Master of Science in INTELLIGENT CRITICAL INFRASTRUCTURE SYSTEMS

PROSPECTUS






University of Cyprus
Department of Electrical and Computer Engineering

KOIOS Research and Innovation Center of Excellence

Imperial College London

CONTENTS

WELCOME MESSAGE

Dear Prospective Student,

It is with great pleasure that we introduce you to the MSc program in Intelligent Critical Infrastructure Systems.

The program is offered by the Department of Electrical and Computer Engineering of the University of Cyprus, in collaboration with the KIOS Research and Innovation Center of Excellence and Imperial College London.

Critical infrastructures, such as electric power systems, water distribution networks, telecommunication networks and transportation systems are essential for the maintenance of vital societal functions. The program considers an integrated engineering approach for the intelligent and efficient monitoring, control, management and security of these systems using innovative methods and tools emerging from the latest developments in the area of Information and Communication Technologies. This represents a point of novelty and uniqueness for the program, especially in the European arena.

This MSc program is characterized by multidisciplinarity and strong relevance to timely research activities and the related industry. The coursework provides a blend of the necessary theory, tools, applications, transferable skills and practical/research experience, in a holistic approach which provides students with knowledge, skills, competencies and experiences relevant to the topic of the program. Particular emphasis is placed on the integration of realistic use cases throughout the various elements of the program, which enable to better illustrate the various concepts and provide students with realistic examples on how to model, simulate, monitor, control, manage and optimize such systems.

Courses in this program have been designed and are delivered by world-class expert academic faculty from both University of Cyprus and Imperial College London, with significant international research reputation in the topic of Intelligent Critical Infrastructure Systems.

It is also worth noting that the program takes advantage of the state-of-the-art building facilities at the University of Cyprus campus, with excellent classrooms and teaching equipment, an outstanding library and modern laboratories, offering an inspiring learning environment.

We warmly welcome you to explore this publication and learn more about the program. If you require more detailed information, you can visit our website www.msccis.ucy.ac.cy or contact us directly.

Maria K. Michael

Program Coordinator
Associate Professor
Department of Electrical and Computer Engineering
University of Cyprus

PROGRAM COLLABORATING INSTITUTIONS

The MSc program in Intelligent Critical Infrastructure Systems is offered by the Department of Electrical and Computer Engineering at the University of Cyprus in collaboration with the UCY KIOS Research and Innovation Center of Excellence and Imperial College London, both international leaders in research and innovation activities in the topics of this MSc program.
Courses in this program have been designed and are delivered by world-class expert academics from both institutions, with significant international research reputation on Intelligent Critical Infrastructure Systems, and in particular on subjects related to the monitoring, control, management and security of these systems.

ECE DEPARTMENT – UNIVERSITY OF CYPRUS

The Department of Electrical and Computer Engineering (ECE) at the University of Cyprus was established in 2003 and is one of the four Departments in the UCY School of Engineering. In a relatively short period of time it has managed to establish high quality research, teaching and outreach activities. The Department provides high quality degree programs at both the undergraduate and graduate levels (BSc, MSc/MEng, PhD). These programs emphasize fundamental principles that prepare students for leadership roles in a challenging and rapidly changing technological world. Research and innovation is achieved in an environment that fosters cooperation between faculty, students, industry, and research organizations.

As of Fall 2018, the ECE Department consists of 18 fulltime academic staff, 308 undergraduate and 96 postgraduate students, at the Master's and PhD levels. Members of the academic staff are currently involved in a large number of externally funded research projects (from EU and local/international industry). According to the 2018 Academic Ranking of World Universities (aka Shanghai Ranking), the Department is ranked in the range of 201-300 among similar departments around the world. It is ranked second among Greek-language departments in Electrical and Computer Engineering. Given the Department's relatively recent establishment and short life, this makes it one of the youngest departments in the top 300 world-wide.

KIOS CENTRE OF EXCELLENCE - UNIVERSITY OF CYPRUS

The KIOS Research Center of the University of Cyprus was established in 2008. It was subsequently upgraded into a Research and Innovation Center of Excellence (KIOS CoE) in 2017 under the EU's strategic program "Spreading Excellence and Widening Participation – Teaming". Currently, it is the largest research and innovation center in Cyprus on Information and Communication Technologies (ICT) with an emphasis on monitoring, control, management and security of critical infrastructures such as electric power systems, water distribution networks, telecommunication networks, and transportation systems.

The goal of the Center is to conduct outstanding interdisciplinary research and innovation and produce new knowledge and tools that can be applied to solve real-life problems. Towards this goal, the Center undertakes numerous education and training activities in its scientific topics of interest, one of which relates to the support of this MSc program. The Center collaborates with an extended network of national and international academic, industrial, and governmental organizations to assure that its research has maximal applicability and impact.

