School of ECE at TUC: Short Overview of the Undergraduate Program

June 16, 2024
Overview

- Diploma in Electrical and Computer Engineering (integrated master)
- Degree requirements
  - Duration: 300 ECTS (30 ECTS per semester)
  - Recommended duration: 9 semesters of courses, 1 semester for thesis
  - A total of 49 courses (about 33% electives)
  - No minor requirements
- History:
  - Accepted 30 students in 1990
  - Today: 27 faculty members (70% have a PhD from abroad), 25 scientific staff members, 150-200 first-year students
Outcomes for graduates

- Very low unemployment
- A reasonable proportion goes on to PhD
- Highly sought as graduate students
Philosophy of the curriculum

- Unified program of study (no “areas,” “directions,” or “specialties”)
- Low number of courses (5 per semester)
- Strong lab/hands-on focus in most of the courses
- Produce high-quality graduates
- Prerequisites

\(^1\) compared to competing curricula in Greece
Degree requirements

- 29 core (compulsory) courses
- 16 elective courses (or more!)
- English (4 courses)
- Electives can be:
  - At least 14 offered by the School
  - up to (1) offered by other departments (5 listed)
  - up to (2) graduates courses
  - up to (1) social science course (9 listed)
- Diploma thesis (nominally eq. to 30 ECTS/1 semester)
### Core courses

<table>
<thead>
<tr>
<th>Year</th>
<th>Math/science</th>
<th>EE</th>
<th>CE</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Calculus I</td>
<td></td>
<td>Logic Design</td>
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<td></td>
<td>Calculus II</td>
<td></td>
<td>Intro to Programming</td>
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<td></td>
<td>Linear Algebra</td>
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<td>OO Programming</td>
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<td></td>
<td>Math for ECE</td>
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<td></td>
<td>Physics</td>
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<td>2</td>
<td>Probability</td>
<td>Circuits I</td>
<td>Digital Computers</td>
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<td></td>
<td>Signals and Systems</td>
<td>Data Structures</td>
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<td></td>
<td></td>
<td>Circuits II</td>
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<td></td>
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<td>Electronics I</td>
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<td></td>
<td></td>
<td>Control Systems</td>
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<td>3</td>
<td></td>
<td>Electronics II</td>
<td>Information Systems</td>
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<td></td>
<td>Digital Signals</td>
<td>Operating Systems</td>
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<td></td>
<td></td>
<td>Energy Systems I</td>
<td>Computer Organization</td>
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<td></td>
<td>Telecom Systems I</td>
<td>Databases</td>
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<tr>
<td>4</td>
<td></td>
<td>Energy Systems II</td>
<td>Algorithms and Complexity</td>
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<tr>
<td></td>
<td></td>
<td>Telecom Systems II</td>
<td>Computer Networks</td>
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<td>Theory of Computation</td>
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Prerequisites
## Elective courses

<table>
<thead>
<tr>
<th>Math/science</th>
<th>EE</th>
<th>CE</th>
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<tbody>
<tr>
<td>Discrete math</td>
<td>Electric materials</td>
<td>Systems programming</td>
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<td>Physics II</td>
<td>EM propagation and antennas</td>
<td>Artificial intelligence</td>
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<tr>
<td>Numerical analysis</td>
<td>Optoelectronics</td>
<td>Embedded systems</td>
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<tr>
<td>Differential equations</td>
<td>Electric machines</td>
<td>System Security</td>
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<td>Mathematical biology</td>
<td>Digital image processing</td>
<td>Autonomous agents</td>
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<td>Intro to quantum computing</td>
<td>Pattern recognition</td>
<td>Human-computer Interaction</td>
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<td>Quantum technology</td>
<td>Telecom. system design</td>
<td>Computer architecture</td>
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<tr>
<td>Tensor calculus</td>
<td>Optimization</td>
<td>Parallel and distr. computing</td>
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<td>Applied mathematics</td>
<td>Wireless comm.</td>
<td>Advanced databases</td>
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<td>Cryptography &amp; number theory</td>
<td>Energy production and networks</td>
<td>Computational geometry</td>
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<td>Functional analysis</td>
<td>Electrical installation design</td>
<td>Graphics</td>
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<td>Spatial stochastic processes &amp; apps</td>
<td>Measurements and sensors</td>
<td>Computer vision</td>
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<td>Parallel scientific computing</td>
<td>CMOS design</td>
<td>Distributed systems</td>
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<td>Power electronics</td>
<td>Randomized algorithms</td>
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<td></td>
<td>Topics in electric machines</td>
<td>Data analytics</td>
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<td>Statistical signal processing</td>
<td>Computer networks II</td>
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<td>Information theory and coding</td>
<td>Queueing models for networks</td>
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<td>Time series analysis</td>
<td>Social network modeling</td>
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<td></td>
<td>Biomedical technology</td>
<td>VLSI and ASIC design</td>
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<td>Renewable energy sources</td>
<td>Reconfigurable digital systems</td>
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<td></td>
<td>Electric system analysis</td>
<td>Sensor networks</td>
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<td></td>
<td>Electric energy economics</td>
<td>Multiagent systems</td>
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<td></td>
<td>Energy management electronics</td>
<td>Services in cloud and fog</td>
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<td>Emerging nano-electronic devices</td>
<td>Robotic algorithms</td>
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<td></td>
<td>High voltage engineering</td>
<td>Modern mobile syst, apps, services</td>
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<td>Generative artificial intelligence</td>
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Lab work

