications, 2011 (in Greek).

Aggeliki Androutsopoulou *(Ph.D Candidate)*

After completing my undergraduate studies in the Department of Informatics in the Athens University of Economics and Business, I was looking for the continuation of my studies with basic criteria to get specialization and deepen my scientific knowledge. With the aim to develop further and combine the theoretical background I had already acquired in Informatics with a more practical dimension focusing on computer applications in management and governance, I made the choice of the Master's Degree Program "e-Government".

The high level in the teaching personnel but also in the students, and the regional nature of the department, paved the conditions for a very creative and constructive experience, in which contributed the direct and continuous contact and support from the highly qualified and active in research faculty.

The curriculum was comprehensive and multifaceted, combining a wide range of disciplines such as marketing, accounting, business management and e-business. The most important asset for me though was the integration of courses in the field of e-Government, a cognitive area with increasing specialized needs, in which the MSc was among the pioneers in Greece.

During my graduate studies I had the opportunity to meet research projects, to come into contact with companies and other research institutions from Europe and renowned scientists from around the world. Finally, it gave me the impetus to engage actively and deeper with the research in the field of e-Government by continuing my studies as a PhD candidate at the University of the Aegean. I believe that my experience at the University of the Aegean has and will continue to have a key role in my future career path and my evolution as a scientist and citizen.

Harris Alexopoulos *(Ph.D Candidate)*

After graduating from the department of Computer Science and Technology in the University of Peloponnese, I chose to continue my studies in the pioneering field of e-Government at the University of the Aegean. The Master Program paved the way and setup the bases of my knowledge evolution through an aptly designed course and the appropriate instructors who effectively combine the scientific with the business component and the recognized international research experience. During my postgraduate studies I had the opportunity to get involved in international and national research programs (e.g., ENGAGE, PADGETS, NOMAD, PLUG-IN) in the field of e-Government and to work further with leading domain experts and researchers from around the globe. Furthermore, I had the chance to participate in national and international competitions in the fields of entrepreneurship and e-governance towards the fulfillment of my degree requirements. My participation and the continued support of my professors resulted in excellence awards at "E-gov Awards" and "e-nnovation" competitions. Moreover, I was able to deal with issues such as, open data management, policy modeling and support and semantic interoperability, as well as, with different methods and techniques addressing these issues. The latter issues, which underpin the domain of e-Government, contributed significantly to my research involvement in the domain. Finally, I believe that the knowledge and skills gained during my postgraduate studies will remarkably conduce to my future personal and career development.

4.4   Stream III

Intelligent Information Systems

4.4.1 Scope and Objectives

In the present-day knowledge society the ability to manage information and knowledge is a prerequisite for any private or public corporation. The needs that have already arisen are particularly compelling, due to the rapid development of the Web and the availability of ubiquitous and abundant information and knowledge of large volume in complex and dynamic environments.

The "Intelligent Information Systems" postgraduate Stream aims at studying advanced systems that can interact with their environment and act accordingly to achieve complicated tasks demonstrating an intelligent behavior. A fundamental property of intelligent systems is their ability to handle existing knowledge and acquire new knowledge through learning processes so that they can better fit to their dynamic environment and users. This ability makes them suitable for tasks such as information management on the Web, Semantic Web services, machine vision, and robotics, areas which are emphasized by the Stream.

The Stream is addressed to graduates of computer science, electrical and computer engineering and it provides postgraduate students with fundamental knowledge and skills to design and implement advanced systems that are able to:

❱ Assist humans in achieving difficult tasks in complex and dynamic environments.

❱ Take advantage of and integrate information coming from heterogeneous sources.

❱ Extract knowledge from large volumes of data and make appropriate use of this knowledge.

Graduates of this postgraduate Stream have a wide open horizon of professional options, with career opportunities in a constantly-increasing number of private and public organizations that apply intelligent systems to complicated problems as well as in companies that design and implement commercial advanced information systems. At the same time, students have acquired the necessary knowledge so that to be able to continue their studies for obtaining a Ph.D. in a definitely cutting-edge field.

4.4.2 Courses per Semester

The titles as well as the distribution of the courses per semester for this Stream are the following:

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-300100	Combinatorial Optimization and Modern Financial Applications	7,5
323-310201	Image Processing and Robotic Vision	7,5
323-300200	Machine Learning	7,5
323-300401	Distributed Systems and Web Services	7,5

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-310100	Data Mining in the Web	7,5
323-300301	Semantic Web	7,5
323-310401	Databases for Multidimensional Data and Web Applications	7,5
323-410201	Pervasive Computing Systems	7,5

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-000000	**M.Sc. Thesis**	**30**

4.4.3 Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

4.4.3.1 Combinatorial Optimization and Modern Financial Applications

Combinatorial Optimization (CO) studies algorithms that compute the optimum solution amongst the feasible solutions of a combinatorial problem. A milestone of the theory was the understanding of the linear/convex problems. The combinatorial problems capture the intrinsic complexity of the most important problems for the computers. Due to this, in the last 50 years CO has played central role to explore the power and limitations of the computers. But, during this decade, due to the power of computers and the explosion of the Internet, modern problems have arisen. These concern the independent, rational interplay of a large number of computers in the Internet, which are motivated by greedy objectives, or coordinated play. These problems lie within an interdisciplinary area of research, such as CO, Computer Science, Game Theory and Economic Theory. An important subject is the study of bimatrix games, because these essentially capture the selfish behavior of atomic players. Also, important is the study of selfish network flows in large scale networks and the computation of their steady states. It is obvious that in many situations the selfish behavior of the users can lead to a suboptimal state the Internet/System. This manifests Mechanism Design as a key area to study.

Learning of advanced topics on modeling and resolution of modern combinational problems related to the selfish use of Internet/System resources. Specialized knowledge in modeling and resolution programs development on such problems.

4.4.3.2 Machine Learning

Inductive learning: Supervised and unsupervised learning, reinforcement learning. Concept learning. Decision Trees. Artificial neural networks. Bayesian methods. Memory-based learning (k-nn, locally weighted regression, radial basis functions). Support vector machines (linearly and non-linearly separable problems, kernel methods). Ensemble learning methods (bagging, boosting). Genetic algorithms and genetic programming. Semi-supervised learning methods. Reinforcement learning (Q-learning, temporal difference learning). Experimental evaluation of classification methods (ROC curves, cost curves). Application examples.

Understanding of the basic types of learning: supervised learning, unsupervised learning, and reinforcement learning. Understanding of classification algorithms and relevant evaluation methods. Familiarity with the use of machine learning toolkits. Understanding of the process of applying machine learning techniques to applications according to their properties.

4.4.3.3 Semantic Web

Introduction to knowledge representation and the semantic web. Basic Logics (Propositional logic and Predicate logic). Logical entailment, Inference rules, Resolution method. Description Logic. Structured Web documents (XML). Ontologies and Semantic Web languages (RDF, RDFS, OWL). Querying ontologies (SPARQL). Rules and reasoning in the Semantic Web. Ontology engineering (tools, methodologies). Ontology learning and Ontology mapping. Development of ontologies and knowledge bases.

Understanding of basic principles of knowledge representation and the Semantic Web. Familiarity with Propositional Logic, Predicate Logic, Description Logics and reasoning methods. Understanding and use of structured documents in the WWW. Use of ontology description languages. Understanding and use of ontology queries. Familiarity with rule systems and reasoning mechanisms on the Semantic Web. Familiarity with ontology engineering and relevant applications. Ability to develop ontologies and knowledge bases.

4.4.3.4 Distributed Systems and Web Services

Characterization and Challenges of Distributed Systems. System Models (Physical, Arcitectural, Interaction, Failure, Security Models). Networking and internetworking. Interprocess communication. Remote Invocation (Remote Procedure Call, Remote Method Invocation, Java RMI). Operating system support (Resource Protection, Processes and Threads, Communication and Invocation). Distributed objects and components (CORBA, Enterprise JavaBeans). Web services (Basic Concepts and Technologies, Service Descriptions, Service Discovery, Security, Coordination). Peer-to-Peer Systems. Time and global states (Logical time and clocks).

Upon successful completion of this course, the students should be able to: a) Explain what is a distributed system, why we develop such systems and what are the possible problems that must be addressed; b) Describe basic architectural models (client/server, peer-to-peer) and explain the role of middleware in distributed application development; c) Distinguish the differences between distributed applications programming models (RPC, RMI, Publish/Subscribe, Web Services); d) Perceive the necessity of clock synchronization and group communication in distributed systems and explain why these constitute fundamental services; e) Perceive the significance of scalability in distributed systems and describe basic techniques that are used for achieving scalable services; f) Apply acquired theoretical knowledge for the development of composite distributed systems using Java RMI and Web Services technologies.

4.4.3.5 Data Mining in the Web

Web Mining: Data collection, preprocessing, data modeling. Opinion Mining: Sentiment classification, argument extraction, opinion comparison. Wrappers: instance based wrapper learning, DOM trees and automatic creation from trees. Web crawling: general purpose crawlers, focused crawlers, local crawlers. Link Analysis: Social networks mining, bibliographic references matching, information retrieval algorithms. Semi-supervised learning: Expectation – Maximization, Transduce Support Vector Machines, mining from positive and unlabeled examples. Unsupervised learning: Geometrical methods, Generalized models, Visualization through integration (SOMs, Multidimensional Scaling, Projections), Collaborative filtering. Supervised learning: Random Forests, Adaboost/Bagging/Boosting, Bayesian Networks. Sequential Mining.

The course intends to give an insight into data mining techniques applied to Internet related data, and what they can be used for. After successful completion of the course, the students should be able to: a) identify and differentiate among application areas for web content mining, web structure mining and web usage mining, b) describe key concepts such as deep web, surface web, semantic web, web log, hypertext, social network, information synthesis, corpora and evaluation measures such as precision and recall, c) discuss the use of methods and techniques such as word frequency and co-occurrence statistics, normalization of data, machine learning, clustering, vector space models and lexical semantics, d) explain in detail the architecture and main algorithms commonly used by web mining applications, e) appropriately select between different approaches and techniques of web mining for, e.g., sentiment analysis, targeted marketing, linguistic forensics, topic/trend-detection-tracking and multi-document summarization (information aggregation), f) apply human language technology tools such as tokenizers, stemmers, part-of-speech taggers, noun phrase chunkers and shallow parsers on different types of web content gathered, for instance, from e-commerce sites, and perform analysis of linguistically processed data using a suitable statistical classifier, g) set requirements, compare and assess the quality of existing web mining tools, h) analyze and explain what web mining problems are satisfiably solved, what is worked upon at the research frontier and what still lies beyond the current state-of-the-art, and i) independently solve a well-defined practical web mining problem using tools and techniques introduced in the course, or analyze it through theoretical studies seeking information beyond the course literature.

4.4.3.6 Image Processing and Robotic Vision

The human vision is a natural function that processes the visual information effortlessly. It is able to detect, locate and identify objects. A human perceives and understands the 3D

world and uses 3D information to perform complex tasks. However, the imitation of the human visual system is difficult and often impossible. The objectives of the 3D systems are to extract these properties from one or more digital images and use them to mimic human vision. Basic techniques of image processing and detection features, webcam models, geometry and calibration, geometric models of one, two and multi-display systems are components of 3D computer vision systems that will be studied in this course. The primary purpose of this course is not to give an exhaustive overview of image processing techniques, but it also covers methods commonly used in the 3D systems, such as dealing with image noise, feature extraction, 3D object representation and matching image.

Comprehension of advanced topics of artificial vision. Design and development of composite systems of mechanical vision.

4.4.3.7 Databases for Multidimensional Data and Web Applications

Introduction to databases for multidimensional data objects. Databases for geographical, spatial, temporal and spatiotemporal data. Spatial networks and mobile objects databases. Databases for multimedia: text, documents, images, audio and video clips. Data models, query languages, indexing and retrieval of multidimensional objects. The generation and visualization of large synthetic datasets for benchmarking purposes. Access multidimensional databases through the web and specialized search engines. Database outsourcing in unsecure and untrustworthy servers. Emerging research topics. Case studies: the ESRI Geodatabase, representation and manipulation of complex multidimensional data objects in Oracle Database, in Microsoft SQL Server, in IBM DB2, in MySQL and in PostgreSQL. Software tools for the implementation of applications and the visualization of multidimensional objects through web-based interfaces: MapServer, Oracle MapViewer, etc.

The course provides the student with knowledge of the fundamentals and trends in multidimensional data handling, and also with ideas on how to apply a sequence of relative core concepts, methods and algorithms in cutting-edge and diverse application domains, such as the multimedia and geographical information systems (GIS) industry, computer-aided design & manufacturing (CAD/CAM), astronomy, molecular biology, etc., reaching beyond the traditional fields of database management applications.