IMPERIAL COLLEGE LONDON

Consistently rated amongst the world's best universities, Imperial College London (ICL) is a science-based institution with a reputation for excellence in research and education. ICL provides multidisciplinary space for education, research, translation and commercialization, harnessing science and innovation to tackle the world's biggest technological challenges. World-renowned academics from Imperial's Department of Electrical and Electronic Engineering and the Institution for Security Science and Technology are involved in the MSc program, leveraging from close and long-lasting collaboration between academics and researchers from UCY and ICL.

Imperial's Department of Electrical and Electronic Engineering delivers high-quality teaching and conducts internationally leading research across a wide range of topics targeting both fundamental advances and practical applications of science and technology. The quality and impact of its research are demonstrated by its many highly cited publications, the personal recognition of its researchers through awards and honours, and the commercial adoption of its results and innovations. The Institution for Security Science and Technology is ICL's hub for security research and is one of the Global Challenge Institutes of the University. Its mission is to coordinate interdisciplinary and trans-disciplinary research in security across ICL and to act as a security science, technology and innovation interface for academia, government and industry.

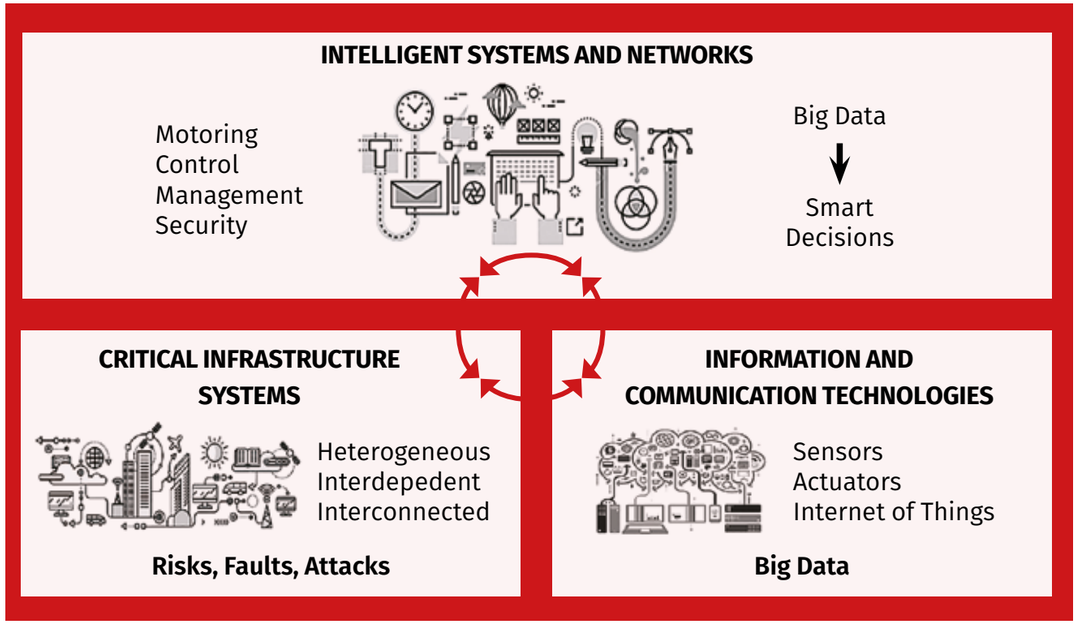
GENERAL OVERVIEW

Critical infrastructures are assets or systems, which are essential for the maintenance of vital societal functions. The principal examples are electric power systems, water distribution networks, telecommunication networks, and transportation systems. Without these, other basic infrastructures (e.g., banking, hospitals, schools, tourism, etc.) cannot operate as intended. Critical infrastructures provide the foundation on which communities are built and, when properly functioning, they enable economic growth and social well-being.

As urbanization increases, critical infrastructures worldwide are expanding and are becoming more complex, necessitating greater efficiency and improved capabilities in order to sustain their effective operation. Equipment failures are also occurring more frequently as large segments and components of critical infrastructures become old and outdated. Such failures may lead to serious degradation in performance or, even worse, to cascading overall system failure and breakdown.

Moreover, the safety and security of critical infrastructure systems against malicious attacks (such as denial-of-service) and natural disasters are becoming crucial issues for citizens, businesses, and governments who expect that these infrastructures will provide uninterrupted service 24/7 and under any circumstances. Unexpected events can also occur (accidents, earthquakes etc.) which create emergency conditions requiring immediate response to prevent fatalities and limit damages.

The problem of monitoring, control, management and security of Critical Infrastructures Systems (CIS) will become even more challenging in the future. Currently, an important proportion of the world population lives in urban areas and it is predicted that an even more significant percent of the developing and developed world will be urbanized in the near future. However, existing critical infrastructures were not designed to accommodate such enormous demands. Moreover, due to wide-ranging deregulation, the use of renewable energy and a massive expansion of wireless communications, critical infrastructures, as well as the associated data, software and management systems, are becoming increasingly more heterogeneous, distributed, and inter-dependent making the seamless integration of all components that make up the CIS an immense challenge.



