MESSAGE FROM THE CHAIRMAN

Dear reader,

The Department of Electronic and Computer Engineering (ECE) of the Technical University of Crete (TUC) was founded towards the end of the 1980’s and admitted its first incoming class of 30 freshmen in 1990. Since then the Department has grown substantially; the incoming freshman class currently exceeds 115 students per year, there are 29 full-time faculty members (22 serving and 7 under appointment), and a total of 472 engineers have graduated from the ECE Department so far.

The ECE Department offers high-level engineering education with emphasis in the four Divisions it is organized in: Electronics and Computer Architecture, Computer Science, Systems, and Telecommunications. The undergraduate program aims at building a solid theoretical background, as well as providing hands-on training through laboratory exercises and projects in almost all courses. The course descriptions and the curriculum are constantly updated according to the latest scientific developments, trends, and practical applications, so that students are prepared in the best possible way for their professional career after graduation.

Many graduates of the Department have pursued graduate studies in Greece or abroad and currently they serve as faculty members at Universities, researchers at academic or industrial research laboratories, and professional engineers in Greece, Europe, and the U.S.A.

The departmental personnel is well-trained and highly-qualified. The majority of the faculty members have earned their Ph.D. degrees from top universities around the world and many have pursued careers as faculty members abroad before joining the ECE Department. The current high level of scientific activity, peer-reviewed publications, and competitive research funding of the ECE Department are due to the unrelenting efforts and the talent of the faculty and their close collaboration with the staff and the students of the Department. The international recognition, which has been bestowed to the Department, can be attested by the numerous publications in top scientific journals and international conferences, several best paper awards, participation in top journal editorial boards and top international conference program committees, etc.

The present Undergraduate Program Guide provides accurate and complete information about all aspects of the undergraduate program of studies in the ECE Department. Further information may be found on the website of the ECE Department (www.ece.tuc.gr). For further inquiries you may contact the Secretariat of the Department (Vicky Grigoraki, 28210 37218, vicky@ece.tuc.gr) or the Chairman of the Department (Associate Professor Dionisios Pnevmatikatos, 28210 37344, pnevmati@mhl.tuc.gr).

Dionisios Pnevmatikatos
Associate Professor and Chairman
The Technical University of Crete

The Technical University of Crete is Greece’s second technical university, devoted to engineering education. It was established in 1977 and admitted its first students ever at the Department of Production Engineering and Management in 1984. The mission of the Technical University of Crete is to advance education and research in new technologies, as well as the establishment of a high–quality scientific and technological institution which is in close cooperation with the production forces of the country.

There are six departments at the Technical University of Crete:

• Department of Production Engineering and Management
• Department of Electronic and Computer Engineering
• Department of Mineral Resources Engineering
• Department of Environmental Engineering
• Department of Architectural Engineering
• Department of Sciences

To this list soon will be added the newly founded Department of Civil Engineering and the School of Fine Arts.

Mission Statement

The curriculum of the ECE Department of the Technical University of Crete aims at in–depth education and high–quality practical training of engineers in current technologies in the areas of electronics, computer science, telecommunications, and systems. The goal is for the students to develop a sound theoretical background, which will enable them to understand the fundamentals of the new technologies in all of the above areas and applied thinking so that they can cope with the demands and the rapid pace of technology growth at an international level. The ECE Department strives to provide broad and modern education to its graduates so that they become competitive against their European colleagues.

Computer science is pivotal in all cutting–edge technological disciplines. According to the European Strategic Program for Research in Information Technology (ESPRIT), the installation of a new computing system entails far greater expenses for the development of the software rather than the hardware, which tends to become inexpensive. Graduates of the ECE Department acquire complete and deep knowledge of all principles related to software development and thus become able to not only work, but also assume leading roles, as software engineers within a company. Current market needs include electronic filing (payroll, merchandise cataloging, ordering automation, etc.), management of large volumes of data (banking, hotel and travel reservations, patient data handling, etc.), and automation of businesses (state offices, insurance companies, etc.). To efficiently deal with these tasks, it is necessary to know how to specifically design and manage large data bases and complex information systems, knowledge which is acquired by our Department’s graduates. It is worth mentioning that the ECE Department puts emphasis on modern technologies such as object–oriented programming, distributed and parallel systems programming, medical data processing, computer graphics and virtual reality, development of Web applications, programming of autonomous robotic systems, and data management in sensor networks. Thus, ECE graduates may be employed in enterprises of the future doing business in areas, such as e–commerce, tele–education, tele–medicine, entertainment and information systems over the Internet, digital libraries, etc.
Modern applications in the industry require that electronic sensors and control systems work efficiently, continuously, and securely even under extreme conditions. The use of microprocessors and microcontrollers is particularly important in a variety of electric and electronic real–time devices in automobiles, factories, land and air traffic controllers, robotics, assembly lines, quality control, smart houses, greenhouses, etc. Our students are trained on new methods of analysis and design of electrical, electronic, and logic circuits. More specifically they learn the fundamentals of basic electronic components (e.g. diodes, transistors, integrated circuits), how to design circuits involving both analog and digital components, how to design power amplifiers and high frequency RF circuits, and how to design Very Large Scale Integration (VLSI) circuits. This knowledge is complemented with hands–on laboratory sessions where students practice on Computer Aided design (CAD) stations and on the workbench.

Telecommunications are rapidly expanding worldwide. The students of the ECE Department gain in–depth knowledge on subjects such as digital telecommunications (antennas, microwaves, wireless communications, satellite communications, wireless and wired telephony, mobile telephony, information and coding theory, computer networks), as well as on modern applications of telecommunications, based on automated voice recognition and speech processing and understanding (voice interfaces, automated dialogue systems) so that they can work with any telecommunications organization. Computer networks, nowadays, transport on only data, but also voice, images, and video streams between computers. Data networking is crucial for all companies due to the rapid growth of Internet usage in Europe and in Greece a shift towards high–performance distributed computing. In fact, many companies and organizations today build their own Virtual Private Networks (VPN) to cover their needs in an absolutely vital domain. Our graduates have solid foundations to cover all needs of the telecommunications market.

Integrated manufacturing systems are prevalent today in the industry, as well as support applications on using graphics for designing, simulating, and monitoring any process on the factory floor to achieve quality assurance. The installation of an integrated automated manufacturing system is a challenging task requiring expert knowledge engineers for designing and incorporating the knowledge base into the plant. Our graduates are trained adequately in factory automation (Computer Aided Design, Computer Aided Management, robotics, quality control, etc.) as well as in the design of control systems for complex processes.

In addition to the theoretical and applied education, which qualifies our graduates to work in the above areas, our undergraduate program prepares students for continuation of their studies at graduate level and for active participation in large research teams following their graduation. A crucial milestone of our undergraduate program is the requirement for completion of a diploma thesis by each student during the last semester of his or her studies under the close supervision of their faculty advisor. The thesis not only allows students to focus on their favorite topic of interest, it also challenges them in conducting independent and novel research responsibly in order to present a complete piece of work. Quite often results of diploma theses are published in international peer–reviewed journals or refereed conferences.

Professional Rights

The establishment of professional rights for the graduates of the ECE Department has been established with Presidential Amendment 372/1997, which states that:
The graduate of the Department, defined as “Diploma–holding Electronic Engineer and Computer Engineer”, has the right to work on the study, design, analysis, implementation, supervision of construction, maintenance, research, supervision of operation, and expert appraisal reports for every kind of electronic and computer systems, their installations and their applications in general in the following scientific areas:

A) **Electronics**, and in particular electronic apparatuses and systems, such as the design of analog and digital circuits, sensors, electronics for power systems, integrated circuits, electroacoustic systems, measurement and data processing systems, optoelectronic apparatuses and the applications of the above.

B) **Telecommunications and Telecommunication Systems**, which include in particular wired and wireless communications, information communication or transmission, switch and routing centers, wired and wireless communication networks, multiplexing systems, mobile telephony, satellite systems and every kind of similar application thereof.

C) **Information Systems**, which includes electronic computers as means of data storage and information processing, their design or construction or application in production or operation or other process or the offer of services in industry, in office automation or agencies, in telecommunications, in publications and in electronic apparatuses. The areas of computer architecture, peripheral units, expert systems, software engineering, human–computer interfaces, telematics, and multimedia are considered to be included in the term Information Systems.

D) **Systems**, and in particular automation systems, signal processing, image processing and every kind of application thereof.

**Administration of the Department**

The Department is governed by the General Assembly and the Department Chairman who chairs the General Assembly. The General Assembly is comprised of the faculty, undergraduate and graduate student representatives, and representatives of the laboratory staff of the Department. The responsibilities of the General Assembly are determined by the current Higher Education Law and its amendments.

**Department Chairman**

The current Department Chairman is Associate Professor Dionisios Pnevmatikatos and Associate Chairman is Professor Apostolos Dollas..

**Department Secretary**

Department Secretary (which is the official position of the supervisor of the administrative services of the Department) is Mrs. Vassiliki Grigoraki.

**Departmental Structure**

The Department is organized in four Divisions:

- Division of Computer Science
- Division of Electronics and Computer Architecture
- Division of Systems
- Division of Telecommunications

**Faculty and Staff**

The faculty and staff of the Department are in the following categories:

a. **Faculty.**

The tenure–track and tenured faculty members of the Department hold Ph.D. degrees and they fall under four seniority ranks: Professors, Associate Professors, Assistant Professors, and Lecturers. In addition to the tenure–track and tenured faculty, there are also several adjunct assistant professors and visiting faculty members charged mostly with teaching responsibilities.

b. **Laboratory Teaching Staff.**

The laboratory teaching staff members perform laboratory and applied educational duties,
which largely include the design, preparation, and administration of laboratory sessions and recitations for the courses taught in the Department. The laboratory teaching staff members hold university and/or graduate degrees.

c. Laboratory Technical Staff.
The laboratory technical staff members provide technical support to the Department by offering specialized technical services to the educational and research activities of the various laboratories in the Department. The laboratory technical staff members hold university and/or graduate degrees.

d. Contracted Staff.
The contracted staff members conduct research and/or administrative work under long–terms contracts with the goal of improving the educational and research activities of the Department. The contracted staff members hold university and/or graduate degrees.

e. Administrative Staff.
The administrative staff includes employees of various ranks reporting to the central administration of the Technical University of Crete. The administrative staff members support the administrative operations of the Department, such as management of student records, departmental archives, course registrations, grade reports, etc.

Faculty

DIVISION OF COMPUTER SCIENCE

Stavros Christodoulakis, Professor

Antonios Deligiannakis, Assistant Professor

Michail Lagoudakis, Assistant Professor

Katerina Mania, Assistant Professor

Euripides Petrakis, Associate Professor

Vassilios Samoladas, Assistant Professor

DIVISION OF ELECTRONICS AND COMPUTER ARCHITECTURE

Konstantinos Balas, Associate Professor

Matthias Bucher, Assistant Professor
Apostolos Dollas, Professor  

Konstantinos Kalaitzakis, Professor  

Ioannis Papaefstathiou, Assistant Professor  

Dionisios Pnevmatikatos, Associate Professor  

George Stavrakakis, Professor  

Peter Stavroulakis, Professor  

DIVISION OF TELECOMMUNICATIONS

Vassilios Digalakis, Professor  

George Karystinos, Assistant Professor  

Athanasios Liavas, Associate Professor  

Michael Paterakis, Professor  
Communication Networks, Packet Transmission Radionetworks.