4.4.3.8 Pervasive Computing Systems

See subsection 4.5.3.8

4.4.4 Research Activities

In the Society of Knowledge, the enormous amount of information resulting from the activities of organizations and communities, has made it imperative to develop applications that are able to collect, exploit and manage different forms of information, from different sources, with different usage. The faculty members and instructors of the "Intelligent Information Systems" postgraduate Stream conduct basic and applied research, which aims: to produce schemes and languages for representing the content of information, to develop methods and techniques for data mining, to exploit semantic information, to develop algorithmic techniques for problems that arise during the processing of large amounts of data, and to develop systems that exploit distributed information. Specifically, the research areas in which the instructors of the Stream have been active are:

- Language technology
- Text mining
- Data mining
- Plagiarism detection
- Intelligent music processing
- Document image processing
- Optical character recognition
- Historical document, image and photo processing
- Bayes belief networks
- Combinatorial optimization
- Algorithmic techniques and applications
- Computational complexity
- Approximation and direct algorithms
- Large-scale optimization
- Service positioning problems
- Resource assignment and routing problems
- Algorithmic game theory issues
- Efficient algorithm implementation
- Ontology engineering

- Semantic Web technologies

The instructors of the "Intelligent Information Systems" postgraduate Stream have a significant number of publications in top-rated journals and the most prestigious and competitive conferences in the area. They have also participated in the organization of international workshops, conferences, and summer schools, such as: Int. Workshop on Uncovering Plagiarism, Authorship, and Social Software Misuse (2007-2014), 14th Int. Conference on Intelligent Text Processing and Computational Linguistics (2013), Int. Document Image Processing Summer School (2013-2014), Summer School on Modeling and Analysis of Environmental Data using ICT (2012), Summer School on Algorithmic Game Theory (2012).

The instructors of the "Intelligent Information Systems" postgraduate Stream have considerable experience in designing and carrying out national, as well as international research and development projects. Such projects have been funded by the European Commission, the Greek General Secretariat for Research and Technology, the Ministry of Education and Religious Affairs, and the University of the Aegean. Postgraduate and undergraduate students work as research assistants in such projects, actively participating in research activities of increased requirements.

The instructors of the Stream have also developed educational and research collaborations with many Greek and European Universities, research institutes and organizations. Examples include the following: University of Patras (Greece), Computer Technology Institute & Press "Diophantus" (Greece), University of Piraeus (Greece), University of Western Macedonia (Greece), NCSR Demokritos (Greece), Democritus University of Thrace (Greece), Ionian University (Greece), Aristotle University of Thessaloniki (Greece), National Technical University of Athens (Greece), National and Capodistrian University of Athens (Greece), General State Archives (Greece), NGO Archipelagos (Greece), Northern Aegean Region, Bauhaus Universitaet Weimar (Germany), Universitat Politecnica de Valencia (Spain), Universitat Autonoma de Barcelona (Spain), Lehigh University (USA), La Rochelle University (France), Antwerp University (Belgium), Duquesne University (USA), i-Know Center (Austria), OFAI (Austria), University of Genova (Italia), Instituto Polytecnico National (Mexico), Instituto de Astrofisica, Optica y Electronica (Mexico), Universidad de San Luis (Argentina), AU-KBC research center (India), Ludwig Maximilian University (Germany), Siauliai University (Lithuania), University of Texas at Arlington (USA).

Particular emphasis is given on linking teaching with research through the Research & Development Project, but also through invited speakers' lectures, as part of the remaining courses of the Stream. Students prepare their theses on contemporary research topics and are encouraged to submit their work for publication, under the guidance of their supervisors.

Detailed information about all the above issues is available at the webpage of Artificial Intelligence Laboratory (**http://ai-lab-webserver.aegean.gr/ai-lab/**).

4.4.5 Honors – Graduates' Impressions

The following list includes recent publications by students of the Stream (students' names in italics):

Potha, N. and E. Stamatatos (2014). A Profile-based Method for Authorship Verification. In Proc. of the 8th Hellenic Conference on Artificial Intelligence (SETN), LNCS 8445, pp. 313-326.

Pappas, N., G. Katsimpras, and E. Stamatatos (2013). Distinguishing the Popularity between Topics: A System for Up-to-Date Opinion Retrieval and Mining in the Web. In Proc. of the 14th International Conference on Computational Linguistics and Intelligent Text Processing (CICLing-2013), Springer LNCS, 7817, pp. 197-209.

Diamantatos, P., V. Verras, and E. Kavallieratou (2013). Detecting Main Body Size in Document Images. In Proc. of the 12th International Conference on Document Analysis and Recognition (ICDAR), pp. 1160-1164.

Raptis, K., G. Vouros, and E. Kapros (2013). Exploring Factors and Policies for Poverty by Agent-based Simulation. In Proceedings of the Conference on Systems Engineering Research (CSER).

Kontos, K. and M. Maragoudakis (2013). Breast Cancer Detection in Mammogram Medical Images with Data Mining Techniques. In Proc. of the 9th IFIP WG 12.5 International Conference Artificial Intelligence Applications and Innovations (AIAI), pp. 336-347.

Pappas, N., G. Katsimpras, and E. Stamatatos (2012). An Agent-Based Focused Crawling Framework for Topic- and Genre-Related Web Document Discovery. In Proc. of the IEEE 24th International Conference on Tools with Artificial Intelligence (ICTAI-2012), pp. 508-515.

Pappas, N., G. Katsimpras, and E. Stamatatos (2012). Extracting Informative Textual Parts from Web Pages Containing User-generated Content. In Proc. of the 12th International Conference on Knowledge Management and Knowledge Technologies (I-KNOW-12), Paper 4.

Matthaiou, E. and E. Kavallieratou (2012). An Information Extraction System from Patient Historical Documents. In Proceedings of the ACM Symposium on Applied Computing (SAC), pp. 787-791.

Vavilis, S. and E. Kavallieratou (2011). A Tool for Tuning Binarization Techniques. In Proc. of 2011 International Conference on Document Analysis and Recognition (ICDAR).

Kourtis, I. and E. Stamatatos (2011). Author Identification Using Semi-supervised Learning. In Proc. of the 5th Int. Workshop on Uncovering Plagiarism, Authorship, and Social Software Misuse (PAN-2011).

Papasalouros, A, Kotis K, and *K. Kanaris* (2011). Automatic Generation of Tests from Domain and Multimedia Ontologies, Interactive Learning Environments journal, 19(1), pp. 5-23.

K. Kotis, A. Papasalouros, G. Vouros, *N. Pappas*, and *K. Zoumpatianos* (2011). Enhancing the Collective Knowledge for the Engineering of Ontologies in Open and Socially Constructed Learning Spaces, Journal of Universal Computer Science, 17 (12), pp. 1710-1742.

Zoumpatianos, K., Papasalouros A, Kotis K. (2011). Automated Transformation of SWRL Rules into Multiple-Choice Questions. Proc. of the 24th Florida Artificial Intelligence Research Society Conference (FLAIRS).

Vouros, G., A. Papasalouros, *K. Tzonas*, A. Valarakos, K. Kotis, J.A. Quiané-Ruiz, P. Lamarre, and P. Valduriez (2010). A Semantic Information System for Services and Traded Resources in Grid e-markets. Future Generation Computer Systems, 26(7), pp. 916-933.

Doulgeri, N., and E. Kavallieratou (2009). Retrieval of Historical Documents by Word Spotting. In Proc. of the 16th Document Recognition and Retrieval Conference (DRR).

Santipantakis, G., and G. Vouros (2009). Semantics based Reconciliaton for Collaborative Ontology Evolution. In Proceedings of the International Conference on Knowledge Engineering and Ontology Development (KEOD), pp. 153-158.

Kanaris, I. and E. Stamatatos (2009). Learning to Recognize Webpage Genres, Information Processing and Management, 45(5), pp. 499-512, Elsevier.

Ioannis Kanaris *(M.Sc.)*

I think that the "Information Management and Web Technologies" postgraduate Stream is one of the most challenging, as well as interesting of the Master's Program of the Information and Communication Systems Engineering Department, University of the Aegean. The technologies taught are at the forefront of technology developments and address completely new fields in relation to the Undergraduate Program of the Department. Courses such as Machine Learning, Knowledge Representation (Ontologies) and Multi-agent Systems spurred my interest more. As a graduate of Mathematics, I initially met some difficulties, especially in terms of coding requirements, which they finally helped me to improve though. After my graduation, I worked on representation and processing of biological data, in the form of ontologies, in the field of Systems Biology at the National Hellenic Research Foundation. I also worked at the EKTORAS project of the University of the Aegean.*

Nikolaos Pappas *(M.Sc.)*

Following my graduation from the Dept. of Information and Communication Systems Eng., University of the Aegean, I continued my studies in the postgraduate Stream of "Information Management and Web Technologies". That Stream provided all necessary sources in a wide range of areas in artificial intelligence and fascinated me to work in the areas of Natural Language Processing and Machine Learning. My involvement in the demanding learning tasks and the development of projects in that postgraduate Stream supported me with the necessary skills to conduct research and contributed in my choice to pursue an academic career as a research assistant in Idiap Research Institute and a Ph.D. student in École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland.*

* The "Intelligent Information Systems" postgraduate Stream was formerly entitled as "Information Management and Web Technologies".

4.5 Stream IV

Communication and Computer Networking Technologies

4.5.1 Scope and Objectives

Communication and computer networks is probably the fastest growing areas in the field of informatics and communications, with important technological developments that change the way of life of modern people. The "Communication and Computer Networking Technologies" postgraduate Stream is the oldest Stream of the Master's Program of the Information and Communication Systems Engineering Department, since it operates from the beginning of the program, during academic year 2002–2003. Trying to meet the demands of the Greek and international market for well trained personnel in modern trends in this area, the Stream offers high-level postgraduate education, providing both theoretical foundations and practical knowledge on recent developments in the area of communication and computer networks.

The Stream is mainly aimed at higher education graduates with qualifications relevant to computer science, computer engineering and electrical engineering, who wish to focus on:

❱ the design and development and/or management and operation of wired and wireless computer networks, in small or large companies in the field of telecommunications and networks in Greece and internationally,

❱ research in similar areas.

The selection of the Stream courses and their content has been done in such way as to deal with specific needs and deficiencies of the telecommunications market personnel in a wide range of issues, which, among others, include technologies of access and trunk networks, protocols, architectures, reliability and performance evaluation of modern networks, as well as modern business issues. Upon successful completion of the Stream's program of study, graduates will have gained important advantages, such as:

❱ strong knowledge of modern networking technologies,

❱ ability to compare and evaluate products and services,

❱ ability of management and supervision of complex and demanding telecommunications projects.

4.5.2 Courses per Semester

The titles as well as the distribution of the courses per semester for this Stream are the following:

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-300401	Distributed Systems and Web Services	7,5
323-400100	Mobile and Satellite Communications	7,5
323-400401	Digital Integrated Systems Design	7,5
323-410101	Design Development and Performance Evaluation of Computer Networks	7,5

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-400201	Network, Green Technology and Next Generation Services Issues	7,5
323-410300	Wireless Communication Networks	7,5
323-410401	Cloud Computing	7,5
CODE	**OPTIONAL COURSES***	**ECTS**
323-410201	Pervasive Computing Systems	7,5
323-410500	Embedded Systems	7,5

Students are expected to choose and successfully attend one (1) of the above optional courses.

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-000000	**M.Sc. Thesis**	**30**

4.5.3 Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

4.5.3.1 Mobile and Satellite Communications

Cellular network architecture (cells, channels, frequency reuse and basic functionalities). Channel access (multiple access and random access techniques). Traffic and system performance. Interference and noise. Design examples of cellular systems. Radio channel description (propagation phenomena, prediction models, coverage). Principles and design techniques for the physical layer. Scattering, diffraction and propagation models. Channel characterization. Orbit mechanics for satellite communications (Keplerian orbits, orbit parameters, earth orbit, earth-satellite geometry, earth station and satellite position, comparison of orbits, orbit perturbations). Analysis and design of satellite communications links (antenna parameters and EMF, signal transmission and reception, propagation, noise, figures of merit, compensation techniques). Analog and digital baseband transmission techniques. Multiple access techniques for satellite networks. Design examples of fixed and mobile satellite systems.

The course consists of a series of lectures that address the issues of mobile and satellite communications. The aspects considered include the analysis, design and evaluation of wireless and satellite systems, along with the knowledge of wireless propagation issues, the characterization and understanding of the physical layer and the services of the advanced mobile and satellite systems. This course is designed to meet the needs of the Greek and European market in regard with the specialization in a wide range of issues relating to communication networks.

4.5.3.2 Digital Integrated Systems Design

Introduction to Application Specific Integrated Circuits (ASICs) and Field-Programmable Gate Arrays (FPGAs), Hardware Description Languages (HDLs), Verilog and Very High Speed Integrated Circuits HDL (VHDL), Combinational and Sequential digital circuits, Design simulation, Design synthesis, Timing analysis, Post-synthesis simulation. Verilog HDL: Overview of Digital Design with Verilog HDL, Hierarchical Modeling Concepts, Basic Concepts of Verilog HDL, Modules and Ports, Gate-Level Modeling, Dataflow Modeling, Behavioral Modeling, Register Transfer Level (RTL) Modeling, Tasks and Functions, Useful Modeling Techniques, Timing and Delays, Logic Synthesis with Verilog HDL. Finite State Machines

(FSMs), First In First Out (FIFO) memories, Handshaking, Random access memories and memory interface, Clock distribution issues, Computer Aided Design (CAD) tools.