OBJECTIVES OF THE PROGRAM

The main objective of the MSc in Intelligent Critical Infrastructure Systems (CIS) program is to teach highly innovative methods, tools, and technologies for the monitoring, control, management, and security of CIS for a competent workforce that will be recruited by local and regional authorities and international companies seeking to make CIS more reliable, safe, resilient, efficient, and sustainable. In addition, the program is designed to transfer knowledge on the research and innovation challenges faced by modern CIS and cultivate student interest in pursuing a career path in research and innovation. Doing so, it is expected to contribute to the transformation of the research and innovation culture of Cyprus and the Mediterranean-Middle East region. The program is open to students from different technical backgrounds, spanning the different areas of science and engineering.

THE PROGRAM IS INTENDED TO:

- Provide the theoretical basis for the monitoring, control, management, and security of intelligent critical infrastructure systems.
- Produce graduates equipped to pursue careers that involve design, modelling, analysis, control and optimization, as well as business aspects of critical infrastructure systems.
- Offer students the opportunity to acquire ICT knowledge for intelligent critical infrastructure systems.
- Provide a solid background that will enable graduates to further continue their studies towards a PhD degree in Electrical & Computer Engineering on the topic of Intelligent CIS.

PROGRAM LEARNING OUTCOMES

When graduating from the program, students will have acquired the skills to:

- Deal with particular CIS challenges, understand the specific technical and management features, and the specific risks and security issues related to the considered CIS.
- Apply innovative ICT techniques to address monitoring, control, management and security of CIS at the technical, managerial, and policy level.
- Conduct both theoretical and applied research contributing to the transformation of the research and innovation culture of Cyprus.

CHARACTERISTICS OF THE PROGRAM

Importance of the topic

A significant strength of the program concerns the blending of topics of great engineering and societal importance for the regional growth of students and researchers in the area of CIS. The program promotes awareness of environmental problems, sustainability and energy-efficiency issues, as well as security and safety aspects.

Novelty and Uniqueness

The program considers an integrated engineering approach taking into account monitoring, control, management and security aspect of critical infrastructures using modern Information and Communication Technologies (ICT). This represents a point of novelty and uniqueness for the program, especially in the European arena.

Multidisciplinarity

The program is designed to be multidisciplinary in nature, including concepts from Electrical and Computer Engineering, Computer Science, Applied Mathematics and Management Science, with an integrated vision of all the aspects of the monitoring, control, management, and security problems from a CIS' perspective.

Strong relevance to UCY's research activities

Monitoring, control, management, and security of intelligent CIS is a significant area of research and investment in the University of Cyprus, as evidenced by various activities at the Department of Electrical and Computer Engineering and the KIOS Research and Innovation Center of Excellence, the largest currently research center at UCY.

Imperial College London

University of Cyprus

Synergetic collaboration between University of Cyprus and Imperial College London

The program is a collaboration between the University of Cyprus and Imperial College London. Courses are designed and delivered by world-class expert academic faculty from both institutions, with significant international research reputation on the topic of Intelligent CIS.

Strong relevance to the industry

The application module of the program is focused on real problems, many provided by industrial partners collaborating with the academic faculty and entities involved in the delivery of the program. Moreover, the MSc Thesis provides the opportunity to perform applied research in collaboration with industrial partners.

DESCRIPTION OF THE PROGRAM

GENERAL INFORMATION

Duration:
3 semesters (1.5 years, 92 ECTS). Part-time study available.

Admission Requirements:
BSc in Engineering or Science discipline

Language:
English

Admission Period:
Every September

Application Period:
Once a year, Spring Semester

Fees:
€6.500 for entire program

A number of Scholarships are awarded every year to top ranking students

ADMISSION TO THE PROGRAM

Minimum requirements to be considered for admission:

- A Bachelor's Degree in an Engineering or Science discipline that must have been judged as equivalent to a University Degree by the Cyprus Council for Recognition of Higher Education Qualifications.
- English Language Certification or other accepted International Standard. Proficiency in English can be demonstrated through one of the following: C-grade at English GCSE; IELTS score of 6.5 or above; Test of English as a Foreign Language (ETS TOEFL®) with a minimum score of 550 (paper based), 213 (computer based) or 80 (internet-based).

Each application for admission should include:

- A completed application form, which can be found on the website of UCY's Graduate School.
- A Curriculum Vitae.
- A short statement (at most two pages) outlining the reasons the candidate wishes to join the program, the candidate's professional and research experience, future goals, etc.
- At least two recommendation letters from academic or professional advisors.
- Copies of representative publications, if any (no more than three).
- Copies of all degrees and transcripts.
- Copies of any other supporting material, such as exams, honors, awards, etc.

Applications must be submitted in English.