**Alexandros Potamianos, Associate Professor**
Voice Processing, Analysis, Synthesis and Recognition, Dialog and Multimodal Systems, Mobile Telephony Services, Nonlinear Signal Processing, Natural Language Processing, Artificial Intelligence, Multimodal Computational Systems for Children.

**Nikos Sidiropoulos, Professor**

**Michael Zervakis, Professor**
Digital Image and Signal Processing, Biomedical Applications.

**Laboratory Teaching Staff**

**Sotirios Bouros**
B.Sc. in Computer Science and Engineering, University of Patras, Greece.

**Emmanuel Doudounakis**
B.Sc. in Electrical Engineering, National Technical University of Athens, Greece. M.Sc. in Production Engineering and Management, Technical University of Crete, Greece.

**Markos Kimionis**
B.Sc. in Electronic Engineering, Technological Education Institute of Crete, Greece.

**George Markoulakis**
B.Sc. in Electronic Engineering, Technological Education Institute of Crete, Greece.

**Laboratory Technical Staff**

**Spyros Argyropoulos**
B.Sc. in Computer Science and Engineering, University of Patras, Greece. M.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece.

**Efthichios Koutoulis**

**Contracted Staff**

**Stamatis Andrianakis**
B.Sc. in Electrical and Computer Engineering, Aristotle University of Thessaloniki, Greece.

**George Anestis**

**Polixeni Arapi**
B.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece.

**Vassilios Diakoloukas**
B.Sc. in Physics, University of Crete, Greece. Ph.D. in Electronic and Computer Engineering, Technical University of Crete, Greece.

**Nektarios Gioldasis**
B.Sc. in Applied Computer Science, University of Macedonia, Greece. M.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece.

**Fotis Kazasis**
B.Sc. in Computer Science and Engineering, University of Patras, Greece. M.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece.
Ioannis Maragoudakis  
B.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece. M.Sc. in Production Engineering and Management, Technical University of Crete, Greece.

Nektarios Moumoutzis  
B.Sc. in Computer Science, University of Crete, Greece. M.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece.

Kyprianos Papademetriou  

Nikolaos Pappas  
B.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece. M.Sc. in Electronic and Computer Engineering, Technical University of Crete, Greece.

Euripides Sotiriades  

Administrative Staff

Vasiliki Grigoraki  
Head Secretary.

Dimitra Athenaki  
Coordinator of Undergraduate Studies.

Eleni Stamataki  
Coordinator of Graduate Studies.

Agapi Karakatsani  
Textbooks and Supplies Administrator.

Laboratory Infrastructure

The teaching and research activities within the Department of Electronic and Computer Engineering are supported by ten laboratories which are listed below.

1. Automation Laboratory  
Director: Professor M. Zervakis  
This laboratory operates under the Division of Systems and serves the educational and research needs in the discipline of Systems Theory and Automatic Control.  
Research areas: Automatic Control Theory, Intelligent Control, Industrial Controllers, Neural Networks, Automated Fault Diagnosis and Repair, Diagnostic Systems in Medicine, Biomedical Systems, Robotics, Robotic Applications in Medicine, Industrial Control Processes, Production System Scheduling.

2. Digital Image and Signal Processing Laboratory  
Director: Professor M. Zervakis  
This laboratory operates under the Division of Telecommunications and conducts active research in applications related to the reception, identification, and diagnosis of operational problems in various signals used in Telecommunications, Industry, and Biomedicine.  
Research areas: Biomedical image and signal processing, Machine vision and non-invasive diagnosis methods, Search methods in image and video archives, Video processing, analysis and compression, Non-linear systems modeling using artificial intelligence methods, Neural networks and fuzzy logic systems, Time series processing.

3. Distributed Multimedia Information Systems and Applications Laboratory  
Director: Professor S. Christodoulakis  
This laboratory was established in 1990 and operates under the Division of Computer Science. It is a centre of research and development in the areas of distributed information systems, multimedia, graphics, human–computer interaction, large–scale web information systems, and business applications on the Internet.  
Research areas: Information retrieval systems, Internet search engines and agent technology, Digital libraries, Communication multimedia systems, Distributed collaborative environments and work flow management, Human–Computer Interaction, Applications in tourism and culture, electronic commerce, eLearning, Office automation, company automation. Distributed multimedia information...

4. Electric Circuits and Renewable Energy Sources Laboratory
   Director: Professor K. Kalaitzakis
This laboratory operates under the Division of Electronics and Computer Architecture and is active in the field of electrical circuits and renewable energy. Its research equipment includes high-precision oscilloscopes, generators, and multimeters, electric power quality analyzer, meters for various quantities, and microprocessor, DSPs and FPGAs development systems, as well as a wind-generator, a photovoltaic array, and a meteorological station with data acquisition system for the measurement of related quantities. Research areas: Sensors and measurement units. Development sensor, actuator, and computer networks. Development of electronic control systems based on fuzzy logic and neural networks. Decision support systems for industrial applications. Wind systems. Applications of photovoltaic units. Management and operation of electric power stations. Management in and optimization of systems with renewable energy sources. Intelligent energy management systems in buildings. Smart-card applications in health, security, billing, access, and energy saving. Biomedical and biomechanical units. Development of controlled inverters and electrical power converters.

5. Electronics Laboratory
   Director: Professor K. Kalaitzakis

6. Information and Computer Networks Laboratory
   Director: Professor V. Digalakis

7. Intelligent Systems Laboratory
   Director: Associate Professor E. Petrakis
This laboratory was founded in 2001 and operates under the Division of Computer Science. The current research activities cover various aspects of Artificial Intelligence, Intelligent Agents, Bioinformatics, Information Retrieval, Machine Learning, and Robotics. The robotic equipment of the laboratory includes quadrupedal Sony Aibo robots and bipedal humanoid Aldebaran Nao robots, which also form the robotic soccer team “Kouretes”. Research areas: System development and data analysis. Hyper-spectral imaging. Optical molecular imaging. Biophotonic medical diagnostic instruments. High-frequency microelectronics. Design and modeling of CMOS devices and circuits. Study, design, and evaluation of very large-scale integration (VLSI) circuits. Optoelectronic devices and applications. Development of optimal battery energy management, the voltage conversion, and uninterrupted power supply (UPS).
8. Microprocessor and Hardware Laboratory
   **Director:** Professor A. Dollas

This laboratory was founded in 1990 and operates under the Division of Electronics and Computer Architecture. Its activities revolve around issues of computer architecture and hardware. The laboratory is a member of the academic and research consortium EUROPRACTICE.


9. Software Technology and Network Applications Laboratory
   **Director:** Professor S. Christodoulakis

This laboratory operates under the Division of Computer Science and is a centre of research and teaching software systems’ technology and network applications. The research and teaching activities of the laboratory include operating and distributed systems, sensor networks, continuous data streams, large and distributed databases, and topics in algorithms and complexity.


10. Telecommunications Laboratory
    **Director:** Professor N. Sidiropoulos

This laboratory operates under the Division of Telecommunications and is active in the field of Telecommunications.


The current laboratory infrastructure was funded in part with the amount of 66,757€ by the European Program EPEAEK II (ETPA).
University Research Institutes

The Telecommunication Systems Research Institute (T.S.I.) [www.tsi.gr] is a Greek Government–sponsored independent Research Institute established by the Greek Ministry of National Education in 1995. Among the objectives of the Institute is to promote graduate education, research and development in the broad areas of Telecommunications and Telecommunication Systems.

The Institute provides technical support, space, research infrastructure, and access to cooperating faculty members and highly qualified R&D engineers with experience in project planning, execution, and management.

Incoming Student Registration

The means of acceptance to the ECE program of the Technical University of Crete, the size of the incoming freshman class, and the dates of enrollment and initial registration are determined by the Greek Ministry of National Education and the related legislation.

The enrollment and initial registration must be done in person or an by authorized person with appropriate notarized authorization document at the Secretariat of the Department.

Notarized authorization documents may be obtained at police stations or Citizen Service Centers, which verify the authenticity of the new student’s signature. The documents needed for initial registration and enrollment in the ECE Department are:

- Enrollment application (provided by the Secretariat of the Department)
- Secondary Education Certificate: Original or certified photocopy of the high school diploma
- Personal Statement of Liability (provided by the Secretariat of the Department), where the new student states that he/she is not enrolled in any other university program
- Photocopy of the personal identification document or a birth certificate
- Six (6) passport–type photographs
- Confirmation of access (certificate provided by the high school of graduation)

Issue of Student ID Card, Transportation Pass and Certificates

Each student, immediately after their initial registration and enrollment in the Department, is issued a Student Identification Card and a Transportation Pass – the latter qualifies the student for reduced fares in public transportation.

Upon request of a student, the Secretariat of the Department can issue registration and enrollment certificates for any legal use. These include the Certificate of Student Status (certifies that the student is indeed enrolled at the Technical University of Crete), the Certificate of Studies (required by the tax office and the army office), the Grade Transcript (detailed list of all courses completed by the student and the corresponding grades received in each one of them), and the Certificate of Completion of Studies (certifies that the student has completed all graduation requirements).

Student Status

The student status is earned upon initial registration and enrollment in the ECE Department and is lost upon graduation. The duration of study in the undergraduate program cannot exceed twenty (20) semesters, that is, twice the nominal duration of the program of study in the ECE Department. In exceptional cases, it is possible to extend the duration of study by two (2) additional semesters, following an application of the student justifying the extension request and subsequent approval by the General Assembly of the Department and the Senate of the Technical University of Crete. Student status is automatically lost upon expiration of the maximum duration of study.

Students are allowed to suspend their studies for up to ten (10) semesters in total by submitting a written request to the Secretariat of the Department. These semesters are counted towards the maximum duration of study. Students suspending their studies lose temporarily their student status for the period of suspension. Student status is restored immediately upon return from suspension.

After the completion of fourteen (14) semesters of study, the student retains the student status, however all student benefits are lost.
Student Benefits

All students are entitled to complete medical insurance by the University.

In case a student is entitled to direct or indirect medical coverage from another organization, he or she can choose the preferred medical insurance carrier by submitting a personal statement of liability to the Secretariat of the Department.

The Department offers a student support service aiming at providing advise for facilitating the transition of students from secondary to higher education and to supporting disabled students and students facing problems in their efforts to complete their studies successfully.

Student advising duties are assigned by the General Assembly to faculty members of the department for at least one academic year.

It is the responsibility of the Faculty Advisors to guide the students towards the successful completion of their studies.