This course aims at familiarizing the students with the process of designing and implementing a digital system by using hardware description languages, Computer Aided Design (CAD) tools and FPGA-based boards. The students will learn how a Hardware Description Language (HDL) is used to describe and implement hardware. The emphasis is not on the details and syntax of the language, but rather on how the language infers hardware. A student who successfully fulfills the course requirements will have demonstrated various abilities, such as: to discriminate between combinational and sequential digital circuits, to design combinational units to be embedded in larger systems, to design state machines to control complex systems, to identify which parts of the Verilog HDL can be synthesized and which cannot, what kind of description should be used depending on the targeted module, and to write synthesizable Verilog, to write a Verilog testbench to test Verilog modules, to target a Verilog design to an FPGA board, to perform post-synthesis simulation with timing information, to analyze and debug Verilog modules, and to build a synchronous digital system in Verilog and verify its performance.

4.5.3.3 Design, Development and Evaluation of Networks and Services

Introduction on advanced networking technologies and methodologies (NAT, IP multicast, WEP, IEEE 802.1X, 802.21, etc.), architectures (MPLS, Diffserv, IntServ, etc.), protocols (RSVP, Mobile IP, IPv6, OSPF, BGP, etc.) and services (WebTV, IPTV, p2p, v2v, CDN). Topics on active services with self-organisation, localization, APIs, security, mobility, QoS.

Emphasis on advanced design features for complex networks and services. Knowledge for networks and communication systems engineers.

4.5.3.4 Network, Green Technology and Next Generation Services Issues

Heterogeneous Networks and user mobility. Broadband networks (WiMax, LTE, DVB-T/ DVB-H), use of DVB for triple-play services in remote areas. Cross-system and cross-layer optimization in heterogeneous wireless and mobile environments. Sensor networks, self-managed systems, location based services. Green networking for access and core networks. Advanded services for the Future Internet, large scale experimental infrastructures as a service (e,g., Panlab, Onelab, GENI).

Advanced topics on Networks, Green Technology & Next Generation Services. Specialized knowledge for engineers on Networks and Communications.

4.5.3.5 Wireless Communication Networks

Principles and technologies of spread spectrum systems, CDMA, WCDMA, OFDM and OFDMA. Scheduling methods, radio resource management and mobility in wireless networks. Diversity techniques (SIMO and MISO systems) and spatial multiplexing (MIMO systems), and advantages for the next generation networks. Evolution of second and 2.5 (GPRS) generation mobile communication networks into third generation systems. Third generation networks: principles, technologies, architecture and applications. Fourth generation mobile communications networks (LTE, LTE-Advanced) and next generation networks (5G). Inter-working between heterogeneous networks. Wireless local area networks technologies: Wireless LANs IEEE 802.11, HIPERLAN and Bluetooth. WiMAX and HSPA technologies. Ad-hoc and wireless sensor networks, packet radio networks, routing protocols, battery energy conservation. Relays' technologies and architecture.

The aim of this course is to study advanced topics in wireless communications future generations. The issues that are studied concern wireless local area networks, packet routing, cellular and ad-hoc networks, at physical layer and MAC. Upon the successful completion of this course, students will have the opportunity to explain the limitations of wireless access and whether these restrictions will affect the performance of the upper layers. Also, they will have understood in great extent the structure and operation of the next generation wireless and cellular networks and they will be in a position to comprehend these networks' specific features and limitations. The course includes projects in a wireless systems software for better understanding and consolidation on the part of students of the basic principles governing the design of wireless networks and the quality of the communications network.

4.5.3.6 Cloud Computing

Cloud computing technologies, types of services (PaaS, SaaS, NaaS, IaaS), development models (private, public, hybrid), tools (openflow), virtualization of networking services and functions (SDN, NFV).

Learning advanced cloud computing and virtualization topics. Specialized knowledge for networks and communication systems engineers.

4.5.3.7 Pervasive Computing Systems

Introduction to ubiquitous computing. Ubiquitous computing systems. Context aware computing. Privacy in ubiquitous computing. User Interfaces in ubiquitous computing. Location in ubiquitous computing. Processing sequential sensor data.

Upon successful completion of this course, students should be able to: a) Report the characteristics of pervasive computing systems; b) Describe the issues that emerge from the heterogeneity of components, the dynamicity of the network, and the large number of nodes in a pervasive computing system; c) Explain the importance of adaptability in a pervasive computing system; d) Recognize the possibility of separation between the infrastructure, the system and the services when designing a pervasive computing system; e) identify issues of privacy and security in pervasive computing systems; f) Perceive the concepts of "context" and "context-awareness"; g) Report basic location positioning systems and explain concisely the operation of each one.

4.5.3.8 Embedded Systems

The goal of this course is to introduce students to issues in hardware/software interfacing, practical microprocessor-based system design, and practical digital hardware design using modern logic synthesis tools. More specifically it includes: introduction to embedded systems, SystemVerilog Hardware Description Language (HDL), Hardware/ Software interfaces, PS/2 keyboard, serial communication, USB, Ethernet, video handling, memories and their utilization in embedded systems, microprocessors, microcontrollers, FPGAs and ASICs.

This course aims at familiarizing the students with the process of designing and implementing embedded systems by using the SystemVerilog hardware description language, already designed cores and FPGA-based boards. The students who successfully fulfill the course will have also developed embedded systems programming skills.

4.5.4 Research Activities

The members of the «Computer and Communication Systems Laboratory» and instructors of the «Communication and Computer Networking Technologies» postgraduate Stream conduct research in a wide range of areas of communication networks and their applications, and hold relevant patents and accreditations (ELOT EN ISO / IEC 17025:2005 for high frequency electromagnetic fields measurements). Their current activities balance between basic and applied research and include:

- Next generation network and communication architectures and services
- Mobile and wireless network security
- Wireless multimedia communications
- Network management and middleware technologies
- Networks and services focusing on energy efficiency, quality and safety
- Mobile and wireless communication networks
- Ad hoc networks, sensor networks and wireless grid networks
- Satellite communications, cooperative satellite and terrestrial networks
- Smart energy networks
- Heterogeneous technologies, reconfigurable and cognitive networks
- Mobile and pervasive computing
- Measurement and evaluation of electromagnetic fields
- Traffic modeling and performance evaluation
- Radio coverage and propagation in wireless terrestrial and satellite networks
- Cloud computing technologies
- Network and communication applications (e.g., e-government, medical informatics)
- Multimedia services, information servers and integrated platform architectures
- Internet of Things services
- Future Internet Applications
- Smart Energy Grids
- Digital integrated circuits and systems

The instructors of the Stream participate in numerous European and National research and development projects with the support of postgraduate and doctoral students, who gain significant experience in the areas of communication networks and applications. Some of these projects are:

International Projects

- Greenet – Initial Training Network on Green Wireless Networks, 2012 – 2015, FP7, (ITN) Marie Curie, Funding: European Commission

- "PASSIVE: Policy-Assessed system-level Security of Sensitive Information processing in Virtualized Environment", FP7, 2010 – 2013, Funding: European Commission

- "COGEU: COgnitive radio systems for efficient sharing of TV white spaces in EUropean context", FP7, 2010 – 2013, Funding: European Commission

- "PEOPLE-2007-2-1-IEF: Provision of optimum radio AcceSS at the Emerging Next GEneration NetwoRks - PASSENGER", FP7, 2008 - 2009, Funding: European Commission

- "HURRICANE: Handovers for Ubiquitous and optimal bRoadband ConnectIvity among CooperAtive Networking Environments", FP7, 2008-2010. Funding: European Commission

- "UNITE: Virtual Distributed Testbed for Optimization and Co-existence of Heterogeneous Systems", FP6-STREP, 2006-2009, Funding: European Commission

National Projects

- «1st Phase of Strategic Cooperation with University, for providing consulting services to OSE for the implementation of TAF/TAP-TSI (Telematic Applications for Freight/Telematic Applications for Passenger Services - Technical Specification for Interoperability)», 2016 – , Funding: Hellenic Railways Organization (OSE) SA.

- "National Observatory of Electromagnetic Fields", 2014 – , Funding: Digital Convergence, Ministry of Infrastructure, Transport and Networks.

- "Virtualized Platforms for innovative applications and sensor-based services in the context of cloud (EPIKOUROS) ", 2012 – 2015, SME Support for R&D Activities, Funding: General Secretariat for Research and Technology

- "Reliability Improvement of Integrated Circuits and Systems in Nanometer Technology" – REIN, Programme: "THALES", 2011 – , Funding: National Strategic Reference Framework (NSRF)

- "PEDION24 - Development, installation and management of a network for measuring the intensity of non-ionizing electromagnetic radiation of cellular network antennas", http://

www.pedion24.gr, 2007 – , Funding: COSMOTE - Mobile Telecommunications SA

- "Development of an Autonomous System for Measuring Electromagnetic Radiation", 2010-2011, Funding: Greek General Secretariat for Research and Technology

- "Study and Measurement of Electromagnetic Radiation in the Municipality of Patmos", 2015 – , Funding: Municipality of Patmos.

- "Study and Measurement of Electromagnetic Radiation in the Municipality of Rhodes", 2012 – 2014, Funding: Municipality of Rhodes

- "Study and Measurement of Electromagnetic Radiation in the Municipality of Samos", 2010 – 2014, Funding: Municipality of Samos

- "Development of a Wireless Local Area Network (WLAN) for providing external and internal access to the students of the University of the Aegean, School of Science, Karlovassi, Samos", 2005-2008

- "Analysis, Design and Development of a Telemedicine Network for remote areas in the Aegean and Cyprus", Community Initiative Programme INTERREG IIIA / GREECE-CYPRUS, 2006-2009, Funding: European Commission

- "High availability, reliability and management of wireless communication in special-purpose ad-hoc networks", Pythagoras Project, 2004-2006, Funding: Greek Ministry of Education and Religious Affairs

- "DIOSKOURI – Education and Training Network in Advanced Network and Informatics Services", Human Network S&T Education, 2003-2006, Funding: Greek General Secretariat for Research and Technology

The instructors of the Stream have also organized and/or served as chairs of technical program and organizing committees of international conferences and summer schools, some of which are listed below:

- 2nd Summer School on "Emerging Architectures and Key Technologies for 5G Networks" (AegeanNetCom2016), Karlovassi, Samos, Greece, Aug 29 – Sep 2, 2016.

- 1st Summer School on "Emerging Architectures and Key Technologies for 5G Networks" (AegeanNetCom2015), Karlovassi, Samos, Greece, Aug 19-28, 2015.

- IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (CAMAD 2014), Athens, Greece, Dec 1-3, 2014

- IEEE International Conference on Communications (IEEE ICC 2012), 10-15 June 2012, Ottawa, Canada

- ManSec–CC 2012 First International workshop on Management and Security technologies for Cloud Computing 2012, in conjunction with the 2012 IEEE GlobeCom, 2012, California, USA

- International Workshop on Computer–Aided Modeling Analysis and Design of Communication Links and Networks (CAMAD) 2012, Barcelona, September 17–19, 2012

- International conference on Telecommunications and Multimedia (TEMU) 2012, Heraklion, Crete, Greece July 30 – August 1, 2012

- ICNC'12 – CQSM International Conference on Computing, Networking and Communications, Communication QoS and System Modeling Symposium, Maui, Hawaii, 2012

- IEEE Consumer Communications and Networking Conference (CCNC), January 7 –10 2012, Las Vegas, Nevada USA

- IEEE International Conference on Communications (IEEE ICC 2011), 5–9 June 2011, Kyoto, Japan

- IEEE Consumer Communications and Networking Conference (CCNC), January 9 –12 2011, Las Vegas, Nevada USA

- IEEE International Conference on Communications (IEEE ICC 2010), 23 –27 May 2010, Cape Town, South Africa

- 1st International Conference on Mobile Lightweight Wireless Systems (Mobilight 2009), May 18-20, 2009, Athens, Greece

- 8th IEEE International Workshop on IP Operations and Management (IPOM 2008), September 22–26, 2008, Samos Island, Greece

Collaborations with other higher education institutions, research institutes and companies operating in the area of networks and communications have been developed in the framework of research and development projects. In order to link teaching with research and recent technological developments in the market, people from various organizations have been invited for lectures to the postgraduate students of the Stream. Additionally, for students with excellent performance, there is the opportunity to visit such organizations and /or work on a part of their M.Sc. Thesis. Some of the aforementioned collaborations are indicated below.

National: National Technical University of Athens, National and Kapodistrian University of Athens, NCSR Demokritos, University of Piraeus, University of Patras, University of Ioannina, Technological Educational Institute of Larissa, Technological Educational Institute of Crete, Athens Information Technology, COSMOTE SA, ERICSSON HELLAS, F–IN, Synelixis, Greek Air Force, PeSYP of Thessaly, PeSYP of North Aegean, Municipality of Samos, Municipality of

Rhodes, Municipality of Lemnos, Administrative Division of North Aegean, Informatics and Telematics Institute, General Hospital of Athens G. Gennimatas, Foundation for Research and Technology, Alfa Logic SA, Minoan Lines.

