Computer Engineering (ECE)

Major in Computer Engineering
Department of Electrical and Computer Engineering, College of Engineering and Applied Sciences
CHAIRPERSON: Serge Luryi UNDERGRADUATE PROGRAM DIRECTOR: Ridha Kamoua STAFF ASSISTANT: Carolyn Huggins
OFFICE: 267 Light Engineering PHONE: (631) 632-8415 E-MAIL: postmaster@ece.sunysb.edu WEB ADDRESS: http://www.ece.sunysb.edu
Minors of particular interest to students majoring in Electrical or Computer Engineering: Applied Mathematics and Statistics (AMS), Computer Science (CSE), Science and Engineering (LSE)

Faculty
Please see the faculty listing in the entry for the Electrical Engineering major.

The Department of Electrical and Computer Engineering offers two majors leading to the Bachelor of Engineering (B.E.) degree. The Department’s teaching and research areas include computer engineering, computer networks, microprocessors, computer architecture, communications, signal and image processing, pattern recognition, electronic circuits, solid-state electronics, lasers and fiber-optics, electromagnetics, microwave electronics, systems and control, biomedical engineering, VLSI, computer-aided design, parallel and distributed processing, computer vision, and computer graphics. Both program majors are accredited by the Accreditation Board of Engineering and Technology (ABET).

The objective of the electrical and computer engineering programs is to give students an excellent preparation for professional careers or graduate studies in the electrical and computer engineering fields. The programs provide students with depth and breadth of knowledge in engineering science and engineering design as well as in mathematics and the natural sciences. Development of non-technical skills such as communication and teamwork is also emphasized. The curriculum of the two programs is shared in the freshman year, and diverges in the sophomore year. See the Electrical Engineering entry in the alphabetical listings of Approved Majors, Minors, and Programs for the requirements for that major. The current Program Educational Objectives are available at http://www.ece.sunysb.edu.

Following graduation many students choose immediate employment in industry from Long Island to the West Coast. Electrical and computer engineers are recruited in diverse fields for a variety of challenging positions: a communications engineer may work on improving the flow of traffic in communications networks; a command and control engineer may work on systems in tactical and traffic control, satellite and surveillance systems, or in commercial applications; a circuit design engineer designs, develops and manufactures electronic circuits for many applications including microcomputers; and computer engineers design microprocessor-based systems that include a range of consumer products, industrial machinery, and specialized systems such as those used in flight control, automobiles, and in financial institutions. Graduates also pursue advanced degrees in engineering, business, finance, medicine, law, and other professions in which their problem-solving skills and technical knowledge are valuable qualities.

Acceptance into the Computer Engineering Major

Freshman and transfer applicants who have specified their interest in the major in Computer Engineering may be accepted into the major upon admission to the University. Applicants admitted to the University but not immediately accepted into the Computer Engineering major may apply for acceptance at any time during the academic year. The Department’s undergraduate committee will consider an application only if the following conditions have been met:
1. the student has completed at least 11 credits of mathematics, physics, electrical and computer engineering, or computer science courses required for the major;
2. the student has earned a grade point average of 3.00 or higher in these courses; and
3. no courses required for the major have been repeated;
4. all transfer courses have been evaluated.

Requirements for the Major in Computer Engineering (ECE)

The solutions to current system design problems are based on both hardware and software. It is important for students who wish to specialize in computer hardware to be fluent in modern software techniques and familiar with digital electronics and the application of large-scale integrated devices.

Completion of the major requires approximately 110 credits.

1. Mathematics
   AMS 151, 161 Applied Calculus I, II
   AMS 210 or MAT 211 Applied Linear Algebra
   AMS 361 or MAT 303 Applied Calculus IV
   AMS 301 Finite Mathematical Structures

Note: The following alternate calculus course sequences may be substituted for AMS 151, 161 in major requirements or prerequisites:
   MAT 125, 126, 127 or MAT 131, 132 or MAT 141, 142

2. Natural Sciences
   PHY 131/133, 132/134 Classical Physics I, II and laboratories
   CHE 198/199 Chemistry for Engineers and laboratory

Note: The physics course sequence PHY 125, 126, 127 or 141, 142 is accepted in lieu of PHY 131/133, 132/134. (Students are advised to take PHY 127 before PHY 126.)

The chemistry course sequence CHE 131, 132, and 133 or 141, 142, and 143 is accepted in lieu of CHE 198 and 199.

3. Freshman Introduction to Electrical Engineering
   ESE 123 Introduction to Electrical and Computer Engineering
   ESE 124 Computer Techniques for Electronic Design

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4. Engineering Topics

Engineering topics include engineering science and engineering design. Content of the former category is determined by the creative application of basic science skills, while the content of the latter category focuses on the procedure of devising systems, components, or processes.

a. Engineering Sciences
   ESE 211 Electronics Laboratory A
   ESE 218 Digital Systems Design
   ESE 271 Electrical Circuit Analysis
   ESE 305 Deterministic Signals and Systems
   ESE 345 Computer Architecture
   ESE 372 Electronics

b. Engineering Design
   ESE 314 Electronics Laboratory B
   ESE 380 Embedded Microprocessor Systems Design I
   ESE 382 Digital Design Using VHDL and PLDs
   ESE 440 Engineering Design I
   ESE 441 Engineering Design II

Note: ESE 440 and 441 are engineering design projects that must be carried out at Stony Brook under the supervision of an Electrical and Computer Engineering faculty member.