Students can apply for various scholarships and interest-free loans, as shown below:

- **Scholarships from the Greek Scholarship Foundation:** The Greek Scholarship Foundation grants scholarships to the top students of each student class in the Department.

- **Merit Scholarships:** The merit scholarships are granted exclusively on academic excellence criteria. The nomination conditions and the selection process are determined by the Senate of the Technical University of Crete.

- **Campus Service Scholarships:** The campus service scholarships are granted in return of on-campus part-time work provided by the student to various services of the university up to forty (40) hours per month.

  The details of the nomination and award process are determined by the Senate and the Bylaws of the Technical University of Crete.

- **Interest-Free Loans:** Students facing serious financial difficulties are entitled to receive interest-free student loans from various credit agencies, provided they have received passing grades in all mandatory courses of their most recent semester of study and they have not exceeded the maximum duration of study.

  The loan is paid in installments at the end of each semester, assuming that the progress criterion in each semester is met.

  The loan is paid off in installments under concessional terms after five (5) years of professional occupation following graduation, but in any case within a maximum of fifteen (15) years from the date of the last loan installment. The procedure and the details of awarding student loans are determined jointly by the Greek Ministry of Economics and the Greek Ministry of National Education.

Placement Examinations

Graduates holding university-level degrees from other disciplines wishing to enroll in the ECE Department may do so, after passing successfully the written placement examinations in a small number of courses announced at the end of the spring semester of each academic year.

Applications for participation to these placement examinations are taken during the first half of November and the examinations are held at the beginning of December each year.

Each contestant is examined on the content listed in the corresponding courses in the ECE curriculum.
Program Structure

The academic year begins on September 1st of each year and ends on August 31st of the following year. The educational program of studies for each academic year is divided in two semesters. The courses offered by the ECE Department are semester-long and they include:

- lectures in class
- tutorials and recitations
- laboratory exercises
- practical training of the students
- seminars or other activities which are deemed necessary for the better coverage of the material

Undergraduate studies in the ECE Department last for ten (10) semesters including the submission of a complete diploma thesis during the last semester.

Regarding registration, transfers, placement, etc. to the ECE Department, the 1st and 2nd semesters are considered to be the 1st year of study, the 3rd and 4th semesters are considered to be the 2nd year of study, and so on up to the 10th semester.

Academic Semesters

The Fall Semester begins in the second half of September and the Spring Semester ends during the first half of June. The exact dates are determined by the Senate of the Technical University of Crete. Each semester includes at least thirteen (13) weeks of classes and two (2) weeks for examinations.

If, for any reason, the class hours completed in any course is less than the nominal number of hours for the working days of that semester, then the corresponding course becomes and is considered equivalent to not having been offered.

The holidays in the academic year are:

a. Fall Semester
   - October 28 (anniversary of Greece’s entry into the WWII)
   - November 17 (anniversary of the 1973 student unrest in Athens)
   - November 21 (the annunciation of Virgin Mary – patron Saint of Chania)

b. Spring Semester
   - Lenten Monday (the beginning of the Great Lent before Easter)
   - March 25 (Greece’s Independence Day)
   - The Holy Week and the Bright Week (Easter vacation – 2 weeks)
   - May 1 (Labor Day)
   - Student elections day (determined by the federation of student unions)

Curriculum Development

The detailed curriculum of the ECE Department is updated as needed at the end of the spring semester of each academic year and applies as of the following academic year. The curriculum entails:

- the titles of all courses
- the organization of courses in semesters of study
- the number of credit hours for each course
- the number of hours per week for lectures, tutorials, and laboratories for each course
- the recommended prerequisites for each course
- a detailed description of topics covered in each course

Coursework is divided in two categories: (a) core or mandatory courses, and (b) elective or optional courses.

The first category includes courses that provide the fundamental core knowledge to the students; all of them must be completed successfully.

The second category includes a large number of courses on specialized topics; the student must choose and complete successfully a sufficient number of elective courses to meet the graduation requirements.

The recommended ordering of courses given in the curriculum and their organization in semesters is indicative and not mandated. Nonetheless, it corresponds to a nominal flow under normal study conditions, it accounts for the minimum number of
semesters towards graduation, and it takes into account the recommended prerequisite courses for each course. This ordering constitutes the Nominal Curriculum in the ECE Department, and it secures the most natural and recommended schedule of course registration that facilitates the completion of the entire program of studies in the ECE Department within the nominal duration of five (5) years.

Course Registration

Each student must register for the courses he/she wants to attend in a semester during the three–week registration period at the dates determined and announced by the Department. The completed course registration form is submitted to the Registrar’s Office of the Department and includes the student’s choices for textbooks in each course. Each student may add/drop courses within two weeks from the end of the registration period.

The Registrar’s Office checks for the validity of the registrations and finalizes the course enrollment lists and the textbook lists for each course. The student enrollment lists are distributed to the course instructors and the textbook lists are given to the service handling the supply and distribution of the free textbooks. Students cannot attend nor be examined in a course in which they are not officially enrolled.

There is a quota to the number of courses in which a student can enroll (from the current, earlier, or later semesters), which differs depending on the student’s current semester of study:

- up to nine (9) courses, for students in the 1st – 4th semesters of study
- up to eleven (11) courses, for students in the 5th – 8th semesters of study
- up to fifteen (15) courses, for students in the 9th semester of study or beyond

It is noted that students cannot enroll to more than two (2) courses from later semesters in each enrollment period. In addition, it is not allowed to enroll into the core courses of a semester without first completing successfully all those core courses from previous semesters which are considered prerequisites for later core courses, according to the Nominal Curriculum.

Undergraduate students who satisfy certain criteria may enroll in graduate courses (if they are offered during that semester) with the instructor’s consent. In these cases, upon successful completion of the graduate course and with the approval by the Department’s General Assembly, the course may be taken into account as an elective course towards meeting the graduation requirement.

In case a student enrolled in a course, but did not successfully complete it, and this course (a) is eliminated from the curriculum, (b) is replaced with an equivalent course, or (c) is not offered for some time, the student has to complete this course requirement by taking another (core or elective) course from the same area of concentration with the approval of the Department’s General Assembly.

Very good knowledge of the English language is necessary for making progress in the Department’s curriculum, given that the largest part of relevant literature is in English, and also that there is no standardized Greek terminology for a significant fraction of the material.

Field Trips

Within the scope of core courses of the 3rd, 4th and 5th years of study field trips are organized to foster practical training. The field trips last up to one week and they include visits to industrial facilities and research centers.

The field trips take place during the second week after Easter vacations and they are held only if attendance exceeds 70% of the corresponding year’s student population.

Course Grading

The progress of a student during the semester and his/her performance are evaluated according to the compliance of the student with the course obligations in the aspects of class attendance, homework completion and submission, laboratory attendance and submission of laboratory reports, possible oral examination in laboratory exercises, mid–term exams, etc., depending on the educational requirements of each course.
The grading method for each class is determined by the instructor who is charged to arrange for written and/or oral examinations, according to his judgment, and/or give homework and projects and/or laboratory exercises.

Students have the opportunity to participate in two (2) examination periods for each semester.

For the Fall Semester the first examination period takes place in January, whereas the second examination period takes place in September.

For the Spring Semester the first examination period takes place in June, whereas the second examination period takes place in September as well.

Students who do not satisfy the requirements for successful completion of a course even after the second examination period have to enroll again in that course in a subsequent semester and perform all required duties regarding attendance and examination for that class.

The grading scale in all courses is expressed in a 0–10 scale, including a fractional part (multiples of half point – 0.5), and the minimum passing grade for each class is five (5.0). The performance of the student according to the grades received is categorized as follows:

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE</th>
<th>GRADE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>POOR</td>
<td>from 0 to 3 (not including 3)</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>from 3 to 5 (not including 5)</td>
</tr>
<tr>
<td>GOOD</td>
<td>from 5 to 6.5 (not including 6.5)</td>
</tr>
<tr>
<td>VERY GOOD</td>
<td>from 6.5 to 8.5 (not including 8.5)</td>
</tr>
<tr>
<td>EXCELLENT</td>
<td>from 8.5 to 10</td>
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</tbody>
</table>

**Diploma Thesis**

All students are required to complete a Diploma Thesis, which includes a substantial amount of work and a final written report on a well-defined project related to the subjects of the Divisions of the ECE Department. The diploma thesis is completed under the supervision of one or more faculty members of the Department, who acts as the student’s advisor. The General Assembly of the Department has determined that:

- All Divisions of the Department announce topics and offer diploma thesis options to all students. Topics may be taken from a different Department, with the approval of the Department’s General Assembly. Each faculty member of the Department announces topics for Diploma Thesis in each academic year. Students desiring to pursue a particular topic ought to get in touch with the desired advisor and fill out the appropriate form for diploma thesis assignment distributed by the Secretariat of the Department.

- The three-member examination committee of the thesis is appointed by the General Assembly after a recommendation by the faculty advisor of a diploma thesis topic.

- The chair of the three-member examination committee is the faculty supervisor of the thesis and must be a faculty member of the ECE Department. It is permissible to include at most one faculty member, or adjunct assistant professor, or visiting professor, or researcher of another recognized academic or research institution in the committee, as long as this person is a Ph.D. holder.

- The assignment of diploma thesis topics is done during the last two semesters of studies. The assignment of a topic is allowed only if a student has two (2) or fewer courses left to complete the course requirements. The oral examination of a student on his/her diploma thesis is allowed only after the completion of all coursework required by the curriculum of the Department.
• Following its completion, the diploma thesis is presented to an open audience and is graded by the three–member examination committee. The presentation of a diploma thesis can be done anytime throughout the academic year, except for the vacation periods. Nevertheless, the presentations of the thesis must take place within twenty (20) days of the completion of some examination period for receiving the diploma degree in the graduation that follows that examination period. The exact date and time of the oral presentation is determined in cooperation with the members of the three–member examination committee.

• Each diploma thesis is graded in the 0–10 scale by taking the average of the grades given by the three committee members to each of the following three criteria with the corresponding percentages: quality of technical content (50%), quality of written report (30%), and quality of oral presentation (20%).

In case of collaborative work among two or more students, which is allowed only following the approval of the Department’s General Assembly, each student is graded separately for his/her contribution to the diploma thesis and his/her oral presentation.

Diploma Grade and Characterization

The final grade of the diploma is computed using the average grade over all courses required for graduation weighted by 80% and the grade of the diploma thesis weighted by 20%.

For computing the average grade over courses, the grade in each course is multiplied by a weight coefficient which depends on its credit hours and the sum of these partial products is divided by the sum of the weight coefficients of all courses.

English I, II, and III are not taken into account in computing the average grade over courses.

The weight coefficients of each course are determined according to their credit hours, as shown in the table below.