International: CERN (Switzerland), Huawei (Sweden), IBM (Zurich), FRANCE TELECOM R & D (France), University of Surrey (UK), Duke University (USA), CEA LETI (France), EURECOM (France), Anect (Czech Rep.), ATOS (Spain), ENGINEERING (Italy), Thales (UK), Rohde & Schwarz (Germany) Technische Universität Dresden (Germany), Waterford Institute of Technology (Ireland), INSTITUTO TELECOMUNICAÇÕES (Portugal), SIGINT Solutions Ltd (Cyprus), University of Malaga (Spain), University of Portsmouth (UK), University of Cyprus (Cyprus), Nowcasting International (Ireland), Cyprus Institute of Neurology and Genetics (Cyprus), Harvard Medical School, Boston (USA), OmegaCube SA (Italy), Indra Espazio SA (Spain) Mondragon-Enyca SA (Spain) Trinity College Dublin (Ireland) Poznan University of Technology (Poland) Institut für Rundfunktechnik (Germany) Centre Tecnològic de Telecomunicacions de Catalunya (Spain).

Detailed information about all the above issues is available at the webpage of Computer & Communication Systems Laboratorys (**http://www.icsd.aegean.gr/ccsl/**).

4.5.5 Honors - Graduates' Impressions

Student awarded by the University of the Aegean Awards of Excellence 2014-15:

Eleni Bogdani, for the publication of one scientific article in international journal and two publications in international conferences, in the context of her diploma thesis "Analysis and Estimation of Indoor Localization Systems", Supervisor: D. Vouyioukas

Best Student Paper Award:

Prodromos Makris, Dimitrios N. Skoutas, Panagiotis Rizomiliotis and Charalabos Skianis, "A User-Oriented, Customizable Infrastructure Sharing Approach for Hybrid Cloud Computing Environments", 3rd IEEE International Conference on Cloud Computing Technology and Science (CloudCom 2011), 29/11-01/12, Athens, Greece.

Students awarded by the *ERICSSON Awards of Excellence in Telecommunications*:

Kikilis Anastasios and Ratsiatos Stylianos, M.Sc. Thesis title: "Admission Control and Pricing in Wireless Networks by Using Game Theory", Supervisor: A. Rouskas

Kokkinis Chrysanthos, M.Sc. Thesis title: "Data link layer performance evaluation of the DVB-H standard", Supervisor: G. Kormentzas

Nikolaos Nomikos *(M.Sc., Ph.D.)*

Current occupation: Post-doc Researcher, Quality Manager of the Computer and Communication Systems Laboratory (ELOT EN ISO 17025:2005 Certified), Department of Information and Communication Systems Engineering, University of the Aegean, Project Engineer in the National Observatory of Electromagnetic Fields and in the PEDION24 program for the continuous and uninterrupted awareness of the levels of electromagnetic radiation in various regions of Greece.

As a graduate of the Department of Electrical and Computer Technology Engineering, University of Patras, with specialization in Telecommunications and Information Technology, the selection of "Communication and Computer Networking Technologies" Stream of the Master's Program of the Information and Communication Systems Engineering Department, University of the Aegean, brought me in touch with the latest developments in the field of Telecommunications and Networks. Furthermore, its faculty, with their experience in research, gave me the motivation to begin my career as a Ph.D. candidate in the Department and successfully complete my Ph.D. studies (with honours). In conclusion, my studies in Samos not only helped me build my profile as an engineer, but also presented me with valuable partners in my further research and professional career.

Nikolaos Angelis *(M.Sc., Ph.D. candidate)*

Current occupation: Ph.D. candidate, with subject: Heterogeneous Telecommunication Architectures for Smart Energy Grid on Emerging 5G Technologies. Participation in the program: National Observatory of Electromagnetic Fields.

My participation in the Postgraduate Programme of the Department of Information and Communication Systems Engineering (ICSD) offered me the unique opportunity to broaden my knowledge in the area of Communication and Networking Technologies and acquire the necessary skills in order to continue my studies at the Ph.D. level. The ICSD Department offers unique educational opportunities and promotes the cooperation between faculty members, who can prove valuable collaborators and connections for future research.

Eleni Bogdani *(M.Sc.)*

Current occupation: Senior RF Engineer – Tea Technical Leader, RF-Assurance Greece, T-Mobile TTS Inc.

As a scholar of the postgraduate program, I had the opportunity to take part in the teaching activities of the teaching staff, the organization of conferences (IEEE CAMAD) and Summer Schools (AegeanNetCom), as well as in research fields that have contributed to my scientific training. This experience, as well as the continuous support of the supervising professors, encouraged me to actively engage in the research in the field of Telecommunication Systems and Indoor Positioning by publishing four papers in refereed scientific journals and conferences.

The skills and experience I gained during my postgraduate studies helped me significantly in my evolution as an engineer and a scientist.

4.6 | Stream V

Digital Innovation and Entrepreneurship

4.6.1 Scope and Objectives

Today, more than 3,500 online stores are operating on the Greek Internet. However there is a significant shortage of skilled personnel administration. Furthermore, at European level, the European Commission recently announced the areas with the greatest potential for job creation in the future, focusing on green economy and Information and Communication Technologies (ICT) services. At the same time, it notes in its report in 2012 that "The success of Europe 2020, the competitiveness and innovative capacity of European industry and social cohesion depend on the strategy and the effective use of Information and Communication Technologies, knowledge, skills, and ingenuity of the European workforce and citizens". The Stream of Digital Innovation and Entrepreneurship expects to contribute in this direction.

The aim of this Stream is the balanced development of a curriculum that approaches both theoretically and practically, contemporary issues of e-Business. Furthermore, through lectures and workshops by invited speakers for the purposes of the education program, innovation, creativity and entrepreneurial spirit of students is boosted. Practical exercises (e.g. business plans for innovative internet companies and promotion techniques through Google AdWords and Social Media) to be implemented on individual modules contribute to the assimilation of knowledge and deeper understanding of modern business practices. The "Digital Innovation and Entrepreneurship" Stream is based on the extensive experience of our department in numerous national and international research projects of various forms of entrepreneurship, and the large network of collaborations with major European Universities, research centers and multinational firms. Specialized, experienced executives from these institutions will participate as invited speakers in courses, as well as supervisors in projects and dissertations.

Graduates of the «Digital Innovation and Entrepreneurship» Stream will gain important and essential knowledge and skills in career development. They will be able to think creatively (out-of-the-box) and aim at an international audience with prospects for extremely rapid growth. Distinguished graduates will have the opportunity to discuss possible collaboration with affiliated companies and organizations in Greece and abroad.

4.6.2 Courses per Semester

The titles as well as the distribution of the courses per semester for this Stream are the following:

1st SEMESTER		
CODE	COMPULSORY COURSES	ECTS
323-200200	Information Systems	7,5
323-200300	Information Systems Security and Privacy Enhancing Technologies	7,5
323-600100	Digital Business Management	7,5
323-600200	Innovation & Entrepreneurship	7,5

2nd SEMESTER		
CODE	COMPULSORY COURSES	ECTS
323-610100	Digital Services and Technologies	7,5
323-610200	Enterprise Resource Planning (ERP) Systems	7,5
CODE	OPTIONAL COURSES*	ECTS
323-110200	Θέματα Δικαίου της Πληροφορίας	7,5
323-210200	Ερευνητική Μεθοδολογία και Τρέχοντα Ερευνητικά Θέματα	7,5
323-610300	Επιχειρησιακή Νοημοσύνη και Μεγάλα Δεδομένα	2,5
323-610400	Ψηφιακό Μάρκετινγκ	5
323-610500	Ηλεκτρονική Εφοδιαστική Αλυσίδα	2,5
323-610800	Οικονομικά του Διαδικτύου	2,5

* Students are expected to choose and successfully attend two (2) of the above optional courses and the summation of 30 ECTS in total in this semester.

3rd SEMESTER		
CODE	TITLE	ECTS
323-000000	M.Sc. Thesis	30

4.6.3 Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

4.6.3.1 Information Systems

See subsection 4.3.3.2

4.6.3.2 Information Systems Security and Privacy Enhancing Technologies

See subsection 4.3.3.3

4.6.3.3 Digital Business Management

Management functions. Outer and inner environment for enterprises and organizations. Fundamental financials for enterprises: balance sheet, profit & loss statement, financial performance indices. Enterprise organization. Business strategy and business planning. SWOT analysis, 4P mix, break-even analysis, budgeting. Digital / virtual companies and internet business models. Students project: making a business / master plan for a company / organisation.

The acquisition of knowledge concerning the management of enterprises and organizations, the main financial, production and marketing functions of enterprises. Acquaintance with information systems and smart organization tools.

4.6.3.4 Innovation & Entrepreneurship

The course focuses on the need to persistently innovate for the sustainable and robust business development in an international and rapidly changing technological environment. Topics of the course mainly cover knowledge management, patents and diversification strategy, innovation models and international business expansion. Particular emphasis is given to the concept of entrepreneurship and its role in economic development and growth of the company, while simultaneously recognizing the key mechanisms of generating new knowledge and the typical phases in the development process of new ICT products and services.

Upon successful completion of this course, students will be able to: a) Recognize the importance of entrepreneurship as a management style and corporate culture, with an emphasis on exploring new opportunities that lead to rapid business growth and profitability; b) Explain the role of entrepreneurship in economic development and growth

of an organization; c) Understand the relation of innovation with technological changes and various forms of business strategy; d) Perceive changes in the nature and the intensity of innovation in different industry sectors; e) Explain the stages of the technological change in a market; f) Identify the e-business resources, skills, and values that can lead to innovative products and services.

4.6.3.5 Digital Services and Technologies

The course focuses on companies that base their competitive advantage in ICT technologies and applications. This course is designed to provide a deep grounding in technological innovation and entrepreneurship for managers and entrepreneurs. Over the semester we will (a) learn key technological innovations for running a business, such as SaaS, cloud ICT, (b) evaluate opportunities for technological innovation and (c) analyze markets that are strongly based on digital services (finance, marketing, media).

Understand basic concepts of technological innovation and up-to-date e-services that strategically support a company, with emphasis on the technological change management. Understanding all new ICT applications, such as social computing, cloud computing services, augmented reality, ubiquitous computing, etc. Ability to analyze radical technological innovations and predict possible incremental or radical innovations in dynamic e-markets.

4.6.3.6 Enterprise Resource Planning (ERP) Systems

Introduction – definitions – evolution (MRP I – MRP II – ERP I – ERP II). Structure and modules of an integrated enterprise resources planning system (ERP). International and Greek market of ERP systems. Operational, managerial and technological benefits. General accounting (ledger) module: chart of accounts creation, entries, general ledger books, customized entry screens, budgets creation, financial reporting, multi-dimensional analysis, adaptation/set-up. Sales and procurement modules: customers and vendors master files, transactions posting (quotes, orders, shipments/receipts, sales/purchase invoices, receivables/payables), setting pricing policies, automated VAT calculation, automated general entry posting, adaptation/set-up. Customer relationships management (CRM) system. Inventory/warehouse module: items master file, warehouses definition, internal shipments/receipts, adaptation/set-up. Production module: master files, definition of workcenters, routing tables and bills of materials, production orders entry and monitoring. Critical success factors of ERP projects. Alternative approaches to ERP development. Alternative approaches to business processes reengineering in ERP projects. ERP system selection methodology. ERP projects implementation methodology.

Learning outcomes: a) comprehension of the structure of an ERP system, as well its basic functionality and operation of its main subsystems, b) practical familiarization with these

subsystems, so that they can be used for the implementation of business scenarios, c) acquisition of knowledge regarding the electronic implementation of the main operations of an enterprise, d) acquisition of knowledge regarding the organisation of ERP projects in enterprises and skills for participating in such projects.

4.6.3.7 Information Law

See subsection 4.2.3.6

4.6.3.8 Research Methods and Current Research Topics

See subsection 4.3.3.8

4.6.3.9 Business Intelligence and Big Data

The course focuses on the analysis and use of data for making rigorous and timely decisions. Today new technologies enable us to access large amounts of data (big data), which arise from the everyday consumer and business transactions. Through modern analysis and visualization of data, managers can make informed decisions that reduce operating costs and offer paths to reengineer and optimize operational procedures.

The course will provide learners an introduction to a range of methodologies and options for implementing Big Data and analytics in an enterprise. Emphasis is on text analysis, data mining, advertising analytics, and social media analytics, exploring both technical and managerial aspects of Big Data.

4.6.3.10 Digital Marketing

This course provides students with the relevant theoretical background, but mainly practical approaches in contemporary issues in the field of digital marketing. Emphasis is given on: a) communication strategy and promotion via various digital channels (web, mobile, social networks, etc.), b) consumer digital behavior process and models, c) customization and personalization of digital content, d) usability of websites, e) CRM information systems and f) advanced digital marketing analytics.

Students will acquire the necessary theoretical background in the field of Digital Marketing adopting an interdisciplinary approach. They will not only understand the current Digital Marketing technologies and applications, but students will be in a position to apply them in different e-business cases and evaluate their performance.