Criteria for the evaluation of candidates:

- Academic background
- Research background
- Recommendation letters
- Additional qualifications

Online application

To apply, candidates must first create a user's account and then complete and submit the online application form. For more information on the application process and link to the application form, please check the website of the University's Graduate School during the application period:

http://www.ucy.ac.cy/graduateschool/en/

CURRICULUM

The program involves coursework of 92 ECTS in total, with 8 compulsory courses (60 ECTS), an MSc Thesis (30 ECTS), and graduate - level seminars and workshop (2 ECTS).

Courses have been designed following an integrated and holistic approach, to provide students with knowledge, skills, competencies and experiences relevant to the topic of the MSc program, as categorized below:

T - Theory: provide specific theoretical and methodological skills necessary to understand how to monitor, control, and optimize CIS.

O - Tools: ICT approaches for addressing the problems in monitoring, control, management, and security of CIS.

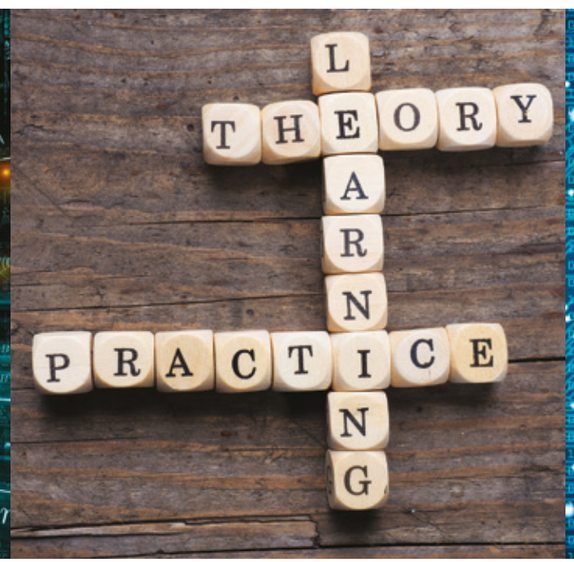
A - Applications: address specific current tasks and challenges in intelligent CIS based on realistic use cases in the applications of power systems, intelligent transportation systems, smart water networks, and telecommunication networks.

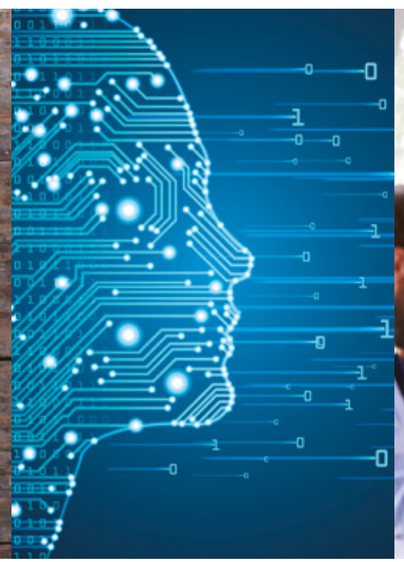
S - Transferable Skills: includes project management and technology transfer for Innovation and Entrepreneurship (also IPR management), communication skills, and ICT skills.

P - Practical/Research Experience: includes the final year project which constitutes a significant piece of research that will be submitted as a dissertation (MSc Thesis). Can be carried out in collaboration with the industry.

The structure of the program is summarized in the table on the right, on a semester basis. The type of each course is indicated by T-Theory, O-Tools, A-Application, S-Transferable Skills, and P-Project.

	First Semester 30 ECTS
T	ECE 801 - Monitoring and Estimation
T	ECE 802 - Optimization of CIS
O	ECE 803 - Security of CIS
A	ECE 807 - CIS Applications I – Fundamentals
	Second Semester 30 ECTS
T	ECE 804 - Industrial Control
O	ECE 805 - Machine Learning
S	ECE 806 - Innovation and Entrepreneurship
A	ECE 808 - CIS Applications II – Advanced
	Third Semester 32 ECTS
P	ECE 809/810 - MSc Thesis
S	ECE 811 - MSc Seminars & Workshop





INTEGRATION OF CIS USE CASES TO COURSEWORK

A significant feature of the program is the integration of CIS model representation and use cases to coursework. Specifically, mathematical models representing CIS at different abstraction layers and realistic use cases for intelligent CIS will be used throughout the various courses in order to:

- Provide students with realistic examples on how to model, simulate, monitor, control, manage and optimize such systems
- Examine possible commonalities, differences, interdependencies among various CIS domains
- Better illustrate theoretical concepts

Models and use cases from electric power and renewable energy systems, smart water systems, and intelligent transportation systems are considered in a stand-alone manner, or in a high-level integrated simulation platform developed at the KIOS Center of Exellence . Models and use cases for CIS cybersecurity and telecommunication networks used in CIS systems are examined in a horizontal dimension across one or more CIS, allowing to better understand how such timely and important topics must be integrated in intelligent critical infrastructures.

The two application courses of the MSc program revisit these models and use cases focusing on current and future challenges in CIS systems, such as energy efficiency, safety, security, reliability, fault detection, big data processing, h/w & s/w design integration in IoT, etc.