<table>
<thead>
<tr>
<th>CREDIT HOURS</th>
<th>WEIGHT COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 2</td>
<td>1,0</td>
</tr>
<tr>
<td>3 – 4</td>
<td>1,5</td>
</tr>
<tr>
<td>5</td>
<td>2,0</td>
</tr>
</tbody>
</table>

If a student has completed successfully more courses than those required for graduation, the elective courses with the lowest grades are excluded from the calculation of the average grade over courses, provided that the remaining courses satisfy the coursework requirement. Nevertheless, all courses completed successfully appear on the grade transcript of the student.

The diploma is characterized depending on the final grade, as follows:

Graduation Requirements

The requirements for graduating with the diploma in Electronic and Computer Engineering are:

• Registration in the Department and enrollment in classes for at least nine (9) of the ten (10) semesters, for regularly enrolled students.

• Successful completion of forty–nine (49) courses in total, that is, all of the thirty–five (35) core courses and a selection of fourteen (14) elective courses (under some restrictions explained below).

• Successful collection of at least 176 credit hours from successfully completed courses.

• Successful completion of a diploma thesis.
The ranking of each graduating class is determined each September, following the second examination period, and includes all students who graduated either in the fall or in the spring semester of the past academic year.

The ranking is according to the students' final diploma grade, regardless of their initial registration and enrollment date. This ranking is used for the award of scholarships, honors, etc.

Annual Grade and Ranking

The annual grade of a student is the average grade over the courses he/she completed successfully in the past academic year. The annual grade is calculated only for student who have completed successfully all courses of the nominal curriculum in the two semesters of the past academic year.

The calculation is similar to the one for the final grade of the diploma (multiplication of each course grade with the corresponding weight coefficient, summation of the partial products, and division by the sum of all weight coefficients), however only the core and elective courses of the nominal curriculum in the past academic year are taken into account.

Additional courses, which may have been completed, successfully by the student, as well as English I, II, and II are not taken into account.

The annual rankings are determined each September, following the second examination period, separately for the students of each of the five (5) years of studies who successfully completed all coursework in the nominal curriculum up to their year of study.

For the first four (4) years in the program, following a student's initial registration, the year of studies is considered to be the corresponding academic year.

Beyond the fourth year, all students are considered to be in the fifth year of studies.

The annual rankings are used for the award of scholarships, honors, etc.

Transfer of Coursework

It is possible only for students enrolled in the ECE Department's undergraduate program through transfer from another university or placement examinations to transfer coursework performed in other universities and count it towards their graduation from the ECE Department. In order to do so, the following conditions must be met:

• The student must have successfully completed the course he/she wants to transfer in a different Department of the Technical University of Crete or in another university in Greece or abroad.

• The Undergraduate Studies Committee, in cooperation with the corresponding instructor, determines the equivalence of the course material of the requested course to the material of the corresponding course in the ECE curriculum, as described in the Undergraduate Studies Guide.

• In case of equivalence, the credit hours of the equivalent ECE course are credited to the student. If this course was taken at a Greek university the grade is transferred as well. However, if the recognized course was taken at a university abroad, the student gets credited with the corresponding credit hours, but the grade is not transferred. In such cases, the annual grade and the final diploma grade of the student are calculated only from courses with grades.

• In cases of non-equivalence, the Undergraduate Studies Committee makes a recommendation to the General Assembly, which takes a final decision for the recognition or not of the requested course.

Regarding the first two English courses (English I and II), students who are certified at C2 level according to the Common European Framework of Reference for Languages may bring a certified copy of their diploma at the beginning of the semester at the Language Research and Resources Center to receive automatically a grade of 8.0 without examination.
Areas of Concentration

All courses of the ECE Department fall under six (6) areas of concentration:

1. ARCHITECTURE, CIRCUITS AND ELECTRONICS [ACE]
   This area covers subjects related to analysis and design of analog and digital electric and electronic systems, computer hardware, computer architecture, real–time microprocessor systems, implementation of digital systems, and CAD tools. It is covered by the Division of the Electronics and Computer Architecture.

2. SYSTEMS [SYS]
   This area covers subjects related to systems theory, automatic control, optimal control, neural networks, fuzzy logic, biomedical applications, and quality assurance. It is covered by the Division of Systems.

3. TELECOMMUNICATIONS [TEL]
   This area covers subjects related to telecommunications systems, telephony systems, antennas, microwaves, information and coding theory, computer networks, wireless communication systems, voice and image processing, speech recognition, and natural language processing. It is covered by the Division of Telecommunications.

4. COMPUTER SCIENCE [COMP]
   This area covers subjects related to programming principles, algorithms, data structures, programming languages, compilers, operating systems, artificial intelligence, agents, graphics, and software engineering. It is covered by the Division of Computer Science.

5. APPLICATIONS OF THE INFORMATION SOCIETY [AIS]
   This area covers subjects related to modern applications of computer science, office automation, human–computer interaction, design and development of information systems, and user satisfaction. It is covered by the Division of Computer Science.

6. POWER ENERGY SYSTEMS [POW]
   This area covers subjects related to power systems, electrical engines, power generation, electric power distribution networks. It is covered by the Division of Electronics and Computer Architecture.

Courses offered by other departments fall under the following scientific areas:

1. MATHEMATICS [MATH]
   This area covers subjects in basic and advanced mathematics for engineers, differential and integral calculus, differential equations, probability, linear algebra, and applied mathematics. It is covered by the Division of Mathematics of the Department of Sciences.

2. PHYSICS [PHYS]
   This area covers subjects in physics for engineers. It is covered by the Division of Physics of the Department of Sciences.

3. CHEMISTRY [CHEM]
   This area covers subjects in chemistry for engineers. It is covered by the Division of Chemistry of the Department of Sciences.

4. SOCIETY, SCIENCE, CULTURE [SSC]
   This area covers subjects in humanities, sociology, philosophy, history of science, public policy, and law. It is covered by the Division of Humanities of the Department of Sciences.

5. PRODUCTION AND MANAGEMENT [PMA]
   This area covers subjects in production, management, industrial design, and computer–aided design. It is covered by the Department of Production Engineering and Management.

6. LANGUAGE [LANG]
   This area covers the use of foreign languages. It is covered by the Languages Research and Resources Center.
Course Numbering

For easy reference to the courses of the ECE Department, their codes are developed as follows:

- the code begins with a three- or four-letter code declaring the area of concentration of the course
- the code ends with a three–digit numeric code
- the first digit is the year of study to which the course belongs nominally
- the second digit is 0 for fall semester courses and 1 for spring semester courses
- the third digit is an index to the course in the corresponding area of concentration

Nominal Curriculum

The concise tables below show the organization of all courses in the curriculum in academic semesters. For each course, the title, the code, the credit hours (Cre), the lecture hours per week (Lec), the tutorial hours per week (Tut), the laboratory hours per week (Lab), and the recommended prerequisite courses are given.

The last table lists all the elective courses offered by the ECE and other Departments from which students are free choose to complement their program of study, along with some constraints these choices must satisfy.

1st Semester

<table>
<thead>
<tr>
<th>TITLE</th>
<th>CODE</th>
<th>Cre</th>
<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Computer Science</td>
<td>COMP 101</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>Logic Design</td>
<td>ACE 101</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>Differential and Integral Calculus I</td>
<td>MATH 101</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Linear Algebra</td>
<td>MATH 201</td>
<td>3</td>
<td>3</td>
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<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Physics I</td>
<td>PHYS 101</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>English I</td>
<td>LANG 101</td>
<td>2</td>
<td>4</td>
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<td>–</td>
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</tr>
<tr>
<td>Elective courses</td>
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</tr>
<tr>
<td>Discrete Mathematics</td>
<td>MATH 208</td>
<td>3</td>
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<td>–</td>
<td>–</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>CHEM 101</td>
<td>3</td>
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### 2nd Semester

<table>
<thead>
<tr>
<th>TITLE</th>
<th>CODE</th>
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<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured Programming</td>
<td>COMP 111</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>COMP 101</td>
</tr>
<tr>
<td>Differential and Integral Calculus II</td>
<td>MATH 102</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>MATH 101</td>
</tr>
<tr>
<td>Ordinary Differential Equations and Difference Equations</td>
<td>MATH 203</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>MATH 201</td>
</tr>
<tr>
<td>Probability Theory – Statistics</td>
<td>MATH 107</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>Physics II</td>
<td>PHYS 102</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>MATH 101</td>
</tr>
<tr>
<td>English II</td>
<td>LANG 102</td>
<td>2</td>
<td>4</td>
<td>1</td>
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</tr>
</tbody>
</table>

**Elective courses**

- Symbolic and Discrete Structures: COMP 112
- Numerical Analysis: MATH 202
- Applied Mathematics: MATH 302

### 3rd Semester

<table>
<thead>
<tr>
<th>ΟΝΟΜΑ</th>
<th>ΚΩΔΙΚΟΣ</th>
<th>ΔΜ</th>
<th>ΔΙ</th>
<th>ΦΡ</th>
<th>ΕΠ</th>
<th>ΣΥΝΙΣΤ. ΠΡΟΑΠΑΙΤ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object–Oriented Programming</td>
<td>COMP 201</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>COMP 111</td>
</tr>
<tr>
<td>Signals and Systems</td>
<td>TEL 201</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>MATH 101, MATH 102, MATH 201, COMP 111</td>
</tr>
<tr>
<td>Digital Computers</td>
<td>ACE 201</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>ACE 101, COMP 111</td>
</tr>
<tr>
<td>Basic Circuit Theory</td>
<td>ACE 202</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>MATH 101, MATH 201</td>
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<tr>
<td>English III</td>
<td>LANG 201</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
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</tr>
</tbody>
</table>

**Elective courses**

- Software Development Tools and Systems Programming: COMP 202
- Electromagnetic Signals and Antennas: TEL 202

### 4th Semester

<table>
<thead>
<tr>
<th>TITLE</th>
<th>CODE</th>
<th>Cre</th>
<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data and File Structures</td>
<td>COMP 211</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>COMP 201</td>
</tr>
<tr>
<td>Probability and Random Signals</td>
<td>TEL 211</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>MATH 107, TEL 201</td>
</tr>
<tr>
<td>Advanced Logic Design</td>
<td>ACE 211</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>ACE 101</td>
</tr>
<tr>
<td>Electric Circuits Analysis</td>
<td>ACE 212</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>ACE 202, MATH 201</td>
</tr>
<tr>
<td>English IV</td>
<td>LANG 202</td>
<td>2</td>
<td>4</td>
<td>1</td>
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</tr>
</tbody>
</table>

**Elective courses**

- Introduction to Energy Technology I: POW 211
- Computer–Aided Design: PMA 423
### 5th Semester

<table>
<thead>
<tr>
<th>TITLE</th>
<th>CODE</th>
<th>Cre</th>
<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Systems</td>
<td>COMP 301</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>COMP 211</td>
</tr>
<tr>
<td>Telecommunication Systems I</td>
<td>TEL 301</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>MATH 102, TEL 201, TEL 211</td>
</tr>
<tr>
<td>Digital Signal Processing</td>
<td>TEL 302</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>TEL 201</td>
</tr>
<tr>
<td>Electronics I</td>
<td>ACE 301</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>ACE 212</td>
</tr>
</tbody>
</table>