4.6.3.11 Electronic Supply Chain

The module is designed for increasing the efficiency of the main supply chain processes (e.g. procurement, warehousing, and freight transport) and for minimizing the operational cost via the use of the Internet and advanced Information Systems (IS). The module drills down on IS such as Warehouse Management Systems, Vehicle Routing Systems, Fleet Management Systems, etc that are mainly used for the optimization of the key supply chain processes as well as for the increase of the customer service level.

Comprehension and evaluation of new technologies that are used for the improvement of processes of supply chain.

4.6.3.12 Internet Economics

Economic models and tools used to understand different and unique phenomena in digital markets, such as electronic transactions, business models, competition policy, auctions and e-advertising.

Students will comprehend the basic concepts and methodology of microeconomic theory, and recognize how these can be applied to enhance understanding in digital transactions and new e-business models.

4.6.4 Research Activities

Through cooperation between teachers, postgraduate students and Ph.D Candidates, a plurality of high-level publications has been achieved. More specifically, research results have been published in Journals and Conferences; journals include Electronic Markets – The International Journal (Taylor & Francis), Journal of Enterprise Information Management (Emerald), Computers and Security Journal (Elsevier), Telematics and Informatics Journal (Elsevier), Artificial Intelligence and Law (Springer Verlag), Information Management and Computer Security (Emerald), etc.; conferences include European Conference of Information Systems, European, Mediterranean & Middle Eastern Conference on Information Systems, TrustBus – International Conference on Trust, Privacy, and Security in the Digital Business, EGOV – International e-Government Conference, European Conference on Information Warfare and Security (ECIW), IFIP Conference on e-Commerce, e-Business, and e-Government, etc.

Furthermore, significant research collaborations have been developed with major organizations and companies such as the European Commission, the General Secretariat for Research and Technology, the Swiss Federal Institute of Technology (ETH) Zürich, the Darmouth College, USA, the University of Leuven, Belgium, University of Koblenz, Germany, the National Technical University of Athens, the University of Patras, the Athens University

of Economy and Business, Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V, Germany, το N.C.S.R. «Demokritos», Google Ireland Limited, Ireland, Microsoft Innovation Center, Greece, ICAP S.A., European Dynamics S.A., Athens Technology Center (ATC), SingularLogic S.A., etc.

Moreover, the instructors of the "Digital Innovation and Entrepreneurship" postgraduate Stream have significant experience of successful participation in both national and international research projects such as the following:

- PADGETS ("Policy Gadgets Mashing Underlying Group Knowledge in Web 2.0 Media"), Framework Programme 7, European Commission

- ENGAGE ("An Infrastructure for Open, Linked Governmental Data Provision towards Research Communities and Citizens"), Framework Programme 7, European Commission

- NOMAD ("Policy Formulation through non moderated crowdsourcing"), Framework Programme 7, European Commission

- "LEX-IS: Enabling Participation of the Youth in the Public Debate of Legislation among Parliaments, Citizens and Businesses in the European Union", eParticipation Trial Project, Oct. 2006

- Affiliated institution in "DEMO-net", Network of Excellence in e-Participation, project IST FP6-2004-27219, European Commission

- "ERMIONE: E-learning Resource Management Service for the Interoperability Network in the European Cultural Heritage Domain", eTEN Program of the European Union, e-TEN C517357

- "Factors increasing the productivity of IT and Communication expenses of Greek enterprises – international comparisons", PENED 2003, Greek General Secretariat for Research and Technology, Ministry of Development

- "i-Learn: Research and development of optimized methodology, procedures and specifications of an integrated software platform for high-standard education and training through the Internet", PAVET Program – NE 2004, Greek General Secretariat for Research and Technology, Ministry of Development

- "ICTE-PAN: Methodologies and Tools for Building Intelligent Collaboration and Transaction Environments for Public Administration Networks", project IST-2001-35120, European Union

Detailed information about all the above issues is available at the webpage of Information Systems Labs (**http://www.icsd.aegean.gr/is-lab/**).

4.6.5 Honors – Graduates' Impressions

All doctoral and a significant number of postgraduate students of the "Digital Innovation and Entrepreneurship" postgraduate Stream have presented original papers in peer-reviewed scientific journals and international conferences. Detailed information about these publications is available at the webpage of Information Systems Lab (students' names in italics):

- Arvanitis, S., Loukis, E., *Diamantopoulou, V.* (2013), 'Are ICT, Workplace Organization and Human Capital Relevant for Innovation? A Comparative Study Based on Swiss and Greek Micro Data', 10th Annual International Industrial Organization Conference, May 17 – 19, 2013, to be held in Boston, USA.

- *Christopoulou, I., Apostolatos, T.,* Drossos, D. and Kokkinaki, F. (2012), "Measuring the effectiveness of group buying coupons", in the Proceedings of the International Conference on Contemporary Marketing Issues (ICCMI), Thessaloniki, Greece, June 13-15.

- Loukis, E., Arvanitis, S., *Diamantopoulou, V.* (2012) "An Empirical Investigation of the Effect of Hard and Soft ICT Investment on Innovation Activity of Greek Firms", 16th Panhellenic Conference on Informatics with international participation, 5 – 7 October 2012 Piraeus, Greece. (Submitted)

- Arvanitis, S., Loukis, E., *Diamantopoulou, V.* (2012) "Soft ICT and Innovation Performance: An Empirical Investigation", European, Mediterranean and Middle Eastern Conference on Information Systems, 7-8 June, 2012, Munich, Germany.

- Arvanitis, S., Loukis, E., *Diamantopoulou, V.* (2011) "The impact of Different Types of ICT on Innovation Performance of Greek Firms", European, Mediterranean and Middle Eastern Conference on Information Systems, 30 – 31 May, 2011, Athens, Greece (Best Practical Paper Award).

- Arvanitis, S., Loukis, E., *Diamantopoulou, V.* (2011) "Information Systems and Innovation in Greek Firms – An Empirical Investigation", 15th Panhellenic Conference on Informatics with international participation 30 September – 2 October 2011, Kastoria, Greece.

- Loukis, E., Kokolakis, S., *Anastasopoulou K.* (2011) 'Factors of PKI adoption in European firms'. In: the 6th Mediterranean Conference on Information Systems (MCIS 2011), 3-5 September 2011, Limassol, Cyprus.

- Loukis, E., Georgiou, S., *Pazalos, K.* (2007) "A Value Flow Model for the Evaluation of an e-Learning Service", 15th European Conference on Information Systems (ECIS), June 7-9, 2007, St. Gallen, Switzerland.

- Loukis, E., *Pazalos, K., Michailidou, F.* (2006) "Electronic Collaboration Networks in the Cultural Heritage Domain – The ERMIONE Project", EGOV 2006 International Conference,

September 4 – 8, 2006, Krakow, Poland.

- Loukis, E., *Sapounas, J.* (2005). "The Impact of Information Systems Investment and Management on Business Performance in Greece", 13th European Conference on Information Systems, May 26–28, 2005, Regensburg, Germany.

- *Tavlaki, E.*, Loukis, E. (2005) "Business Model: A prerequisite for success in the network economy", 18th Bled eConference: eIntegration in Action, June 6–8, 2005, Bled, Slovenia.

Michalis Karypidis *(M.Sc.)*

After completing my undergraduate studies in the Department of Information and Communication Systems Engineering at University of the Aegean, I decided to continue my postgraduate studies Digital Innovation and Entrepreneurship at the University of the Aegean again, making, in my opinion, the ideal choice. Knowing how several professors teach from my undergraduate courses, I knew that the level of teaching and learning would be quite high, as it happened.

The lessons were structured based on the needs of the modern business. Professors, with their theoretical backgrounds and professional training, had the answers to all the questions. Finally, I should not forget the many conferences we participated (either online or in person) as well as our, priceless, visits to companies such as Microsoft, Singular Logic etc. learning firsthand the best practices of a healthy and modern business. Already my knowledge and prestige of this Master's degree have helped me in my professional path.

Maria Gkouni *(M.Sc.)*

After my undergraduate studies of Department of Digital Systems of the University of Piraeus, I decided to further improve my skills in Information Management Systems, for a carrier in the field of business consulting. The choice of this Master of 'Digital Innovation and Entrepreneurship' of the University of the Aegean was ideal. The course structure included a series of very interesting courses about basic business operations, the use of ICT in firms (e.g. Enterprise Resource Planning, e-Commerce systems, etc.), Information Systems management, etc. Faculty combines theoretical knowledge and work experience in their areas of expertise. In addition, they are part of intense international research activities (participation in international research projects, international publications, etc.), qualities that they successfully integrated as part of their lectures. Moreover, the academic community in Samos is small and human centric, which results in good communication with the teachers and co-students. The knowledge that I gained will help my future career.

5 Master's Degree Program (MSc) in "Research in Information & Communication Systems"

5.1 Scope and Objectives

The objective of the Postgraduate Program is the **production and dissemination of knowledge in Information and Communication Systems Science**. In this program, the student is bound to select and deal with a specific research topic. As a result, beyond the Master Thesis, an original publication in a scientific journal or equivalent prestigious international conference is expected.

The Program **aims** to **promote Research in Information and Communication Systems Science and in particular the principles governing the analysis, design, implementation and management of an Information and Communication System with high standards and requirements**. The "Research in Information and Communication Systems" program **provides graduate students with the theoretical and practical knowledge** and all the necessary supplies and a high level of scientific expertise in the relevant cutting-edge topics of ICT. The program will enable them to develop their individual skills and a successful career in the Information Technology and Communications sector.

This program is an ideal precursor for doctoral studies.

5.2   Courses per Semester

The titles as well as the distribution of the courses per semester for this Stream are the following:

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-700100	Research Methods	7,5
323-700200	Research Design and Development	15
CODE	**OPTIONAL COURSES***	**ECTS**
323-100100	Computer and Communication Networks Security	7,5
323-100200	Cryptography	7,5
323-100300	Database Systems Security	7,5
323-100400	Future Internet Security and Privacy	7,5
323-200100	e-Government I: Services and Infrastructure	7,5
323-200200	Information Systems	7,5
323-300100	Combinatorial Optimization and Modern Financial Applications	7,5
323-300200	Machine Learning	7,5
323-300401	Distributed Systems and Web Services	7,5
323-310201	Image Processing and Robotic Vision	7,5
323-400100	Mobile and Satellite Communications	7,5
323-400401	Digital Integrated Systems Design	7,5
323-410101	Design Development and Performance Evaluation of Computer Networks	7,5
323-600100	Digital Business Management	7,5
323-600200	Innovation & Entrepreneurship	7,5

* Students are expected to choose and successfully attend one (1) of the above optional courses.

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-710100	Initiation of MSc Thesis – Extended Literature Review – Problem selection and interrelation with existing techniques and methods	7,5
323-710200	Development and Application of experimental / theoretical framework – Methodological preparation – Problem identification and management Pilot application	15
CODE	**OPTIONAL COURSES***	**ECTS**
323-110100	Advanced topics in Cryptography and Security	7,5
323-110200	Information Law	7,5
323-110300	Information Systems Security Management	7,5
323-110400	Wireless and Mobile Networks Security	7,5
323-210100	e-Government II: Open and Collaborative Government	7,5
323-3003001	Semantic Web	7,5
323-310100	Data Mining in the Web	7,5
323-310401	Databases for Multidimensional Data and Web Applications	7,5
323-400201	Network, Green Technology and Next Generation Services Issues	7,5
323-410201	Pervasive Computing Systems	7,5
323-410300	Wireless Communication Networks	7,5
323-410401	Cloud Computing	7,5
323-410500	Embedded Systems	7,5
323-610100	Digital Services and Technologies	7,5
323-610200	Enterprise Resource Planning (ERP) Systems	7,5
323-610300	Business Intelligence and Big Data	2,5
323-610400	Digital Marketing	5
323-610500	Electronic Supply Chain	2,5
323-610700	Greek Interoperability Framework	7,5

* Students are expected to choose and successfully attend optional courses for the summation of 7,5 ECTS in total in this semester.

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-720100	Master Thesis Completion	15
323-720200	Scientific Paper Composition	15

5.3 Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

5.3.1 Research Methods

Principles of epistemology. Literature review and research questions formulation. Categories of research methodologies. Qualitative research methodologies: Case study, action research, ethnographic, etc. Collection and analysis of qualitative data. Quantitative research methodologies. Collection of quantitative data, design of questionnaires. Quantitative data analysis (descriptive statistics, correlation analysis, X^2 tests, t-tests, analysis of variance (ANOVA), regression). Organization of research projects. Writing research proposals, papers and dissertations.

Learning outcomes: Comprehension of research methodologies. Research projects planning and implementation skills development. Quantitative and qualitative research performing skills development. Scientific papers and thesis writing skills development.

5.3.2 Research Design and Development

Focusing on specific scientific and research fields, reflection on the research methods used. Basic principles and conditions analysis, in order to design and develop appropriate solutions.

Understanding of research methodologies. Skills to design and carry out research projects. Skills to perform qualitative and quantitative research. Skills for writing scientific articles and theses.