TEACHING PERSONNEL

As the program is a collaboration between the University of Cyprus and Imperial College London, courses are designed and delivered by world-class expert academic faculty from both institutions, with significant international research reputation in the topic of Intelligent CIS and related topics and applications. MSc Thesis supervision can be carried out by one or more instructors and advisors mentioned below.

COURSE INSTRUCTORS

Alessandro Astolfi
PROFESSOR

Imperial College London
ECE 802 – Optimization of CIS

Georgios Ellinas
PROFESSOR

University of Cyprus
ECE 807 – CIS Applications I

Chris Hankin
PROFESSOR

Imperial College London
ECE 803 – Security for CIS

Elias Kyriakides
ASSOCIATE PROFESSOR

University of Cyprus
ECE 808 – CIS Applications II

Marianna Makri
ASSOCIATE PROFESSOR

University of Cyprus
ECE 806 – Innovation and Entrepreneurship

Maria K. Michael
ASSOCIATE PROFESSOR

University of Cyprus
ECE 809/810 – MSc Thesis
ECE 811 – MSc Seminars & Workshop

Christos Panayiotou
PROFESSOR

University of Cyprus
ECE 801 – Monitoring and Estimation

Thomas Parisini
PROFESSOR

Imperial College London
ECE 804 – Industrial Control

Marios Polycarpou
PROFESSOR

University of Cyprus
ECE 805 – Machine Learning

ADDITIONAL THESIS ADVISORS

Demetrios Eliades
SENIOR RESEARCHER

University of Cyprus

Panayiotis Kolios
SENIOR RESEARCHER

University of Cyprus

Constantinos Pitris
ASSOCIATE PROFESSOR

University of Cyprus

Theocharis Theocharides
ASSOCIATE PROFESSOR

University of Cyprus

Stelios Timotheou
ASSOCIATE PROFESSOR

University of Cyprus

COURSE DESCRIPTIONS

ECE 801
Monitoring and Estimation
7 ECTS

The purpose of this course is to familiarize the students with some of the main techniques for estimating the state of a dynamical system and use the state of estimation to detect faults in some of the system's components such as sensor faults and water leaks. Topics include classical estimation theory, observer design, Kalman filters, and fault diagnosis. The students will learn to design and implement (in MATLAB) state estimators and fault detection algorithms for various systems, as well as to model faulty components. Infrastructure (small-scale testbed and simulation software) from the KIOS Laboratory for Power Systems and Renewable Energy will be used in the teaching of estimation theory and observer design. Furthermore, an in-house developed platform on intelligent vehicle routing will be integrated in the teaching of Kalman Filter algorithm, while the KIOS platform for Smart Water networks will be used in the teaching of fault diagnosis methods.

ECE 802
Optimization of CIS
7 ECTS

This course introduces finite-dimensional optimization and decision theory and basic optimization algorithms. The formulation of optimization problems arising in CIS is also presented together with worked out examples.
After the course the students will be able to formulate optimization problems, design computer algorithms for finding minima and maxima in a wide range of optimization problems involving smooth criteria and, just as importantly, to interpret, and if necessary, modify, the algorithms found in standard computer packages. The students will also be able to formulate and solve decision making problems and problems involving graphs. Finally, the students will be capable of formulating optimization problems arising in CIS and to compute their solutions.

ECE 803
Security for CIS
7 ECTS

The aim of this course is to cover the underlying principles and techniques used in securing CIS and to give examples of how they are applied in practice.
At the end of the course, the students will have an understanding of the themes and challenges of CIS security and the current state of the art, they will have developed a critical approach to the analysis of CIS security and will be able to bring this approach to bear on future decisions regarding security. Finally students will be able to appreciate the main threats, attack techniques and defenses relevant to the security of CIS, to identify potential vulnerabilities and propose countermeasures and to design secure critical infrastructure systems.

ECE 804
Industrial Control
7 ECTS

The aim of the course is to provide basic elements of industrial control systems as well as a glimpse of advanced multi-variable control of generic large-scale systems related to critical infrastructures. Insight on basic concepts of multi-variable control is given with emphasis on optimal and model-predictive control approaches, as well as insight on the basic architectures of modern multi-level software automation architectures. The automation SW architectures and technologies are put in the context of CIS use cases where appropriate.
The students, at the end of the course, should know the basic principles governing the analysis and design of multivariable control systems in the context of large-scale systems. They should be able to carry out the static and dynamic analysis characterization of models to be used in the design of multi-variable control systems. Moreover, they should be able to evaluate, among several options, how to configure and design the architecture and the controller of a multi-variable automatic control system starting from requirements and considering technological constraints.