**Elective courses**

- Statistical Modelling and Pattern Recognition | TEL 303 | 4 | 3 | 2 | 1 | MATH 102 |
- Introduction to Energy Technology II        | POW 301 | 4 | 3 | 1 | 2 | POW 211 |
- Simulation                                 | PMA 501 | 4 | 3 | – | 2 | –               |
- Sociology                                   | SSC 101 | 3 | 3 | – | – | –               |
- Art and Technology                          | SSC 301 | 3 | 3 | – | – | –               |
- Philosophy and History of Science           | SSC 203 | 3 | 3 | – | – | –               |

### 6th Semester

<table>
<thead>
<tr>
<th>TITLE</th>
<th>CODE</th>
<th>Cre</th>
<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Databases</td>
<td>COMP 311</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>COMP 211, COMP 301</td>
</tr>
<tr>
<td>Telecommunication Systems II</td>
<td>TEL 311</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>TEL 201, TEL 211, TEL 301</td>
</tr>
<tr>
<td>Electronics II</td>
<td>ACE 311</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>ACE 101, ACE 301</td>
</tr>
<tr>
<td>Computer Organization</td>
<td>ACE 312</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>ACE 201, ACE 211</td>
</tr>
</tbody>
</table>

**Elective courses**

- Digital Image Processing                   | TEL 312 | 4 | 3 | 1 | 3 | TEL 302 |
- Political Economy                          | SSC 102 | 3 | 3 | – | – | – |
- Introduction to Philosophy                 | SSC 104 | 3 | 3 | – | – | – |
- History of Civilization                    | SSC 202 | 3 | 3 | – | – | – |

### 7th Semester

<table>
<thead>
<tr>
<th>TITLE</th>
<th>CODE</th>
<th>Cre</th>
<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Systems</td>
<td>SYS 401</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>TEL 201</td>
</tr>
<tr>
<td>Algorithms and Complexity</td>
<td>COMP 401</td>
<td>4</td>
<td>3</td>
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<td>COMP 211</td>
</tr>
<tr>
<td>Computer Networks I</td>
<td>TEL 401</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>TEL 211, MATH 107</td>
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</tbody>
</table>

**Elective courses**

- Introduction to Speech Processing         | TEL 402 | 4   | 3   | 1   | 2   | TEL 201, TEL 211, TEL 302  |
- Wireless Communications                    | TEL 403 | 4   | 3   | 2   | –   | TEL 301                    |
- Principles of Programming Languages       | COMP 402 | 4   | 3   | 1   | 2   | COMP 211                   |
- Web Information Systems                    | AIS 403 | 4   | 3   | 1   | 2   | COMP 311                   |
### 7th Semester (cont.)

<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
<th>Cre</th>
<th>Lec</th>
<th>Tut</th>
<th>Lab</th>
<th>Prerequisites</th>
</tr>
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<tbody>
<tr>
<td>Multimedia Management Methods</td>
<td>AIS 404</td>
<td>4</td>
<td>3</td>
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<td>2</td>
<td>COMP 211, COMP 311</td>
</tr>
<tr>
<td>Machine Vision</td>
<td>AIS 405</td>
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<td>3</td>
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<td>TEL 312</td>
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<tr>
<td>Advanced Issues in Databases</td>
<td>COMP 406</td>
<td>4</td>
<td>3</td>
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<td>COMP 311</td>
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<tr>
<td>Fuzzy Logic Technology and Applications</td>
<td>SYS 402</td>
<td>4</td>
<td>3</td>
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</tr>
<tr>
<td>Embedded Computer Systems</td>
<td>ACE 401</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>ACE 312, COMP 301</td>
</tr>
<tr>
<td>Electric Measurements and Sensors</td>
<td>ACE 402</td>
<td>4</td>
<td>3</td>
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<td>ACE 311, ACE 312</td>
</tr>
<tr>
<td>Biomedical Electronics</td>
<td>ACE 403</td>
<td>4</td>
<td>3</td>
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<td>ACE 301</td>
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<tr>
<td>Introduction to the Legal System and to the Technical Legislation</td>
<td>SSC 204</td>
<td>4</td>
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<tr>
<td>Micro– and Macro– Economic Analysis</td>
<td>SSC 201</td>
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### 8th Semester

<table>
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<tr>
<th>Title</th>
<th>Code</th>
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<th>Tut</th>
<th>Lab</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory of Computation</td>
<td>COMP 411</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>COMP 401</td>
</tr>
<tr>
<td>Theory and Applications of Automatic Control</td>
<td>SYS 411</td>
<td>4</td>
<td>3</td>
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<td>SYS 401</td>
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<tr>
<td><strong>Elective courses</strong></td>
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<tr>
<td>Information, Semantics, and Services in the Web</td>
<td>AIS 412</td>
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#### Elective courses

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### 10th Semester

DIPLOMA THESIS
Notes

Students are required to complete successfully at least fourteen (14) elective courses subject to the following constraints:

- At least eight (8) courses from the ECE Department:

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<td>SYS 411, SYS 402, SYS 413, SYS 401, SYS 414</td>
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<tr>
<td>Applications of Neuro–Fuzzy Logic in Control Systems</td>
<td>SYS 504</td>
<td>4</td>
<td>3</td>
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<td>SYS 401, SYS 412</td>
</tr>
<tr>
<td>Optimal Control</td>
<td>SYS 505</td>
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<td>SYS 411</td>
</tr>
<tr>
<td>VLSI and ASIC System Design</td>
<td>ACE 501</td>
<td>4</td>
<td>3</td>
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<td>2</td>
<td>ACE 312</td>
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<tr>
<td>Electronic System Testing</td>
<td>ACE 502</td>
<td>4</td>
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<td>ACE 312</td>
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<tr>
<td>Analog CMOS Design</td>
<td>HPY 503</td>
<td>4</td>
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<td>ACE 301, ACE 311</td>
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<tr>
<td>Modern Topics in Electronics and Computer Architecture</td>
<td>HPY 52x</td>
<td>4</td>
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### Detailed Curriculum

- At most three (3) courses from the Department of Sciences and the Department of Production Engineering and Management:

<table>
<thead>
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<th>TITLE</th>
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<th>Lab</th>
<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Chemistry</td>
<td>CHEM 101</td>
<td>3</td>
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<tr>
<td>Discrete Mathematics</td>
<td>MATH 208</td>
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<tr>
<td>Numerical Analysis</td>
<td>MATH 202</td>
<td>4</td>
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<td>MATH 201</td>
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<tr>
<td>Applied Mathematics</td>
<td>MATH 302</td>
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<td>MATH 101, MATH 201</td>
</tr>
<tr>
<td>Computer–Aided Design</td>
<td>PMA 423</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Simulation</td>
<td>PMA 501</td>
<td>4</td>
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<tr>
<td>Computer–Aided Manufacturing</td>
<td>PMA 421</td>
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<tr>
<td>Robotics</td>
<td>PMA 502</td>
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</tbody>
</table>

- At most three (3) courses from the following humanities courses:

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<th>TITLE</th>
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<th>PREREQUISITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociology</td>
<td>SSC 101</td>
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<tr>
<td>Political Economy</td>
<td>SSC 102</td>
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<tr>
<td>Introduction to Philosophy</td>
<td>SSC 104</td>
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<tr>
<td>Micro- and Macro- Economic Analysis</td>
<td>SSC 201</td>
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<tr>
<td>History of Civilization</td>
<td>SSC 202</td>
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<tr>
<td>Philosophy and History of Science</td>
<td>SSC 203</td>
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<tr>
<td>Introduction to the Legal System and to the Technical Legislation</td>
<td>SSC 204</td>
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<tr>
<td>Art and Technology</td>
<td>SSC 301</td>
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<tr>
<td>Industrial Sociology</td>
<td>SSC 302</td>
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</table>

Students are advised to pay particular attention in choosing their elective courses to meet the required number of credit hours for graduation.
Detailed Course Descriptions

The pages below list detailed descriptions of all courses in the curriculum. The ordering of the listing follows the ordering of the courses in the nominal curriculum of the ECE Department.

1st Semester

Introduction to Computer Science COMP 101

Logic Design ACE 101

Differential and Integral Calculus I MATH 101

Linear Algebra MATH 201
Linear spaces, base and dimension of a linear space, inner product spaces, orthogonality, matrices, matrix rank, column and row spaces, fundamental problems in linear algebra, systems of linear equations, determinants, linear mappings, linear mapping matrices, eigenvalues and eigenvectors, eigenspaces, quadratic forms, positive definite matrices, case–studies and applications of linear algebra.

Physics I PHYS 101
Linear motion, motion on the plane, vectors, Newton’s laws, gravitational forces, estimation of the acceleration of gravity from free fall, friction forces, estimation of the friction factor of surfaces in contact. Momentum, conservation of momentum, centre of mass. Kinetic and dynamic energy, law of energy conservation, work, power, conservative forces, relation between force and dynamic energy. Circular motion of a particle, rotation of a rigid body, estimation of angular acceleration, torque, and frictional torque, general condition of mechanical equilibrium. Angular momentum of particles and rigid bodies, angular momentum conservation law. Simple harmonic oscillator, simple, compound, and torsional pendulum, estimation of the spring constant and estimation the acceleration of gravity using a simple pendulum, estimation of the torque of a body using a doubly–supported pendulum. Restricted motion, generalized coordinates, Hamilton’s equations of motion. Electric field, Coulomb’s Law, motion of a charge in an electric field. Gauss’ Law and applications. Electric potential, electric potential difference, electric dipole, electric dynamic energy, estimation of electrostatic field from potential measurements. Simple electric circuits, Kirchhoff’s rules, charging and discharging effect of a capacitor.

English I LANG 101
English grammar and development of writing and oral skills in English at B2 level.

Discrete Mathematics MATH 208

General Chemistry CHEM 101
Atomic Structure. Introduction to Quantum Chemistry. Elementary particles. Atomic orbitals. Electronic config-

2nd Semester

Structured Programming COMP 111

Differential and Integral Calculus II MATH 102

Ordinary Differential Equations and Difference Equations MATH 203

Probability Theory – Statistics MATH 107

Physics II PHYS 102

English II LANG 102
Development of writing and oral skills in English at C2 level with emphasis on reading and writing academic texts.

Symbolic and Discrete Structures COMP 112
Basic set theory: algebra, finite and infinite sets, countable and uncountable infinite sets, power sets, diagonalisation. Relations and functions: properties of binary relations, equivalence relations and partitions,

Numerical Analysis MATH 202

Applied Mathematics MATH 302

3rd Semester

Object-Oriented Programming COMP 201
In depth study of the object-oriented model, object oriented design patterns and requirements analysis and modeling of large object oriented applications. Classes, interfaces, privileges. Special topics of object management (creation and destruction of objects). Code re-usability: inheritance, polymorphism of objects) encapsulation, overloading, exception management, multi-threading. Introduction to object oriented design patterns. The basic principles of a design pattern, composition, decoupling. Pattern categories for generating objects, for organization of objects and classes, for task oriented support. Introduction to Requirements Analysis and Design in large object oriented applications using UML. Use Cases, Class Diagrams, Robustness Diagrams, Sequence Diagrams.