5. Probability and Statistics

ESE 306 Random Signals and Systems

6. Computer Science

CSE 114 Computer Science I
CSE 214 Computer Science II
CSE 219 Computer Science III
CSE 230 Intermediate Programming in C and C++
ESE 333 Real-time Operating Systems

7. Engineering Technical Electives

4 or 5 ESE electives chosen from:
ESE 311 Analog Integrated Circuits
ESE 330 Integrated Electronics
ESE 337 Digital Signal Processing Theory
ESE 344 Software Techniques for Engineers
ESE 346 Computer Communications
ESE 347 Digital Signal Processing
ESE 349 Introduction to Fault Diagnosis of Digital Systems
ESE 355 VLSI System Design
ESE 356 Digital System Specification and Modeling
ESE 357 Digital Image Processing
ESE 358 Computer Vision

Sample Course Sequence for the Major in Computer Engineering

<table>
<thead>
<tr>
<th>Freshman Fall</th>
<th>Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year Seminar 101</td>
<td>1</td>
<td>AMS 161 (or MAT 132)</td>
</tr>
<tr>
<td>D.E.C.</td>
<td>3</td>
<td>PHY 132/134#</td>
</tr>
<tr>
<td>AMS 151 (or MAT 131)</td>
<td>3-4</td>
<td>ESE 124</td>
</tr>
<tr>
<td>PHY 131/133#</td>
<td>4</td>
<td>CHE 198</td>
</tr>
<tr>
<td>ESE 123</td>
<td>4</td>
<td>CHE 199</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15-16</strong></td>
<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Sophomore Fall</th>
<th>Credits</th>
<th>Spring Credits</th>
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<tbody>
<tr>
<td>AMS 361 (or MAT 303)</td>
<td>4</td>
<td>AMS 210 (or MAT 211)</td>
</tr>
<tr>
<td>ESE 217#</td>
<td>4</td>
<td>ESE 211#</td>
</tr>
<tr>
<td>ESE 372#</td>
<td>4</td>
<td>ESE 372#</td>
</tr>
<tr>
<td>CSE 230#</td>
<td>3</td>
<td>CSE 114#</td>
</tr>
<tr>
<td>D.E.C.</td>
<td>3</td>
<td>D.E.C.</td>
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<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Junior Fall</th>
<th>Credits</th>
<th>Spring Credits</th>
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<tbody>
<tr>
<td>ESE 305</td>
<td>3</td>
<td>ESE 300</td>
</tr>
<tr>
<td>ESE 314</td>
<td>3</td>
<td>ESE 382#</td>
</tr>
<tr>
<td>ESE 380#</td>
<td>4</td>
<td>ESE 306</td>
</tr>
<tr>
<td>AMS 301</td>
<td>3</td>
<td>AMS 301</td>
</tr>
<tr>
<td>CSE 214#</td>
<td>4</td>
<td>CSE 219</td>
</tr>
<tr>
<td>D.E.C.</td>
<td>3</td>
<td>D.E.C.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Senior Fall</th>
<th>Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESE 440</td>
<td>3</td>
<td>ESE 441</td>
</tr>
<tr>
<td>ESE 396#</td>
<td>3</td>
<td>ESE 396#</td>
</tr>
<tr>
<td>ESE 345#</td>
<td>3</td>
<td>ESE 345#</td>
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<tr>
<td>ESE 333 or CSE 306</td>
<td>3</td>
<td>D.E.C.</td>
</tr>
<tr>
<td>D.E.C.</td>
<td>3</td>
<td>D.E.C.</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td><strong>Total</strong></td>
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</table>

Note: Courses with a # must be passed with a grade of C or higher.

Total credits must equal 128 or more.

8. Upper-Division Writing Requirement:
   ESE 300 Writing in Electrical/Computer Engineering

All degree candidates must demonstrate skill in written English at a level acceptable for computer engineering majors. Students must register for the writing course ESE 300 concurrently with or after completion of ESE 314, 324, 380, or 382 and submit approximately three long reports based on the experiments performed in these courses. Students whose writing does not meet the required standard are referred for remedial help. Detailed guidelines are provided by the Department. If the standard of writing is judged acceptable, the student receives an S grade for ESE 300, thereby satisfying this requirement.

Grading

All courses taken to satisfy requirements 1 through 7 must be taken for a letter grade. A letter grade of C or higher is required in the following courses:
AMS 151 and 161 (or MAT 125, 126, and 127 or MAT 131 and 132)
PHY 131/133 and 132/134 (or PHY 125, 126, and 127)
ESE 211, 218, 271, 345, 372, 380, and 382
CSE 114, 214, and 230

Four ESE technical electives