5.3.3 Computer and Communication Networks Security

See subsection 4.2.3.1

5.3.4 Cryptography

See subsection 4.2.3.2

5.3.5 Database Systems Security

See subsection 4.2.3.3

5.3.6 Future Internet Security and Privacy

See subsection 4.2.3.4

5.3.7 e-Government I: Services and Infrastructure

See subsection 4.3.3.1

5.3.8 Information Systems

See subsection 4.3.3.2

5.3.9 Combinatorial Optimization and Modern Financial Applications

See subsection 4.4.3.1

5.3.10 Machine Learning

See subsection 4.4.3.2

5.3.11 Semantic Web

See subsection 4.4.3.3

5.3.12 Distributed Systems and Web Services

See subsection 4.4.3.4

5.3.13 Mobile and Satellite Communications

See subsection 4.5.3.2

5.3.14 Digital Integrated Systems Design

See subsection 4.5.3.3

5.3.15 Design Development and Performance Evaluation of Computer Network

See subsection 4.5.3.4

5.3.16 Digital Business Management

See subsection 4.6.3.3

5.3.16 Innovation & Entrepreneurship

See subsection 4.6.3.4

5.3.17 Initiation of MSc Thesis – Extended Literature Review – Problem selection and interrelation with existing techniques and methods

Based on the selected scientific and research area, extended literature review. Selection of the problem(s) under study and interrelation with existing techniques and methods..

5.3.18 Development and Application of experimental / theoretical framework – Methodological preparation – Problem identification and management - Pilot application

Development and Application of experimental / theoretical framework. Methodological preparation. Problem identification and management. Pilot application.

5.3.19 Advanced topics in Cryptography and Security

See subsection 4.2.3.5

5.3.20 Information Law

See subsection 4.2.3.6

5.3.21 Information Systems Security Management

See subsection 4.2.3.7

5.3.22 Wireless and Mobile Networks Security

See subsection 4.2.3.8

5.3.23 e-Government II: Open and Collaborative Government

See subsection 4.3.3.6

5.3.24 Data Mining in the Web

See subsection 4.4.3.5

5.3.25 Image Processing and Robotic Vision

See subsection 4.4.3.6

5.3.26 Databases for Multidimensional Data and Web Applications

See subsection 4.4.3.7

5.3.27 Network, Green Technology and Next Generation Services Issues

See subsection 4.5.3.5

5.3.28 Pervasive Computing Systems

See subsection 4.5.3.8

5.3.29 Wireless Communication Networks

See subsection 4.5.3.6

5.3.30 Cloud Computing

See subsection 4.5.3.7

5.3.31 Embedded Systems

See subsection 4.5.3.9

5.3.32 Digital Services and Technologies

See subsection 4.6.3.5

5.3.33 Enterprise Resource Planning (ERP) Systems

See subsection 4.6.3.6

5.3.34 Business Intelligence and Big Data

See subsection 4.6.3.9

5.3.35 Digital Marketing

See subsection 4.6.3.10

5.3.36 Electronic Supply Chain

See subsection 4.6.3.11

5.3.37 Greek Interoperability Framework

See subsection 4.3.3.7

5.3.38 Internet Economics

See subsection 4.6.3.12

5.4 Research Activities

The Postgraduate Program "Research in Information and Communication Systems" is supported by the Department faculty, the research activities of whom fall within the research activities of the respective laboratories, as being presented in sections 4.2.4, 4.3.4, 4.4.4, 4.5.4 and 4.6.4.

5.5 Honors – Graduates' Impressions

The program was offered for the first time in the academic year 2015-2016.

6 Master's Degree Program (MSc) in "Teaching Information and Communication Technologies"

6.1 Scope and Objectives

The **objective** of the Postgraduate Program is **research in teaching of Information and Communications Technologies in primary and secondary education and the acquisition of knowledge for professional engagement in education**.

The program **aims** at the **specialization of graduate students**, coming from the disciplines of Informatics, Communication and Education, and their postgraduate education in addressing research issues and all the individual items that make up the scientific area of Teaching of Informatics and Communications. Students will also get knowledge and experience in designing appropriate teaching interventions for the learning of Informatics and Communications in primary and secondary education.

6.2   Courses per Semester

The titles as well as the distribution of the courses per semester for this Stream are the following:

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-800100	Modern learning theories in Education on Computing and Communication Systems	7,5
323-800200	Research methods in Education	7,5
323-800300	Current trends in Computing & Communication Systems I	7,5
323-800400	Teaching and learning Computing & Communication Systems using Technology	7,5

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-810100	Collaborative learning and critical thinking in Education on Computing and Communication Systems	7,5
323-810200	Computing and Communication Systems Curriculla & Practice in Primary and Secondary Education	7,5
323-810300	Modern teaching approaches in Education on Computing and Communication Systems	7,5
323-810400	Current trends in Computing and Communication Systems II	7,5

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-000000	**M.Sc. Thesis**	**30**

6.3   Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

6.3.1 Modern learning theories in Education on Computing and Communication Systems

Instructional design for F2F and Distance Learning, Traditional & Modern Theories & Methods of learning and applications in Computing & Communications, Computational thinking and Didactics of Computing and Communications, Core Cognitive Skills, Student & Teacher roles in F2F and Distance Learning, Educational Games, Affective Learning, e-Assessment.

To help students to be able to: (a) know what "computational thinking is", traditional and modern learning theories and methods applied to ICT, about learning activities and how to design them, which tools are often used in ICT, about the State-of-the-art in ICT didactics, and the role of motivation and affect in learning, (b) understand differences between traditional and modern theories and methods, their impact on course design in real educational scenarios and student and teacher role in an ICT class and lab, in F2F and distance learning, and (c) apply ICT scripts in real educational settings applying modern learning theories and methods.

6.3.2 Research methods in Education

The course content provides an overview of educational research, its philosophical and ethical issues and the different components and methods in educational research including methods of data collection and analysis. It is presented in five units over thirteen weeks. In these units a range of issues will be discussed. The Units are: 1) The context of educational research. 2) Ethics and Planning educational research. 3) Research Methods (quantitative and qualitative, as well as mixed methods and action research. 4 Strategies for Data Collection. 5 Strategies for data analysis.

The aim of the course is the students to acquire knowledge and skills related to research methodology in education, focusing on quantitative, qualitative and mixed methods research, through the analysis of relevant examples from published researches and designing researches in areas of their interest. In particular they should be able to: a) Discover the characteristics of a good educational research. b) Understand the differences between quantitative and qualitative research, mixed research methods and action research. c) Familiarize themselves in designing an educational research through the study of specific examples in their areas of interest. d) Develop and evaluate research questions. e) Identify

appropriate research methodology for specific research questions (specific research issues). f) Work out in data collection and analysis. g) Explore ethical issues associated with conducting an educational research.

6.3.3 Current trends in Computing & Communication Systems I

History of Information Technology – Information Technologies and Communication (applications) – Multimedia – Encryption – Data Security – Network Security – Malware – Privacy-Copyrights – Computer Programming – Internet (technologies, security, web, etc.) – Software Categories

Acquaintance with modern fields of Information & Communication. Acquaintance with modern research topics. Elaboration of a research project. Presentation of research.

6.3.4 Teaching and learning Computing & Communication Systems using Technology

Visual educational programming environments (Scratch, Code Studio, etc.). Microcosms for teaching/learning object oriented programming (BlueJ, Alice, etc.). Application development for mobile devices (App inventor). Teaching and learning of programming through game development. Computational and mathematical problem solving with educational environments based on functional programming (Bootstrap/Racket). Educational robotics. Educational simulations for teaching Computing and Communication Systems. Environments and methodologies from recent research.

Using modern environments for the support of teaching and learning of Information and Communication Technologies (ICT). Being informed about the related literature. Learning basic methodologies in teaching and learning of ICT and their relation with modern learning environments.

6.3.5 Collaborative learning and critical thinking in Education on Computing and Communication Systems

Critical thinking skills in teaching and learning of Computing and communications. Problem solving in teaching and learning Computer Science and Communications. Collaborative learning in Computer Science education. Advantages and disadvantages of collaborative learning. Collaborative learning patterns and collaborative communication structures for learning Computing.

To help students to be able to: (a) know what Collaborative Learning is and its components, the basic principles of Collaborative Learning, about Digital Communities of practice and learning, what Computer Supported Collaborative Learning (CSCL) is, which collaborative learning strategies can be supported by ICT and about the state-of-the-art in the field of CSCL, (b) understand student and teacher roles in a Collaborative Learning Environment, CSCL management, learning communities rules, where, when and how to apply a CSCL model, the advantages and disadvantages of Collaborative Learning, the advantages and disadvantages of CSCL and the importance of e-assessment in CSCL, and (c) apply a collaborative learning strategy, a CSCL strategy and e-assessment of CSCL activities.

6.3.6 Computing and Communication Systems Curriculla & Practice in Primary and Secondary Education

Computer Science as a Core Discipline – Terminology –Organization of the Learning Outcomes – Levels - Strands – Computational Thinking – Collaboration – Computing Practice and Programming – Computer and Communications Devices – Community, Global, and Ethical Impacts – Comprehensive Computer Science Standards for K–12 – Computer Science in the Modern World – Computer Science Principles – Implementation Challenges – Practice – Evaluation.

The course aims to enable students to: a) Plan effective learning situations to apply modern learning / teaching methods and utilizing the ICT concepts and IT skills. b) Prepare, implement and evaluate learning plans. c) Plan, implement and evaluate learning activities. d) Plan and evaluate learning plans for primary and secondary education.

6.3.7 Modern teaching approaches in Education on Computing and Communication Systems

The course concerns the theoretical and applied education on modern pedagogical models and the corresponding, ICT enhanced, learning and teaching methods in the context of Computer Science and ICT Education. The students will be familiarized to the learning/teaching methods in order to be able to apply them for the design and development of effective learning situations, activities, educational material according to Computer Science Didactics for Computer Science concepts and skills. The pedagogical models and methods include more conventional ones (e.g. lectures, demonstrations, workshops, discussion, and case study) as well as modern learning/teaching approaches (e.g. learning by design, learning by construction, collaborative learning, creative learning/teaching, learning by modeling, apprenticeship learning, studio learning, digital games based learning, mobile learning, learning by research, problem and project based learning, simulation, scenario based learning, e-learning, learning in communities of practice, situated and anchored learning, story based learning, experiential learning, inquiry learning etc.)

The learning/teaching methods are studied in the context of applied educational and learning design in the case of Computer Science and ICT Education as well as interdisciplinary, and transdisciplinary. The students are prepared also to be able to participate in the research community which studies the cyclic relation of the pedagogical models/methods, the ICT and Computer Science Education. The students are expected to develop the competence to: a) Design effective learning situations, interventions, activities, scenarios, material and software, for Computer Science – ICT concepts and skills, applying modern learning approaches/instructional methods and taking advantage of ICT for learning. b) Elaborate, develop, apply and evaluate research projects for the experimental validation of their learning designs. c) Elaborate, develop, apply and evaluate, learning activities, units/modules, courses, curriculums, and professional development/training programs for computer science and ICT according to the principles of modern learning design. d) Design and assess learning designs for ICT enhanced interdisciplinary or trans-disciplinary learning. e) Utilize special educational digital environments (e.g. e-toys, scratch, greenfoot, agentsheets, StarLogo, google docs, educational robotics) for the deployment of learning interventions using modern pedagogy. f) Develop, orchestrate and implement learning scenarios using learning design environments (e.g. CSCL Scripts, LAMS). g) Get familiar to the computer science education research community information resources such as journals, conferences, associations, and online communities.

6.3.8 Current trends in Computing and Communication Systems II

Robotics Principles – Robot Categories – Simulators – Electronics Basics – Sensors – Motors – Microcontrollers – Introduction to Arduino – Programming – Applications – Robotics Competitions

Acquaintance with Robotics. Acquaintance with Arduino. Elaboration of a research project. Presentation of research.