Signals and Systems TEL 201
Signals, systems, signal processing, continuous and discrete time signals, periodic and aperiodic signals, energy and power signals. Continuous and discrete time systems, analysis of linear time-invariant systems, convolution, input-output stability (BIBO). Study of signals and systems with the use of MATLAB. Sinusoidal signals, harmonically related signals, Fourier series of a periodic signal. Continuous-time Fourier transform, properties and applications of Fourier transform, Fourier transform of a periodic continuous-time signal, discrete-time Fourier transform, Nyquist sampling theorem. Amplitude modulation, frequency multiplexing, angle modulation, applications of modulation in telecommunications systems, AM and FM. Laplace transform, region of convergence, inverse Laplace transform, properties and applications of Laplace transform.

Digital Computers ACE 201
Basic computer organization: processor, memory and peripherals, machine code, assembly language, assembly programming. Processor programming model, instructions, instruction sets, addressing modes, interrupts and traps. Binary number representation (integer and floating point), arithmetic operations: addition/subtraction, multiplication, division. Computer memory systems, stack. Laboratory exercises using microprocessors or simulators.

Basic Circuit Theory ACE 202
Lumped electric elements and circuits, Kirchhoff’s cur-
rent (KCL) and voltage law’s (KVL), Tellegen theorem, basic circuit elements (resistors, capacitors, inductors, transformers, independent sources, two–terminal elements), waveforms, small–signal analysis, introduction to Linear Time–invariant Circuits, analysis of first order, second order and higher order linear circuits (differential equations, zero input response, zero state response, complete response, transient and steady state response, impulse response, step response), basic principles of the node and mesh analysis methods for linear circuits analysis, state equations, Laplace Transforms (definition, fundamental properties, solutions of simple circuits, solution of linear differential equations and of general networks, state equations solution, applications), network (transfer) functions (poles, zeros and frequency response, impulse response, natural frequencies of a network, Bode diagram, application to oscillator and filter design).

**English III** LANG 201

Self–learning program at the Language Research and Resources Center using educational material designed to improve oral, writing, and comprehension skills.

**Software Development Tools and Systems Programming** COMP 202


**Electromagnetic Signals**

and Antennas TEL 202

Time–Varying Fields (Maxwell equations, wave equation, scalar and vector potentials, Poynting theorem). Electromagnetic wave plane (transmission of wave plane on non–conducting media, polarization of wave plane, transmission of wave plane in non–perfect insulation media, field within conducting media, diffusion equation, transmission of wave plane in random direction, team velocity, theorem of reciprocity). Reflection and refraction of wave plane (Laws, Fresnel equations, total reflection, reflection and refraction energy coefficients, vertical and lateral encounter with lossy means, static wave encounter in dielectric plate, radiation pressure, scattering of electromagnetic wave). Bipolar linear antennas, directional and gain antennas, example applications. Uniform and non–uniform antenna arrays, Yagi–Uda antenna array, example applications. Surface antennas and receiving antennas (antenna as receiver, active surface antenna). Friis equation, Radar equation, antenna temperature. Transmission in earth space (tropospheric transmission and refraction, interruption phenomena, ionospheric transmission, example applications).

**4th Semester**

**Data and File Structures** COMP 211


**Probability and Random Signals** TEL 211


**Advanced Logic Design**

ACE 211


**Electric Circuits Analysis**

ACE 212

Fundamental circuit elements (resistors, capacitors, inductors, independent voltage and current sources), ideal elements, approximations, parasitic effects, equivalent circuits, associated reference direction, passive and active elements, linearity, variables – parameters – instantaneous values, characteristic curves, power and energy. Simple circuits, Kirchhoff's laws, basic connections, resistor bridge, ladder network, sensitivity analysis. Sinusoidal Steady State, complex numbers, theorems and lemmas for SSS, phasors, sinusoidal excitation (partial solution and complete response), impedance – admittance, parallel and series RLC resonant circuits, resonance frequency, overcurrent and overvoltage, quality factor, network functions, the decibels, frequency response, filters, real or average power, complex power, reactive power, power factor, effective or root mean square values, maximum power transfer theorem. Coupled inductors, transformers, coefficient of coupling, multi-winding transformers, ideal transformer, transformer equivalent, controlled or dependent voltage and current sources, coupled branches, power of transformer and dependent source. Network graphs, subgraph, oriented graph, connected graph, incidence matrix, cut-set, loop. Node and mesh analysis, equations by inspection, sources and branches transformations, planar graph, mesh, outer mesh, dual graphs and dual networks. Network theorems, substitution theorem, superposition theorem, Thevenin – Norton theorem, reciprocity theorem. Two-ports, two-ports or one-ports, four-ports, terminated two-ports, open-circuit or impedance or Z parameters, short-circuit or admit-

tance or Y parameters, hybrid H parameters, hybrid G parameters, transmission or ABCD parameters, reverse transmission parameters, small-signal analysis.

**English IV**

LANG 202

Study of text and vocabulary using technical material for engineers.

**Introduction to Energy Technology I**

POW 211

Basic concepts, ac circuits, power, triphase systems, symmetrical components, the system unit (per-unit). Historical development of electric power systems, power plants, the transmission system, and the distribution system. The Greek electricity system, quantitative data. Synchronous generators, principle of operation, structural components, circuit model of turbine generator, power relations, operational limits of turbine generators. The power transformer, circuit model, triphase joints of windings, voltage-current relation in triphase transformers. Inductive engines, operating principles, structural components, circuit model, relation of torque and power. Operation of engines, generators, and brakes, starting and adjusting the speed of induction engines.

**Computer-Aided Design**

PMA 423

Design using computers, role in the process of studying a product, applications – design systems, three-dimensional modeling systems, wire models, surface models, solid models, representation of curves and surfaces using Ferguson, Bezier, B-Splines, and NURBS methods. Solid modelling systems, constructive solid geometry, Limited representation (B-Rep).

**5th Semester**

**Operating Systems**

COMP 301


Telecommunication Systems I  TEL 301

Digital Signal Processing  TEL 302

Electronics I  ACE 301
Semiconductor physics, p–n diode, special diodes (LED diode, Schottky diode, variable capacitance diode, zener diode), applications of diodes (voltage rectifier–regulator–multiplier, logic gates), bipolar transistors (BJT), common emitter–base–collector configurations, hybrid transistor models, transistor characteristics and bias, amplifiers, JFET, MOSFET transistors, integrated circuit development technologies.

Statistical Modeling and Pattern Recognition  TEL 303

Introduction to Energy Technology II  POW 301
The transmission system, electric power cables, components and specifications. The short transmission line, circuit model, power relations, voltage regulation. Control of voltage drop, offsetting unused power. Electricity conservation, system loads, costing and pricing of electricity, electricity market liberalization. Power electronics, AC/DC converters, applications. Electrical installations for buildings and industrial facilities, regulations and safety of people and equipment of low and medium voltage, specifications of installations, means of implementation, planning and sizing.

Simulation  PMA 501
Simulation of production systems and waiting lines, modeling of discrete event systems, statistical estimation techniques for measuring performance and comparing systems, variance reduction techniques, introduction to perturbation analysis, optimization, simulation software.

Sociology  SSC 101
Introduction to Sociology. Analytic and synthetic study of concepts related to the social framework in which of production activity of people takes place: society, social position and role, social changes, social stratification and mobility, social classes, socio–political institutions, socio–economic institutions and societal transformations.

Art and Technology  SSC 301
Technology and Art in the social structure. Technology as objectification, as a framework for the human impact on nature and for the relations among people, as a fore-
running conception—knowledge and as an instrument implicating upon Nature. The particularity of the aesthetic moment. The aesthetic moment as a specific activity in the division of labor (Art). Art and technology in the history of civilization. Metaphysical discourse on “Appollonean” and “Dionysian” elements.

Philosophy and History of Science

Science as a social—cultural phenomenon. The role of science in the social structure. Theoretical issues concerning knowledge, logic and the methodology of scientific research. Sciences in History. Differentiation, integration and interdisciplinarity of science. Traditions and innovations in the development of science. The subject of scientific activity. Theories, orientations and approaches in the philosophy of science.

6th Semester

Databases


Telecommunication Systems II


Electronics II

Differential amplifiers, operational amplifiers with transistors (characteristics, frequency response, speed, power), operational amplifiers with FET (characteristics, frequency response, speed, power), analysis and design of amplifiers (feedback, frequency compensation, input and output impedance), operational amplifier based circuits (power amplifiers, logarithmic amplifiers, video amplifiers, oscillators, multi–vibrators, timing circuits, comparators, voltage and current regulators, voltage followers, adders, multipliers, dividers, differentiators, integrators, filters, modulators, de–modulators, phase detectors, VCOs, PLLs, analog switches, sample and hold circuits). Special–purpose integrated circuits.

Computer Organization

Survey of addressing modes, MIPS addressing modes and the corresponding formats in assembly language and object code. Design of the datapath and control of a processor that executes a subset of the full MIPS instruction set single–clock–cycle processor datapath, multiple–clock–cycle processor datapath, Exceptions and interrupts Pipelining, Data hazards, Branch hazards, Performance of pipelined systems, Hierarchical memory systems, Interleaved memory, Caches, Virtual memory

Digital Image Processing

General principles and modeling of digital images. Image Perception. Color representation and transformations. 2–D Sampling, 2–D Fourier and other trans-

Political Economy SSC 102
Brief review of economic history with particular reference on the succession of different modes of production and on the contemporary development trends. The development of economic theory up to day is also examined, as well as certain elements of micro- and macro- economics.

Introduction to Philosophy SSC 104
A brief overview of the history of philosophy. Main categories and laws of dialectic in the areas of knowledge. Theory of ontology and logic (formal and dialectical). Elements of social philosophy. The social structure as an organic whole, social consciousness and its forms.

History of Civilization SSC 202
Introduction to the basic concepts of civilization from a variety of viewpoints (sociology, anthropology, philosophy, history). Analytic and synthetic approach of issues related to the history of civilization, particularly in some critical time periods: eastern territories, ancient Greece, Western Europe in Middle Ages, Renaissance, etc. Critical review of theories which attempt to explain the modern civilization: behaviorism, metamodernism, etc.

7th Semester

Linear Systems SYS 401
Introduction to linear systems, study and modeling of linear systems, state space, examples from signal processing, images, etc. Application in continuous and discrete time systems, analysis, controllability and observability, minimal realizations, linear systems design. Modeling of dynamical systems, transient response analysis, basic control actions and response of control systems. Root locus, analysis and design, frequency domain methods analysis and design, Bode plots.