Labs in core courses (bench)
- Circuits (2 semesters)
- Electronics (2 semesters)
- Energy systems (2 semesters)
- Hardware (3 semesters)
- Programming (4 semesters)
- Signals & Telecom. (3 semesters)
- Control (1 semester)
- Physics (1 semester)
- Math (1 semester)

Lab in core courses (term project):
- Digital signal processing
- Telecom. systems
- Operating systems
- Databases

Remarks:
- Most courses have a term project
Undergraduate course projects

Digital Garden Group
Undergraduate course projects

RoboCup “Kouretes” Group
Undergraduate course projects

3D Computer Graphics & AR/VR Group
Diploma thesis

- Nominal duration is 1 semester, in practice students start early
- Major writing requirement (most theses are 50–100 pages long)
- Topics negotiated between student and supervisor, approved by school assembly
  - Students who want to continue to doctoral studies/abroad often undertake research topics
- One main supervisor, part of 3-seat committee (mostly for the defense talk)
- 1 hr defense talk
- Frequently, results are publishable
Internships & educational trips

- **Practical Training**
  - Optional, during the 3rd or 4th year
  - Students employed as interns in public/private institutions for practical training
  - Funding for internships in Greece (NSRF) or EU (Erasmus+).
  - Counts for one elective course, if it lasts for at least 3 months.

- **Educational trips**
  - Case 1: In the context of courses
  - Case 2: Weekly trips in the end of Spring Semester
Connection with industry

- Career Days
  - Visit by Deloitte (Nov. 25, 2022)
  - Visit by Renesas (Dec. 2, 2022)
  - Visit by Raycap (Mar. 31, 2023)
  - Visit by Netcompany-Intrasoft (June 2, 2023)
Curriculum evolution

- **External Advisory Board**
  - Anastasia Ailamaki, EPFL
  - Dionysios Aliprantis, Purdue Univ.
  - Nicholas Buris, Amazon
  - Christos Cassandras, Boston University
  - Georgios Dimou, Niobium Microsyst.

  ▶ Tasks: Evaluation the progress of the staff of our School, recommendations on strategic directions and/or improvement measures.

- **Student Exchange Agreements**
  - Four (4) Erasmus+ Agreements: EURECOM, Cracow University of Technology, University Toulouse III, Universidad de Valladolid
  - One (1) Agreement with a US institution: University of Southern California

- **Continuous evolution, slight changes every year with focus on lab-based teaching in conjunction with strong theoretic background**
Strengths of the ECE undergraduate curriculum

- unified curriculum
- intense laboratory practice
- graduates find work, even during the recent financial crisis
- all Professors have experience abroad
- important international distinctions every year
- many graduates in top universities abroad (e.g., graduates in 2018, 2019, 2021 were offered full PhD studies fellowship from MIT)
- many graduates are today Professors in USA and Europe

Graduates of the School of ECE of the Technical University of Crete that today are Professors in Europe and the US

- Constantinos Dounatzis (graduated in 1995) - Georgia Institute of Technology, USA
- Georgios Sevastidas (graduated in 2000) - Delft University of Technology, The Netherlands
- Evangelos Kalogerakis (graduated in 2005) - University of Massachusetts Amherst, USA
- Spyros Stavrou (graduated in 2006) - Ohio State University, USA
- Dimitris Papadopoulos (graduated in 2007) - University of Wisconsin–Madison, USA
- Anastasios Kyriakidis (graduated in 2008) - Rits University, USA
- Panos Markopoulos (graduated in 2010) - University of Texas at San Antonio, USA
- Vangelis Papadopoulos (graduated in 2011) - University of California, Riverside, USA
- Alkiviadis Balatsoukas-Stimming (graduated in 2010) - Delft University of Technology, The Netherlands
- Nikos Nikoulais (graduated in 2011) - University College London, UK
- Dimitrios Skarlatos (graduated in 2014) - Carnegie Mellon University, USA
- Vassilis Papadakis (graduated in 2018) - HSE Paris, France