ECE 805
Machine Learning
7 ECTS

This course aims to introduce the theory, methods and applications of the field of Machine Learning. The objectives of the course are the presentation of the core principles and algorithms of supervised, unsupervised and reinforcement learning, the explanation of the application of these algorithms for the solution of regression, classification, clustering and decision-making problems and the demonstration of practical machine learning tools suitable for the analysis of data sets and the solution of machine learning problems. Special emphasis will be placed on real-world critical infrastructure systems applications.
By the end of the course, students should be able to understand the principles of supervised, unsupervised and reinforcement learning, to design and implement a wide variety of machine learning algorithms, to analyze raw data to create representations that are more suitable for machine learning algorithms and to solve and evaluate the performance of classification, regression, dimensionality reduction and clustering problems that arise in critical infrastructure systems using state-of-the-art machine learning tools.

ECE 806
Innovation and Entrepreneurship
7 ECTS

Creating new businesses calls for venturing into unknown territory. This course examines successful strategies, business models, and frameworks for introducing innovative products and services to the market. Topics include human-centered and design-driven innovation, lean-start-up methodology, and business model innovation. The main purpose is to explore the many dimensions of new venture creation and growth. Students will gain thorough knowledge of where innovation can be found within an organization, how to recognize it, and how it can be used for competitive advantage. While most examples will be drawn from new venture formation, the course examines cases in ICT-related entrepreneurship. Cases, lectures, and projects focus on emerging and established firms in a number of industries for which innovation is a key source of competitive advantage.

ECE 807
CIS Applications I - Fundamentals
9 ECTS

This course provides a solid understanding on the fundamentals of the following critical infrastructure systems: electric power systems, telecommunication networks, water distribution networks, and transportation networks. To understand how to model and simulate simple instances of these networks, it introduces general tools for modeling such systems (automata, Petri-nets, graph theory, conservation laws, differential and algebraic equations, partial differential equations) and general tools for simulating and analyzing such systems (discrete event simulation, steady-state methods, state-space, design of algorithms).
By the end of the course students will obtain the fundamental skills required to model the most important critical infrastructure system components and the systems as a whole. They will also be able to simulate simple cases for these systems under steady state and faulty conditions.

ECE 808
CIS Applications II – Advanced
9 ECTS

The purpose of this course is to provide a solid understanding of the following critical infrastructure systems: electric power systems, telecommunication networks, water distribution networks, and transportation networks. The course aims to: model and analyze these systems using advanced network simulators, help students understand the practical problems in the control and management of these systems, and to obtain practical skills related to the design and operation of these systems under normal and faulty conditions.
The students are expected to be able to model the most important critical infrastructure system components and be able to analyze them under steady state conditions. Moreover, they should be able to design and simulate these systems according to given operational criteria and constraints. Finally, students should understand the technical, economic, and environmental implications of the design and operation of critical infrastructure systems.

ECE 809/810
MSc Thesis for Intelligent CIS I&II
30 ECTS

The MSc thesis is a full-year project which enables students to carry out research in order to deepen their scientific and applied knowledge and skills in a specific topic in the area of Intelligent CIS. The thesis is expected to give the opportunity to students to work on a comprehensive, individual project that demonstrates mastery in innovative ICT techniques to address monitoring, control, management and security of CIS at the technical, managerial and policy level.
Through their research students will understand technical and management features in Intelligent CIS, learn to deal with particular challenges in Intelligent CIS and obtain experience in research methods, including technical writing and communication skills, as well as project management.
The thesis constitutes a significant piece of research and should be of suitable complexity for results to be published for an expert audience. Projects are allocated at the end of February of the 1st year of study (student proposals for projects may also be allowed, after examination and approval by the Program's Committee). Projects can be carried out in collaboration with the industry, tackling specific research challenges faced by the industry. For industrial projects, the specific project and student(s) involved are approved mutually by the project supervisor(s) and the specific company/organization.

ECE 811
MSc Seminars & Workshop
2 ECTS

Seminars exploring current research and topical issues in the areas of monitoring, control, management, and security of CIS, as well as other related electrical and computer engineering disciplines, focused on the general theme of innovation. Seminars are organized in blocks with related content, and are presented by prominent external speakers as well as by faculty members and graduate students.
The course requires participation in at least 15 seminar presentations over the course of the MSc program. Students must attend at least 5 non-technical seminar presentations. Students are also expected to participate in a dedicated workshop, organized at the University of Cyprus, which will be exploring specific research and innovation topics related to their MSc program. The workshop will include prominent speakers from the academia and industry. During the workshop, students will also be required to showcase the work for their MSc thesis, attend the presentations by other fellow MSc students, and discuss their research work and exchange ideas with other students and faculty.

STUDENT ADVISING

Academic Advisor

Every student is assigned, upon admission into the program, an Academic Advisor who is a faculty member of the ECE department. The Academic Advisor, assigned by the Program's Committee during the admission evaluation process, monitors the progress of the student and consults with the student on his/her academic plans.

Research Supervisor

By the end of the second semester, every student needs to find a Research Supervisor who will be responsible for overseeing the work conducted by the student with regards to the MSc Thesis. The Research Supervisor is approved by the Program's Committee, in consultation with the student and the suggested advisor. If the student fails to find a Research Supervisor, then he/she can consult his/her Academic Advisor for alternative solutions.