Algorithms and Complexity COMP 401

Computer Networks I TEL 401
Introduction to the operating principles of computer communication networks (shared Ethernet: hubs and collisions, interconnecting Ethere nts: switches and routers, the Internet: routing and the Transmission Control Protocol, Asynchronous Transfer Mode: main features, Quality of Service control), Design principles for computer communication networks: switching and multiplexing, the OSI reference model. Physical layer: error control and information digitization. Data Link layer: the Alternating Bit, GO BACK N and Selective Repeat protocols and their performance evaluation. Medium Access Control layer: ALOHA protocol, tree and stack-based packet contention resolution algorithms. Local Area Networks: Ethernet, Token Ring, FDDI, wireless LANs. Third generation wireless communication networks: voice, data and compressed video transmission protocols and their performance analysis. Network layer: routing, congestion control. The Internet: architecture, naming and addressing, the Internet Protocol (IP), TCP and UDP. Introduction to computer network modeling and simulation. The course includes a project in computer communication protocol simulation.

Introduction to Speech Processing TEL 402
the VoiceXML language.

**Wireless Communications**  
**TEL 403**

History of mobile communications. Wireless channel models: free–space propagation, 2–ray models, M–ray models, empirical path loss models (Okumura, Hata), shadowing, time–varying linear system model, narrow–band flat fading model (Rayleigh, Rice), wide–band (frequency selective) channel model. Mean probability of error for fading channels. Diversity in time, space, frequency, mean probability of error. Elements of CDMA. Elements of OFDM. GSM, IS–95.

**Principles of Programming Languages**  
**COMP 402**

Development of programming languages. Syntax specification, type systems, type interface, exception handling, information hiding, structural recursion, run–time program data storage management. Non–structured programming, such as functional programming with Lisp, Scheme, ML, and logic programming with Prolog.

**Web Information Systems**  
**AIS 403**


**Multimedia Management Methods**  
**AIS 404**

Processing, archiving, and searching multimedia information including documents, one–dimensional signals, still and moving images (video) in information systems and the Internet. Classic models of information retrieval (binary, relational, probabilistic), information clustering and clustering algorithms (partitional, hierarchical, hybrid algorithms), clustering applications grouping in document collections. Visualization of one–dimensional signals and images in multimedia systems. Feature extraction (color, texture, shape, and spatial relationships) from images. Retrieval methods for one–dimensional signals and images. Indexing techniques in information systems for documents and multimedia information (inverted files, k–d trees, grid files, R–trees). Design of information systems on the Internet, management and analysis of information on the Internet (PageRank and HITS methods). Basic processing techniques and analysis of still and moving images (video) in information systems. Compression techniques, JPEG, MPEG–1, 2, 4, 7 standards.

**Machine Vision**  
**AIS 405**

Advanced Issues in Databases COMP 406

Fuzzy Logic Technology and Applications SYS 402
Introduction to Fuzzy set theory, fuzzy relations, approximate reasoning, systems based on fuzzy rules, inference engines, applications of fuzzy logic in pattern recognition and control systems.

Embedded Computer Systems ACE 401
Hardware/software systems and codesign, models of computation for embedded systems. Behavioral design, architecture selection, partitioning, scheduling, and communication. Simulation, synthesis, and verification, hardware/software implementation. Performance analysis and optimization, design methodologies and tools. Design examples and case studies.

Electric Measurements and Sensors ACE 402
Electric measurements principles. Analog signal processing (amplification, scaling, filtering, linearization, level shifting, correlation, common mode rejection, isolation, sampling, holding, compression, etc.). Elimination of influences (temperature, humidity, noise, thermoelectric effect, electromagnetic, inductive, capacitive, ground loop, etc.). Digital to analog signal conversion (D/A), analog to digital signal conversion (A/D). Processing of digital signal with μP, PC or DSP). Transducers (displacement, force, speed, acceleration, power, magnetic field strength, frequency, liquid level, liquid flow, pressure, etc.). Sensors (temperature, wind speed, wind direction, humidity, barometric pressure, etc.). Detectors (proximity, microwave, light, smoke, fire, etc.). Actuators. Biomedical transducers, microsensors, sensor arrays, sensor networks, smart sensors. Interfacing sensors to computer, parallel and serial interfaces, USB interface, DMA, the IEEE488 (GPIB) standard, the I2C standard, the CAN standard, modem interfacing, Ethernet interface, Internet interface. Analog and digital multiplexers. Data acquisition. Automated measurements. Control systems with sensors. Measurements error theory.

Biomedical Electronics ACE 403

Introduction to the Legal System and to the Technical Legislation SSC 204
Introduction to the legal system. Basic law classification. Elements of public and European law. Elements of civil law (general principles of civil law, contract law, property law). Elements of labour law (individual contract of employment, collective bargaining, labour accidents), commercial law, industrial property (trade–mark, patent), intellectual property, elements of environmental law. Elements of public works law (undertaking and elaboration of public works projects, undertaking and construction of public works, contractor’s counter value, procedures to receive a public work, contractual liability, procedures to resolve conflicts in public works, organization of public works contractors).

Micro– and Macro–Economic Analysis SSC 201
Analysis of the supply–and–demand commodity, the theory of the consumer and the firm. Macroeconomic topics for the income and employment determination, the role of investment, and the impact of international exchange.
8th Semester

Theory of Computation  COMP 411

Theory and Applications of Automatic Control  SYS 411
Introduction and study of classical control systems, modeling of systems based on transfer function, analysis and synthesis of systems using conventional methods, application of Bode, Nyquist, and Nichols diagrams for the design of regulators, examples of applications in control of ships, aircraft, etc. Usage of software packages developed for controlling systems. The PID controller and an introduction to robust control. Analysis of control systems in the state space. Design of systems in the state space.

Information, Semantic, and Services in the Web  AIS 412

Agent–Based Internet Computing  AIS 413

Principles of Distributed Software Systems  COMP 414

Information Technology in Education  COMP 415
Information technology in education. Politics and degree of integration of information technology in education in Greece and other European countries.

Multidimensional Data Management COMP 416

Artificial Intelligence COMP 417

Computer Graphics COMP 418

Compilers COMP 419

Computer Networks II TEL 411
Introduction to computer networks and the Internet. Application layer: network application principles, examples of network applications and their protocols (the Web and HTTP, file transfer and FTP, electronic mail and SMTP, the Internet’s directory service and DNS), content distribution (web caching, content distribution networks, peer–to–peer systems). Transport Layer: principles and services, connectionless transport and UDP, principles of reliable data transfer, connection–oriented transport and TCP, principles of congestion control, TCP congestion control. Network layer: network service models, routing principles, hierarchical routing, the Internet Protocol (IP), routing in the Internet, router architecture, multicast routing, mobility support and Mobile IP. Multimedia networking: networking applications, streaming stored audio and video, limitations of Internet’s best–effort service, protocols for real–time interactive applications (RTP, SIP and H.323), principles for providing Quality of Service guarantees, scheduling and policing mechanisms, integrated and differentiated services, RSVP. Security in computer networks: definition, principles of cryptography (symmetric key and public key cryptography), authentication, data integrity, key distribution and certification, access control (firewalls), attacks and countermeasures, secure E–mail and PGP, transport layer security, network layer security and IPsec. Introduction to computer network management: infrastructure for network management, the Internet–standard management framework and SNMP.

Information Theory and Coding TEL 412
Review of probability theory and random variables. Source coding, memoryless source, entropy, joint and conditional entropy, source with memory, entropy rate, source coding theorem. Fixed–length and varying–length codes, definition and classification of codes, Kraft inequality, Shannon, Huffman, Fano, Shan-
non–Fano–Elias, arithmetic, and Lempel–Ziv codes. Application of source codes in data compression, zip, bzip, pkzip, gzip, 7zip. Channel coding, mutual information between discrete random variables, data processing inequality, differential entropy, maximum differential entropy distributions, mutual information between continuous random variables, communication channel capacity, capacity of simple channels, capacity of the discrete or continuous input Gaussian–noise channel, channel coding theorem. Channel codes, linear block codes, Hamming, Hadamard, Golay, and LDPC codes, optimal (soft–decision) and algebraic (hard–decision) decoding of linear block codes and their performance, error detection and correction, cyclic codes, implementation of cyclic codes, BCH and Reed–Solomon codes, convolutional codes and their optimal decoding, the Viterbi algorithm and its performance, concatenated codes, Turbo code. Application of channel codes in data recording and transmission, CD/DVD, modem, DSL, 3G, DVB, WiFi, WiMAX.

Rate–distortion theory, lossy source coding, application in JPEG, MPEG, H.26X.

Natural Language Processing TEL 413

Introduction to Modeling and Performance Evaluation of Communication Networks TEL 414
Introduction to queueing theory based modeling of communication networks (Little's theorem, the M/M/1 and M/M/m/m Markovian queues, the general service time distribution queue, the M/G/1 queue with service vacations, priority queues. Design, modeling and performance evaluation of Medium Access Control (MAC) protocols for: 1) wireless integrated voice/data/compressed video services networks, 2) packet radio networks, 3) wireline high–speed metropolitan/local area networks and wireless local area networks. Transmission scheduling techniques for communication networks.

Statistical Signal Processing for Communications TEL 415

Modern Topics in Automatic Control SYS 412
Introduction to neural nets, linear separability and its properties, learning laws, Backpropagation, Hopfield, supervised and non–supervised learning laws, simulated annealing, applications in pattern recognition, dynamic neural networks, applications in systems identification and control. Introduction to fuzzy logic, fuzzy dynamical systems, industrial applications, Introduction to adaptive control. DSP dynamical systems control.

Industrial Control Systems SYS 413

Neural Networks and Applications SYS 414
Computer Architecture

ACE 411

Historical perspective, Performance Trends, Technology Trends, VLSI layout and cost models, Measuring performance, Instruction set paradigms, Superscalar and ILP, Instruction issue, Nonlinear pipes, Branch prediction, Speculation, Limits of ILP, Multithreading, VLIW, Virtual memory, Virtual machine and OS support, Buses, I/O, and disk, Shared memory multiprocessors, Cache coherence schemes, Distributed shared memory Vector/array processors.

Microelectronic System Implementation

ACE 412

Design and implementation methodology, rapid system prototyping (RSP), the waterfall model. Project management with PERT and GANTT charts, system cost and time–to–market issues. System decomposition and partitioning, top–down and bottom–up design methodologies. Subsystem reusability, intellectual property (IP) cores, technology mapping, special–purpose architectures. Power analysis, thermal analysis, design for reliability. Intellectual property protection, patents, trade secrets. How to proceed from an initial idea to a final product, startup company issues.

Parallel and Distributed Computer System Architecture

ACE 413


Optoelectronics

ACE 414

Elements of optics and solid–state physics, modulation of light, display devices, Lasers and applications, photodetectors, fiber optics, optical communication systems.