6.4 Research Activities

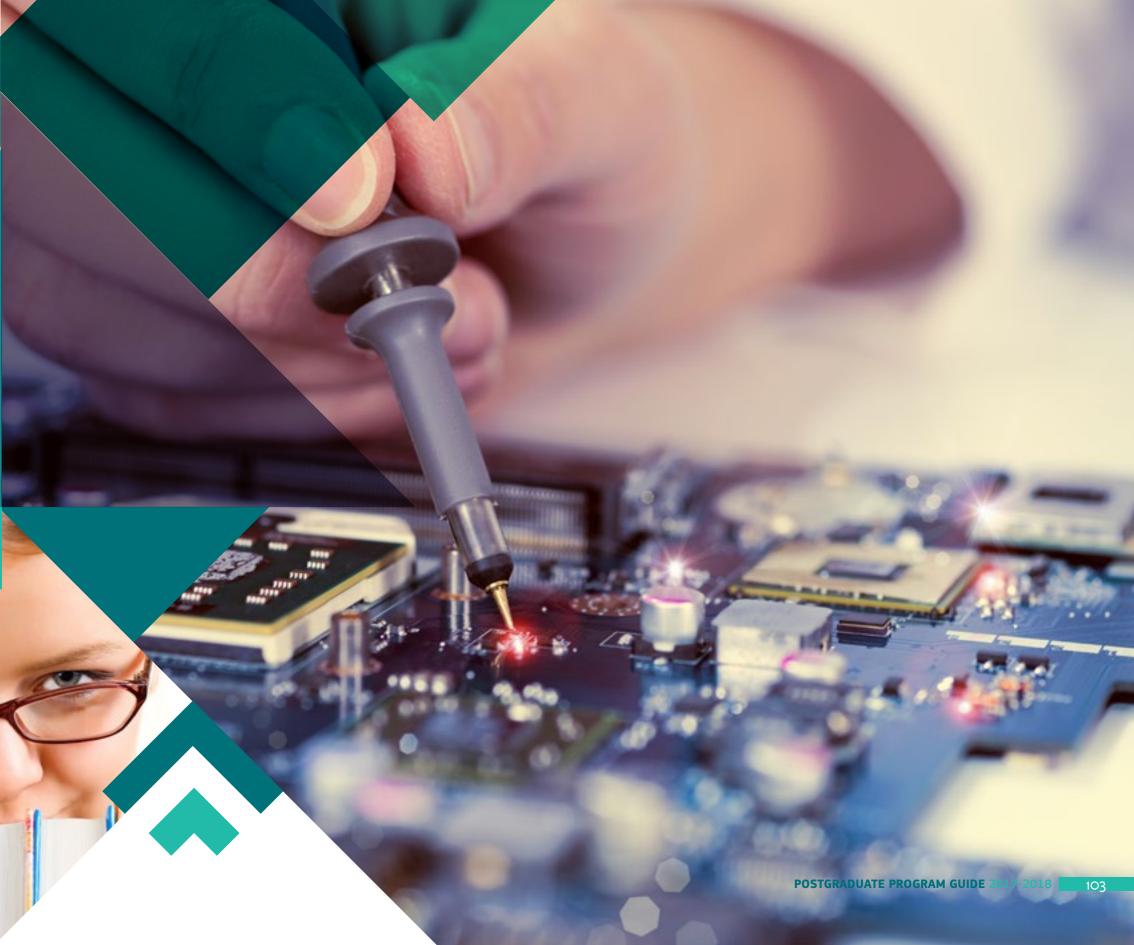The Postgraduate Program "Teaching Information and Communication Technologies" is supported by the Department faculty, the faculty of University of the Aegean and other Greek and International Universities, the research activities of whom fall within the objectives of the program.

6.5 Honors – Graduates' Impressions

The program was offered for the first time in the academic year 2015-2016.

7 Master's Degree Program (MSc) in "Information and Communication Systems"

7.1 Scope and Objectives
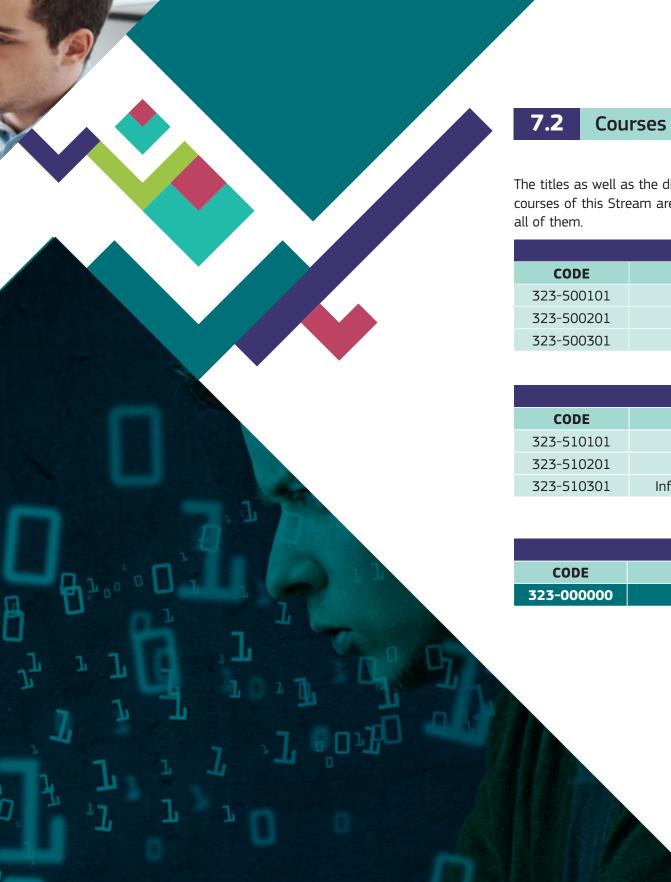
The **aim** of the MSc program is the **promotion of the Science of Information and Communication Systems** and in particular the principles of the analysis, design, implementation and management of an Information and Communication System keeping up with high standards and demanding requirements.

The program **targets** University and Technical Education Institute graduates with the exception of Computer Science and Engineering graduates, for obtaining horizontal knowledge in the area of Information and Communication Technologies.

The design of the curriculum of the program has taken into account international curriculum standards and covers all the core subjects in Information and Communication Systems, ensuring the quality of the courses. In addition, this curriculum addresses modern research topics in the cognitive area of Information and Communication Systems for the acquisition of new scientific knowledge. The curriculum is regularly updated and evolving constantly, following the dynamics of the field, so that the studies offered are always modern, dynamic and competitive in nature.

In short, the "Information and Communication Systems" program **provides theoretical knowledge and practical training** at a high level along with all the tools necessary to develop in the students scientific expertise in the most recent advances in technology, enabling them to sharpen their individual skills and to pursue a dynamic career in the constantly forward-moving field of Science of Informatics and Communications.

7.2   Courses per Semester

The titles as well as the distribution of the courses per semester are presented below. All courses of this Stream are compulsory and students are expected to successfully attend all of them.

1st SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-500101	Information Systems	10
323-500201	Networks and Communication Technologies	10
323-500301	Software Technologies	10

2nd SEMESTER		
CODE	**COMPULSORY COURSES**	**ECTS**
323-510101	Data Structures and Databases	10
323-510201	Intelligent Systems	10
323-510301	Information and Communication Systems Security	10

3rd SEMESTER		
CODE	**TITLE**	**ECTS**
323-000000	**M.Sc. Thesis**	**30**

7.3　Courses Syllabus and Learning Outcomes

For each course, syllabus is shown first and learning outcomes follow.

7.3.1 Information Systems

Introduction – Role and Types of Information Systems in Modern Enterprises. The Lifecycle of Information Systems. Information Systems Analysis and Design Techniques. Integrated Enterprise Resource Planning (ERP). Information Technologies Project Management. Business Process Improvement and Organizational Change. Introduction to Electronic Entrepreneurship. Electronic Commerce. Electronic Communication and Promotion. Development of New Technologies Business Plans.

The aim of this course is the acquisition of knowledge and skills regarding the exploitation of information and communication technologies in the context of modern enterprises, in order to support both their internal operations and also their communications and transactions with the external environment. The student will comprehend the structure and the capabilities of various types of information systems being used in modern enterprises. The student will also learn information system design and implementation methodologies, what project management is and how business plans are developed.

7.3.2 Networks and Communication Technologies

Telecommunication system model, basic principles of analog and digital transmission and reception, interference, noise and capacity, transmission media, mobile radiosystems components (cells categories and communication channels, cellular systems functionalities). Modern and next generation mobile networks. Introduction to computer communications, Network architecture and protocols. Network design. The OSI and TCP/IP reference model. Principles of data transfer. The family of IEEE 802 for local networks. Design and analysis of data link layer. Networking devices (switches, routers, etc.). TCP/IP model and platforms, addressing and routing protocols. Client-server model and peer-to-peer networks. Configuration protocols DHCP, BOOTP. Distributed naming system (DNS). File transfer: FTP, TFTP, NFS. Electronic mail: MIME, SMTP, mail gateways, POP, IMAP. TCP, UDP and real-time transfer protocols. Protocols for QoS at the network (RSVP, diffserv).

The aim of this course is to study basic issues of communications networks and Internet technologies. The student will understand the modules of the physical layer, the data link level and sub-level access control of modern communication systems, as well as basic network elements and data transfer. Upon the successful completion of this course, students will gain introductory knowledge and skills in communication systems and network

technologies and the Internet and will be able to explain the limitations of wireless and local access and whether these restrictions will affect the performance of networks and the internet.

7.3.3 Software Technologies

Introduction to algorithms. Introduction to computer programming. C programming and basic notions. Introduction to object-oriented technology. Introduction to UML. Object-oriented development methodologies. Software life cycle models. Flexible Software Development Methodologies.

Developing programs in C language. Algorithm design and analysis. Basic principles of object-oriented technology. Object-oriented analysis and design. Overview of UML. CASE tools. Object-oriented development methodologies. Software development models and information systems design issues.

7.3.4 Data Structures and Databases

Basic concepts of data structures. Arrays, lists, heaps, stacks and tails. Search and sort, hashing, trees, binary trees. Primary file organizations and indexing methods for data files. B-trees. Basic concepts and architecture of database systems. The entity-relationship and the relational model. Relational database design by entity-relationship to relational model mapping. Integrity constraints and database update operations. Database languages: relational algebra, the QBE query language, the SQL language. Database management systems. Advanced topics: data security and privacy protection, search engines, big data management, applications of database technology in the field of Geographic Information Systems.

The aim of the course is to provide the means so that the student can achieve the following: comprehend basic principles of the scientific fields of data structures and data bases, describe basic data structures and comprehend their use and implementation, comprehend data base design principles through conceptual and logical modelling, learn data base query languages and develop relational databases by using appropriate tools.

7.3.5 Intelligent Systems

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

Bayesian methods and instance-based learning, Ensemble methods. Unsupervised learning. Applications.

Learning intelligent algorithms for solving problems. Familiarization with techniques and tools of mechanic learning.

7.3.6 Information and Communication Systems Security

Conceptual foundations of information systems security. Applied Cryptography. Fundamental cryptographic algorithms. Digital Signatures and Certificates. Public Key Infrastructure. Risk Analysis and Assessment. Security Policies. Identification and Authentication. Access Control. Operating Systems security. Malware. Network Security. Internet Security. International Security Standards. Foundations of Information Privacy. Privacy Enhancing Technologies.

Learning of security concepts and technologies. Ability of risk analysis and composition of policies and technologies in the context of an integrated IS security plan.

7.4   Research Activities

The Postgraduate Stream "Information and Communication Systems" is supported by faculty members of the Department of Information and Communication Systems Engineering whose research activities are conducted in the research laboratories that were presented in sections 4.2.4, 4.3.4, 4.4.4, 4.5.4 and 4.6.4.

7.5 Honors – Graduates' Impressions

Evangelia Drakou *(M.Sc.)*
Current occupation: National Social Security Entity, former Self-Employed Workers' Insurance Organization
Basic qualification: Greek Civilization, Hellenic Open University

The ever-increasing demands in the workplace and the increasing use of Information and Communication Systems in the Public Sector, have prompted me to seek a postgraduate program that would allow me to be further specialized and scientifically trained, especially in the applications of Information Technology.
The choice of the MSc program "Information and Communication Systems", University of the Aegean, proved the most appropriate choice because, while my undergraduate studies were not relevant to this MSc, it nevertheless offered me an important knowledge base, so as to cope with the demands of the endlessly evolving technological applications.

The wide range of thematic modules, the right teaching and the high level of the teaching staff constitute the key for the completion of the studies and the acquisition of skills. Of course, intensive personal effort is required with much reading, as well as research into the existing literature, to understand this infinitely innovative science. However, the experience gained daily in the workplace, as well as the collaborative way of thinking with the knowledge gained through the development of individual and group work in the MSc, contribute decisively to the evolution of my professional career.

Aris Anastasiadis *(M.Sc.)*

Current occupation: Officer of the Armed Forces

Basic qualification: Graduate of Hellenic Army Academy

By finishing my undergraduate studies at the Hellenic Army Academy in 2006 and understanding the direct relationship between IT and information systems in terms of collection, acquisition, transmission, exploitation and sharing of the information required in a modern information environment, I decided to take the opportunity to gain knowledge. Since it was not necessary to have an undergraduate degree in computer science, I decided to move on to the specific MSc program, so that I could gain the necessary knowledge to upgrade my career in a field where I would be needed.

The initial hesitation and awe of the big argument of entering another high school graduate into the demanding area of engineering of information systems, was replaced by a sense of efficiency and reward for the efforts invested in this purpose.

Both the teaching and the administrative staff of the university contributed to the creation of a familiar environment, targeting the creativeness of the students. The extensive research in all the scientifically taught subjects provided me with all the necessary knowledge for the successful cooperation and response to all the issues that require specialized knowledge about IT and information systems in general. Also, the acknowledgement of the specific science domain has helped me to recognize the knowledge and the moral attribution provided from my domain. I believe that this might have been my smartest professional choice.

Chryssanthi Papamichail *(M.Sc.)*

Current occupation: IT Consultant in European Dynamics SA

Basic qualification: Philology

As an IT practitioner, the completion of the «Information and Communication Systems» MSc program gave me the basics I needed to improve and further develop in my workplace through the familiarity gained in regard with the sophisticated technology tools and modern software analysis and development methods. At the same time, I also gained broader knowledge in the field of Informatics, as a natural result of the academic level of the teachers, but also of their professional experience. In conclusion, I consider this postgraduate program ideal for someone whose undergraduate studies are not in Informatics and who already works or wants to work in technology, and who is of course interested in this discipline.