MSc THESIS

Thesis Committee

The Thesis Committee will consist of the student's Research Supervisor and two additional faculty members with related research interests. One of the members of the Committee can be a qualified individual who is external to the Department. Qualified individuals are considered holders of a PhD or MSc degree, with extensive knowledge in the research subject. The student's Research Supervisor will be the chairperson and coordinator of the Committee.

Thesis Proposal

Students are expected to submit a written initial report by the end of the 2nd semester (Spring). The initial report covers the background, specification and milestones for the project, providing the aims and objectives of the project, a literature review and a contents page for the final report.

Thesis Report

Students start full time work on their project after the end of exams in May. The student presents a written project report to the MSc Thesis Committee at least by the end of November of the 3rd semester of the program. The report has to be in a generally accepted format and must contain a description of the proposed research, obtained results, and a complete bibliography which includes the current state of the art.

Defense of the MSc Thesis

The student presents the scientific research findings of his/her MSc Thesis during an oral defense, which takes place before the MSc Thesis Committee (usually during December) and is open to the public.

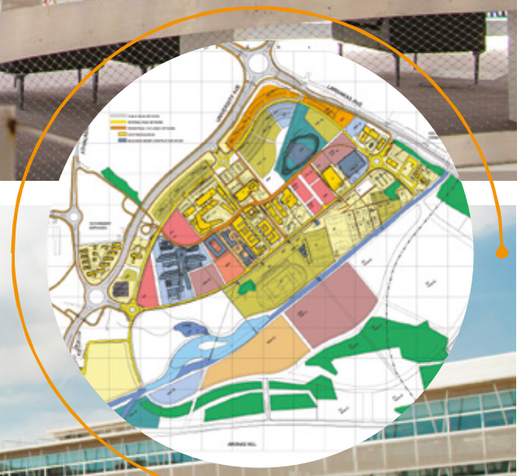
The procedure for the defense is comprised of three stages:

- An oral presentation of the thesis in an open lecture lasting 30-45 minutes, with additional time available for questions from the public.
- A closed discussion between the student and the members of the MSc Thesis Committee.
- Meeting of the MSc Thesis Committee to make its final deliberation.

The program includes a full-year project (MSc thesis) on a research topic. Projects are allocated at the end of February of the 1st year of study (student proposals for projects may also be allowed, after examination and approval by the Program's Committee). Projects can be carried out in collaboration with the industry, tackling specific research challenges faced by the industry. For industrial projects, the specific project and student(s) involved are approved mutually by the project supervisor(s) and the specific company/organization.

STATE OF THE ART FACILITIES

Learning Resource Center - Library Stelios Ioannou



Athletic Center

Social Facilities Center

UNIVERSITY CAMPUS

UCY has a new and impressive main Campus located on the outskirts of east Nicosia, between Aglantzia and Athalassa. It includes a range of facilities that help students to study, learn and engage with campus life.

Courses of the MSc program are taught in teaching buildings located at the main Campus ***(Common Teaching Facilities Buildings 1&2)***. The state of the art classrooms, amphitheaters, auditoriums and seminar rooms of different sizes and capacity, provide an excellent environment to support the teaching and learning for both staff and students. Teaching rooms are well-equipped with audio-visual means (sound systems, video projections, televisions, interactive boards and screens) and lit with the use of smart systems. Additionally, all teaching areas are covered by wifi.

The Library is an integral part of the student's life and plays an important role in the learning and research activities of the community at the University. The outstanding ***Learning Resource Center – Library Stelios Ioannou*** is the home and central core of knowledge – with advanced aesthetics at the heart of the Campus. This impressive building covers an area of 15,700 square meters and houses 1 million printed volumes, over 30,000 electronic titles and 150 databases. It also provides approximately 900 study seats that are equipped with the latest technology.

The ***University House Anastasios G. Leventis*** located also at the main Campus, accommodates the central administration and administrative services of the University of Cyprus. Students can access a number of services at the House such as the Academic Affairs and Student Welfare Services, the University's Graduate School and Information System Services.

In addition to its outstanding educational facilities, the University offers excellence also in its social facilities. The UCY ***Athletic Center*** comprises of modern athletic fields and sports halls that are accessible to all UCY students. It includes the main indoor Sports Hall, outdoor football field, 3 outdoor tennis courts, outdoor hand ball court, 2 outdoor futsal fields, 2 basketball/volleyball outdoor courts and beach volley court. The UCY Sports Centre operates daily and on Saturdays, offering a flexible sports program that meets all needs and interests.

Also located at the main UCY Campus is the ***Social Facilities Center*** which plays a central role in the recreation, socialization and support of the student community. The complex is comprised of seven buildings organized around a public square and encompasses various and alternative indoor and outdoor spaces. A variety of services operate in the complex, including restaurants, coffee shops, a pub, a mini market, a bookshop/copy center, various banks, ATM machines etc.