Power Electronics

ACE 415

Introduction, thyristors, triacs, power transistors, power MOSFETs, GTO thyristors, IGBT transistors. Rectifiers (single–phase, three–phase, controlled, etc). DC–DC converters, DC–AC inverters, cycloconverters, battery chargers. Maximum power point tracking (MPPT), high–frequency link, snubbers, special induc-
tors and transformers. Power supply units (linear, switching, uninterruptible, power regulation). Heat radiation, harmonics, electromagnetic compatibility, protection. Applications to electric drive systems.

Renewable Energy Sources

ACE 416

Introduction to the energy problem. Renewable energy sources categories. Wind energy (wind velocity measurement, estimation of the Weibull distribution parameters, types and operation principles of wind turbines, types and operation principles of electrical generators, interconnection with the power grid, autonomous operation, power absorption maximization). Solar energy, incident solar energy calculations, solar thermal systems, passive solar systems, applications. Photovoltaic solar plants (basic principles, crystalline PV cells, thin film PVs, electrical characteristics of silicon PV cells, autonomous PV systems, grid connected PV systems, maximum power tracking systems, inverters, fundamentals of industrial electronics). Small hydro plants. Electric energy storage systems (batteries, pump storage hydro systems, fuel cells, etc.). Geothermal energy. Biomass. Tidal energy. RES applications. RES legislation elements. Environmental impact of RES.

Computer–Aided Manufacturing

PMA 421

Introduction to Computer–Aided Manufacturing, birth – death models, the system M/M/1, Markov systems, the Erlang distribution, collective service, advanced models M/G1, M/G/G/1, G/G/m, advanced models for analyzing production lines. Introduction to the problems and models of flexible manufacturing systems (FMS).

Industrial Sociology

SSC 302

The basic concepts of Sociology of Labour and Development, focusing on changes in production systems generally and particularly in the manufacturing sector (middle and large size industry), in conjunction with relevant sectors of production and scientific activity. Analytic and synthetic approach at various scales (international, national, local–regional) to issues relating to industrial relations, production processes, research and development (R&D), the know–how, industrial policy, interdisciplinary and interindustrial relations.

9th Semester

Software Engineering

COMP 501


Human–Computer Interaction AIS 502
The goal of this course is to present the principles and methods of evaluating human computer interaction. Cognitive models, perception, vision, attention and memory workload, knowledge acquisition evaluation. Technologies and interactive methods. Advantages and disadvantages of such methods. Interaction interfaces (menu-based, natural language, forms, etc.). Principles of interaction design. Usability evaluation metrics. Techniques for assessing usability and interactive tools.

Autonomous Agents COMP 503

Economics of the Information Society AIS 504
The industry of the Information Society and the basic principles for starting and running successful businesses in this domain. The environment of high-tech industries and the environment of the information industry. Basic principles and procedures for the creation of a start-up company in the information domain, emphasizing creativity and technological innovation, focus on goals, opportunity and timing, technology development, marketing, financing, creation of partnerships. The economics of information, information cost, information pricing, business plans, financing, targets of opportunity, market planning, product planning, management of research and development, marketing, sales management, legal coverage for intellectual property rights on information, management and organization of human resources for delivering products and services. The influence of the Internet to the information industry. Market models for producing and distributing products in the market.

Society and Information Technology AIS 505
The importance of spreading information and communication technologies and their applications in society, the restructuring of societies, organizations and businesses, the risks of their misuse, and the legal framework (Greek and European) which governs the operation of enterprises and organizations. Applications of information technology in society: e-government, e-commerce, e-tourism, e-health, e-learning, e-services, environmental monitoring. Integrated television and Internet services and applications. Basic principles of protection of personal information and individual rights, productivity, quality of work, monitoring, user communities, preservation of social groups. Mechanisms of encryption and security of personal data. Automation of business operations. Patents, intellectual property rights, ways of protecting and exploiting multimedia and software products. Legislation (Greek and European) for the operation and collaboration of businesses in research, creation, and marketing of multimedia products and information technology.

Data Management and Processing in Sensor Networks COMP 506

Modern Topics in Computer Science COMP 52x
1. Information System Security COMP 521

Wireless Telecommunication Systems and Networks TEL 501
Introduction to wireless networking technologies. Wireless network architectures. Wireless Medium Access Protocols. Wireless Wide Area Networks (WWANs): principles of cellular networks (cell structure, frequency reuse, mobility management), second generation systems (GSM, GPRS), third generation systems (UMTS). Mobility support in IP Networks (Mobile IP, WAP). Wireless Metropolitan, Local and Personal Area Networks (WMANs, WLANs, WPANS): WiMax and IEEE 802.16 (network architecture, protocol architecture, MAC layer, physical layer), WiFi and IEEE 802.11 (network architecture, protocol architecture, MAC layer, physical layer), Bluetooth and IEEE 802.15, wireless ad hoc and sensor networks (architecture, protocols, routing algorithms).

Modern Topics in Telecommunications TEL 52x
1. Optical Communication Systems TEL 521
Fiber optic and electro–optic devices technology, Laser as an optical communication signal source, transmission and detection of optical signals. Applications of optical systems in modern telecommunications.

2. Satellite Communications TEL 522

3. Advanced Topics in Digital Communications TEL 523

4. Modern Coding Theory TEL 524
Modern coding and decoding techniques that approach Shannon’s channel capacity. Data transmission with rate close to channel capacity and low error probability. Viterbi and BCJR algorithms for decoding of convolutionally coded signals. Decoding of linear block codes using convolutional decoding techniques. Turbo and Gallagher’s low–density parity check codes and iterative decoding using two maximum–likelihood decoders and a priori information exchange.

5. Introduction to Asynchronous Transfer Mode (ATM) Networks TEL 525
Integrated Services Digital Networks, Circuit, Message and Packet Switching, Broadband ISDN, Asynchronous Transfer Mode (ATM). Source Characterization in ATM Networks: Quality of Service metrics, source traffic models. Traffic management in ATM networks: Call Admission Control, traffic policing and the Leaky Bucket Algorithm, reactive congestion control mechanisms. Routing in ATM networks. Switching in ATM networks: shared medium, shared memory and space division architectures, Banyan switches and their performance analysis. Introduction to queueing theory based modeling of communication networks: Little’s theorem, Markovian queues (M/M/1, M/M/m, M/M/m/m), the M/G/1 and G/M/1 queues with server vacations, priority queues. Packet transmission protocols for third generation integrated services wireless networks. Scheduling techniques for packet data broadcasting over wireless channels.
Principles of Biomedical Systems SYS 501
X–ray and Non–X–ray systems, ultrasounds, MRI, Computerized tomography, 3–D volume space projection, biomedical image rendering, differences between liquids, solids and flesh. Surgical robot, applications and programming, laparoscopic surgeries, surgical automations.

Robotics SYS/PMA 502

Control Systems Design SYS 503

Applications of Neuro–Fuzzy Logic in Control Systems SYS 504
Scheduling and routing problems, industrial optimization, QoS control in multimedia applications. ATM traffic control, channel equalization and channel assignment. Neuro–fuzzy applications in character recognition and document analysis.

Optimal Control SYS 505
Introduction to the calculus of variations, Pontryagin’s maximum principle, and application of the method to finding a solution in the problem of optimal control for a deterministic dynamical system and to determining the boundary conditions for the boundary value problem. Applications of optimal control in practical problems, such as a minimum fuel consumption, application in biological problems, application in economic models.

VLSI and ASIC System Design ACE 501
Very Large Scale Integration (VLSI) circuit technology, Field Effect Transistor (FET) principles, processing technologies, design under scale, design flows and design rules. Basics of ratioed logic. Circuit and digital logic design of Complementary Metal Oxide Semiconductor (CMOS) circuits. The pass transistor and the CMOS switch, logic gates in fully complementary logic. Design methodology for Application Specific Integrated Circuits (ASIC) and system design issues. Dynamic logic with precharge/evaluate circuits. Sequential logic with 2–phase and multi–phase clocks. Static and dynamic RAM design. Power distribution and clock distribution methodologies.

Electronic System Testing ACE 502

Analog CMOS Design ACE 503

Modern Topics in Electronics and Computer Architecture ACE 52x
1. Reconfigurable Computing Systems ACE 521
Design with reconfigurable logic (FPGA). Application mapping to fine–grain and coarse grain reconfigurable logic. Usage of embedded block RAM (BRAM) and clock distribution mechanisms (PLL/DLL). Methods to download designs to FPGA’s. Design flows, manual placement, critical path analysis, optimization for speed or logic density or power consumption. Design for very high speeds ( > 200MHz).
2. Design for Reliability and Fault Tolerance  
ACE 522
Fault modeling, redundancy techniques, reliability evaluation, error detection and correction codes, self-checking circuits, triple- and n-modular redundancy (TMR, nMR), fault detection. Failsafe software. Case studies and architectures for fault tolerance (e.g. ESS6, Tandem). Hardware vs. software faults, n-version programming, checkpointing. Case studies.

3. Real-Time Systems  
ACE 523
Definition of real-time systems, alternative constraints (e.g. hard/soft real-time), task scheduling algorithms, examples of real-time operating systems for microprocessors (e.g. VX WORKS, TRON). Constraints in actual systems with asynchronous events (e.g. interrupts, DRAM refresh) and unpredictable performance (e.g. cache memories). Examples of actual real-time systems (e.g. avionics).

4. Low Power Systems  
ACE 524
Study of power reduction methods in high performance computing systems. Methods for static as well as dynamic power reduction. Approaches at the architectural level, logic design level, and circuit level. Description and implementation of CAD tools to model aspects of power estimation and assessment of power reduction. Methodology for power characterization and modeling, as well as power measurement from actual systems.

5. High-Performance Architecture  
ACE 525

6. Graph Theory and Circuit Analysis  
ACE 526
Graph theory, circuit topology, the node analysis method, the mesh analysis method, simulation algorithms, DC response, AC response, transient response, Monte-Carlo analysis, sensitivity analysis, spectrum analysis, Fourier and FFT analysis. Simulation of actual electronic components. Circuits study using the SPICE program.

7. Power Electric Systems  
ACE 527

ACE 528

9. RF Telecommunication Circuits Design  
ACE 529
High frequency amplifier circuits (RF, VHF, UHF, video), oscillators, frequency synthesizers, PLLs, tuned power amplifiers, receivers (RF, VHF, UHF), modems, noise.
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* add +30 for international calls
CONTACT INFORMATION

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To Προπτυχιακό Πρόγραμμα Σπουδών του Τµήµατος Ηλεκτρονικών Μηχανικών & Μηχανικών Υπολογισµών του Πολυτεχνείου Κρήτης έχει ενταχθεί στο 2ο Επιχειρησιακό Πρόγραµµα Εκπαίδευσης και Αρχικής Επαγγελµατικής Κατάρτισης (ΕΠΕΑΕΚ ΙΙ) του Υπουργείου Εθνικής Παιδείας και Θρησκευµάτων, µε τη συγχρηµατοδότηση της Ευρωπαϊκής Ένωσης και του Ευρωπαϊκού Κοινωνικού Ταµείου (ΕΚΤ).