8 Supporting Services

8.1 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
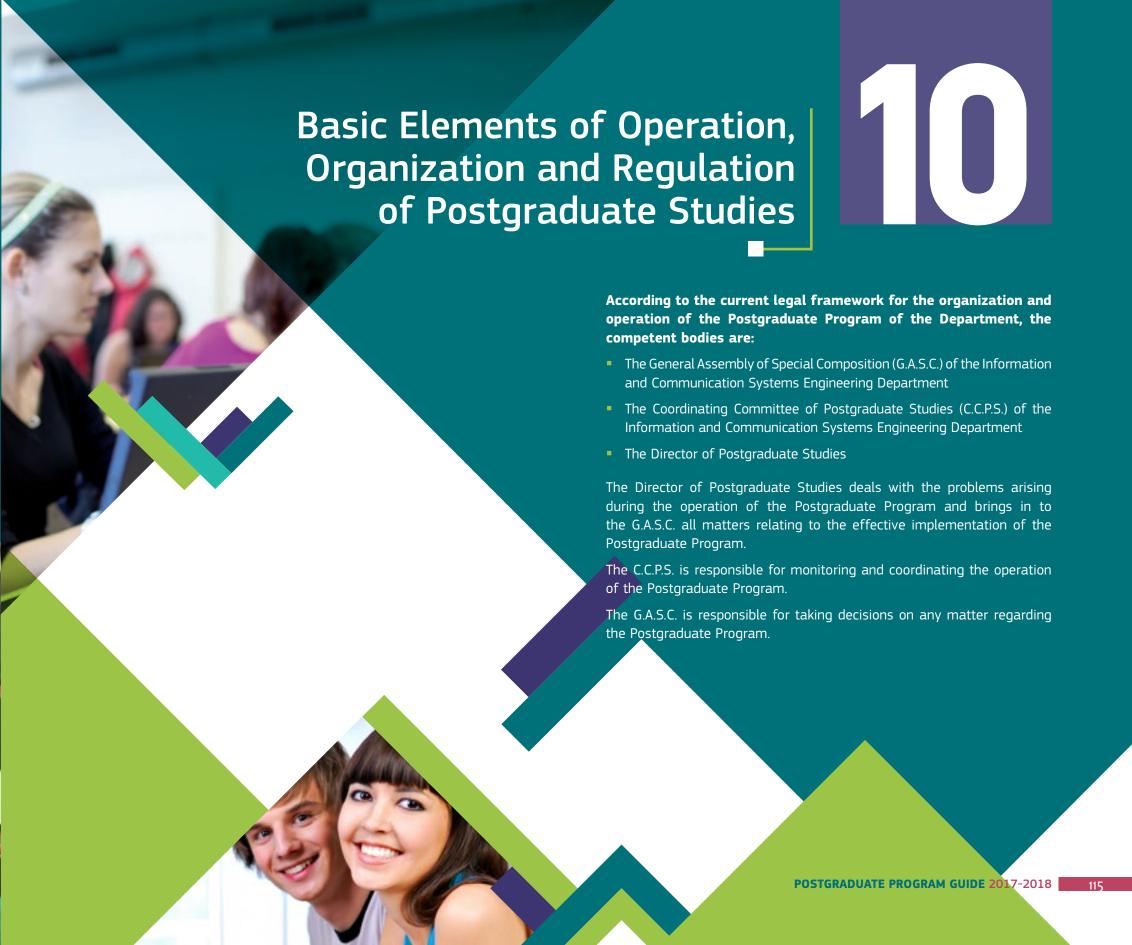
8.2 Computing Center and Laboratories

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, DORYSSA and ARTEMIS), which have modern computer systems, software products and hardware instruments, for supporting the teaching and research needs the Department. Additionally, in Emporiki building, there is a fully equipped teleconference room.

9 Postgraduate Student Services

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

❱ Full medical and hospital care, which includes medical, hospital and clinical examinations and pharmaceutical care.

❱ Free meals and accommodation, under the condition that, according to the law and the internal regulation of the University of the Aegean, specific requirements relating to financial and family situation are met.

❱ Scholarships and loans, in accordance with the law and the internal regulation of the University.

❱ Discount tickets for public transport, including ferry, under certain conditions. The discount is interrupted throughout periods of possible suspension of study, military service or loss of student status.

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

Basic Elements of Operation, Organization and Regulation of Postgraduate Studies

10

According to the current legal framework for the organization and operation of the Postgraduate Program of the Department, the competent bodies are:

- The General Assembly of Special Composition (G.A.S.C.) of the Information and Communication Systems Engineering Department

- The Coordinating Committee of Postgraduate Studies (C.C.P.S.) of the Information and Communication Systems Engineering Department

- The Director of Postgraduate Studies

The Director of Postgraduate Studies deals with the problems arising during the operation of the Postgraduate Program and brings in to the G.A.S.C. all matters relating to the effective implementation of the Postgraduate Program.

The C.C.P.S. is responsible for monitoring and coordinating the operation of the Postgraduate Program.

The G.A.S.C. is responsible for taking decisions on any matter regarding the Postgraduate Program.

Duration of Study

The **duration of study for obtaining the Master's Degree** (M.Sc.) is **three** (3) **full-time semesters**, two of which are teaching semesters and include attending courses, laboratories, seminars and any other educational or research activity of the Master's Program, and the third is dedicated to the preparation of the M.Sc. Thesis.

The teaching hours per week for each course are three (3). In addition to these hours and in order to meet the needs of possible laboratories, seminars, practical exercises, etc., extra hours can be added by a decision of the G.A.S.C.

Teaching, Studying, Exams

1. The start and end of the courses of each Master's Program are defined according to the annual academic calendar of the University of the Aegean, which is included in the final pages of this guide.

2. Each teaching semester comprises thirteen (13) full-time weeks of teaching. Exams are taken twice a year in February and June. In case a course is taught less than twelve weeks or thirty six hours of teaching, laboratories, practical exercises, etc. in total, the course is considered not to have been adequately taught and postgraduate students have to attend this course in a following semester.

3. The Master's Program uses standard education methods that could combine: a) courses, with obligatory attendance and b) standard (electronic) distance learning methodologies. Course attendance provides the ground for discussing theoretical problems, clarifying concepts, promoting creative thinking and collaborative learning and evaluating part of the curriculum courses. The use of e-learning tools, on the other hand, ensures continuous participation of the students in the learning process, synchronous and asynchronous communication between tutors and students, as well as between students themselves, access to the educational material and literature and thorough student evaluation.

4. The attendance of the educational (lectures) and other activities of the Master's Program is mandatory for the postgraduate students. The instructor of each course determines the fulfillment of this requirement.

5. The method of evaluation of the postgraduate students' progress in each course may include written examination, oral examination, preparation and presentation of project(s), another method or combination of methods at the discretion of the instructor. Written examinations take place at the end of each semester, according to the annual academic calendar of the University of the Aegean.

6. Each postgraduate student can be examined only once in each course. If a student fails the examination in one or more courses, then the possibility of repeating the examination, as well as the details of such an examination, are determined by a decision of the G.A.S.C., upon a reasoned request.

7. Teaching language is Greek, whereas the educational material and literature can be in Greek or/and in English language. Towards internationalization of the Master's Program education (e.g., invitation of foreign tutors) part of the courses could be taught in the English language by a decision of the G.A.S.C.

8. A postgraduate student must accumulate 60 credit units (ECTS) worth of courses, laboratory exercises and seminars, as well as 30 credit units (ECTS) worth of Master Thesis in order to earn the Master's Degree (M.Sc.).

9. The working effort required by a postgraduate student in order to earn the Master's Degree (M.Sc.) is estimated in two thousands and four hundred (2400) hours corresponding to the minimum number of thirty nine (39) complete weeks of teaching, attendance in all kinds of educational and research activities of the program, preparation and examinations, excluding student holidays. In more detail, the working effort required by a postgraduate student for each course of the Master's Degree Program is two hundred (200) hours, whereas for the fulfillment of Master thesis eight hundred (800) hours are required. In total, the winter semester requires 800 hours of working effort, the spring semester 800 hours of working effort and the fulfillment of Master thesis 800 hours of working effort.

M.Sc. Thesis

The cognitive area and the exact topic of the M.Sc. Thesis can be set after the end of the second semester of study, after consulting with a supervisor. For each postgraduate student, a faculty member is appointed as a supervisor by the G.A.S.C., after a proposal of the C.C.P.S. The supervisor has the scientific responsibility of the preparation of the M.Sc. Thesis and is appointed when the choice of the subject is made. Researchers at recognized research institutions, who hold a Ph.D., or other faculty members, may be appointed as co-supervisors of the postgraduate student. For the examination of the Master's Thesis, a three-member committee is appointed by the G.A.S.C. of the Department, comprising the supervisor and two (2) other faculty members or researchers of grades A, B and C, who hold a Doctoral Degree. The examining committee members must have the same or a related scientific specialty to the subject of the Master's Program.

The title of the M.Sc. Thesis and the appointment of supervisor(s) are decided by the G.A.S.C., upon recommendation of C.C.P.S. at the end of the second semester of study. The M.Sc. Thesis

is submitted to the three-member examining committee appointed by the decision of the G.A.S.C.

The M.Sc. Thesis defense is done in front of an audience at a date and time designated by the supervisor, during the examination period of the winter semester of each year. After M.Sc. Thesis defense, the committee evaluates and grades the thesis.

The three-member examining committee may refer back the M.Sc. Thesis for corrections, for a period of up to one (1) month. The Examining Committee Report shall be signed by all members present during M.Sc. Thesis defense, while a separate document with the signatures of all committee members who vote positively (i.e., that the candidate has passed) should be also included in the original text of the M.Sc. Thesis.

Completion of Study

A postgraduate student is considered to have fulfilled their obligations if they have completed at least three (3) semesters of study, have attended and been examined successfully in all courses, laboratory and practical exercises included in the Master's Program, and their M.Sc. Thesis has been approved by the examining committee, according to the regulation of postgraduate studies. Additionally, the postgraduate student must have been successfully examined in all preparatory undergraduate courses that may have been set by the G.A.S.C., and they should have provided sufficient and consistent supportive work as a teaching assistant (see *Other Obligations* section).

During the first two semesters of study, postgraduate students attend the courses and any other educational and research activities included in the Master's Program. At the end of the second semester, and after having successfully been examined in all courses of the first two semesters, a postgraduate student may apply for starting preparing their M.Sc. Thesis.

Calculation of the M.Sc. Degree Grade

Postgraduate students, who have successfully fulfilled their obligations, receive the M.Sc. Degree, the final grade of which is calculated as follows::

- M.Sc. Thesis: weight factor: 30%
- Compulsory and Optional courses: weight factor: 70% (on average score)

Suspension of Study

1. Each postgraduate student has the right to request a suspension of attending the courses of

a Master's Program or of the preparation of their M.Sc. Thesis. The permission is granted by a decision of the G.A.S.C., can be given only once and cannot be longer than two semesters or shorter than one semester. Suspension permission for more than two semesters may be granted only in cases of prolonged health problems or significant personal reasons.

2. During the suspension of study, the student status is lost as well as all relevant rights of the postgraduate student. The student status is recovered after the expiry of the suspension.

3. Postgraduate students, who continue their studies after suspension, are expected to attend all courses and any other academic activities, in which they had not been succeeded before the suspension of the study.

Other Obligations

Instead of tuition fees, postgraduate students are obliged to serve, for two semesters, as teaching assistants in the labs or the review-problem sessions of the courses of the undergraduate program of the Department, for eight (8) hours per week.

The consistency and adequacy of this supportive work is decided by the G.A.S.C., upon recommendation of the instructors of the corresponding courses of the undergraduate program, and is necessary and obligatory for all the postgraduate students so as to obtain the M.Sc. degree.

These provisions are further specified in the Regulation of Postgraduate Studies of the Department of Information and Communication Systems Engineering, which is available on the website: ***http://msc.icsd.aegean.gr/***.

11 Academic Calendar

WINTER SEMESTER 2017 – 2018

Beginning of courses:	02.10.2017
End of courses:	12.01.2018
Semester duration::	13 weeks
Examination period:	From 15.01.2018 to 09.02.2018

Holidays:

National Holiday:	Saturday 28.10.2017
Polytechnion Anniversary:	Friday 17.11.2017
Christmas Holidays:	23.12.2017 – 07.01.2018
Religious Holiday (Trion Ierarhon):	Tuesday 30.01.2018

SPRING SEMESTER 2017 – 2018

Beginning of courses:	12.02.2018
End of courses:	25.05.2018
Semester duration:	13 weeks
Examination period:	From 29.05.2018 to 22.06.2018

Holidays:

Monday, the 1st of Lent:	Monday 19.02.2018
National Holiday:	Sunday 25.03.2018
Easter Holidays:	02.04.2018 – 15.04.2018
First of May Holiday:	Tuesday 01.05.2018
Religious Holiday (Holy Spirit):	Monday 28.05.2018
Students' elections:	Exact date to be announced

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