FACILITIES OF THE ECE DEPARTMENT

New building facilities of the Faculty of Engineering of the University of Cyprus are currently under construction and will soon materialize into an impressive building complex, including state-of-the art infrastructure and facilities of approximately 25,000 square meters. It will house, along with other departments of the School, the ECE Department as well as the KIOS Center of Excellence. It is envisaged that with the completion of the new facilities of the Faculty of Engineering, the Campus will be enriched with a building complex which will constitute a landmark representing in a powerful way the teaching and research activity of the University of Cyprus.

The Department of Electrical and Computer Engineering is currently housed, along with other departments of the School of Engineering, in a number of buildings located near or at the main UCY Campus. The MSc program's teaching personnel offices, the administrative support of the program, meeting rooms and the KIOS research laboratories are located in the KIOS facilities in the Social Facilities Center at the main UCY Campus. The rest of the laboratories are located in a number of buildings at or close to the main UCY Campus.

Overall, the Department currently houses a large number of teaching and research laboratories with high-end tools, large-scale infrastructure, software and hardware equipment that enable advanced research and learning in the several research topics of the Department. These include laboratories in the following areas: power systems; photovoltaic technology; sensors and robotics; mobile communications and networking; embedded systems; dependable integrated systems; distributed control systems and networks; computer architecture; biomedical imaging and applied optics; electromagnetics; electronics; microwave and antennas; microwave photonics.

New School of Engineering Complex (under construction)

LABORATORIES RELEVANT TO THE PROGRAM

The Department of Electrical and Computer Engineering and the KIOS Research and Innovation Center of Excellence have several dedicated laboratories investigating different key enabling technologies in monitoring, control, management and security of critical infrastructures using cutting-edge equipment for experimental evaluation, testing and prototyping.

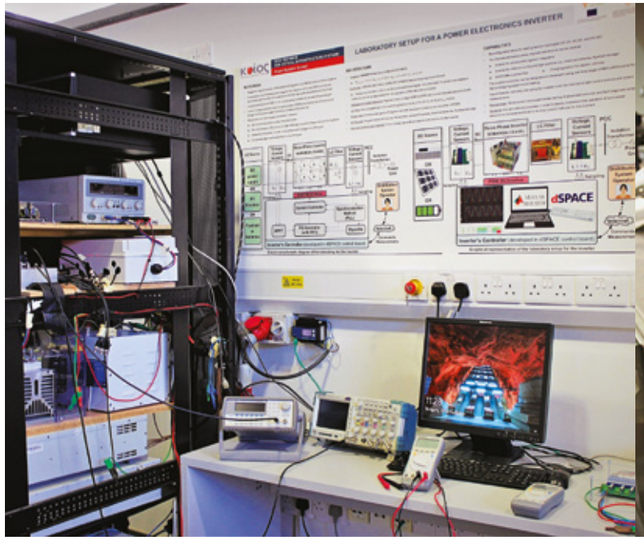
RELEVANT LABORATORIES:

Power Systems Laboratory
Aims towards modelling, simulation, emulation and experimental validation of energy systems, with expertise in developing smart converters for the integration of renewable energy sources both at the building and grid level, as well as in generation and storage technologies. The laboratory includes wind turbine, photovoltaic system, real time digital power system simulator, flywheel basedkinetic battery, electrolyzer and hydrogen storage.

Mobile Communications & Networking Laboratory
Examines the modelling, simulation, emulation and design of architectures, protocols, algorithms and technologies for next-generation communication systems with a focus on communication theory, wireless communications and networking. Key equipment includes software defined radio platform, energy harvesting development kit for wireless sensors as well as simulation software for optical/telecommunication networks.

Sensors and Robotics Laboratory
Investigates the design and implementation of embedded, multi-sensor systems for monitoring and control different environments such as critical infrastructures. These sensors can be on fixed or mobile (robotic) platforms. Key equipment includes drones, miscellaneous terrestrial robotic platforms and drone attachable thermal camera with radiometry.

Embedded Systems Laboratory
Focuses on the design, development, implementation and verification of low-power, high-performance and highly reliable systems on chip, suitable for embedded and mobile environments. The laboratory includes hybrid platform for large scale circuit and system emulation, multi-GPU supercomputers, boards for acceleration of compute intensive applications, BeeCube Platform for large-scale hardware emulation, embedded Computing Systems, bumblebee stereoscopic camera, smart camera nodes, embedded GPU platform for accelerated edge computing and logic analyzers/oscilloscopes/function generators for circuit design.



Prospectus Approval
The prospectus has been approved by the University of Cyprus and the Cyprus Agency of Quality Assurance and Accreditation in Higher Education by their letter dated 27th June 2018.

Disclaimer: Information included within this prospectus was correct at the time of publication. The information is to be used as a general guide, changes may occur after publication.

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