BEng in Computer Engineering

In addition to the requirements of their major programs, students are required to complete the University requirements for graduation. For details please refer to the respective section on this website.

Students may use no more than 6 credits earned from courses offered in self-paced online delivery mode to satisfy the graduation requirements of a degree program. This 6-credit limit does not apply to credits obtained through the credit transfer procedures of the University.

For students graduating with an additional major, they must take all the requirements specified for that major, within which they must complete at least 20 single-counted credits. These 20 credits cannot be used to fulfill any other requirements for graduation except for the 120-credit degree requirement.

Under the new 30-credit Common Core Program which is applicable to students admitted to the University in 2022-23 and thereafter, courses that have been counted towards Major Requirements are not allowed to be reused for fulfillment of the University Common Core Requirements. Students should look up the details of the Common Core Program including the general and School-/program-specific distributional requirements posted on the Common Core website where the link to it is available on this website.

**Major Requirements**

**Engineering Fundamental Course(s)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit(s) attained</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 1021</td>
<td>3</td>
</tr>
<tr>
<td>COMP 1022P</td>
<td>3</td>
</tr>
<tr>
<td>Technical Communication I</td>
<td>3</td>
</tr>
<tr>
<td>Calculus IAB</td>
<td>4</td>
</tr>
<tr>
<td>Calculus IB</td>
<td>3</td>
</tr>
<tr>
<td>Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>Accelerated Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Honors Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>Honors Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Multivariable Calculus</td>
<td>3</td>
</tr>
<tr>
<td>Matrix Algebra and Applications</td>
<td>3</td>
</tr>
<tr>
<td>General Physics I with Calculus</td>
<td>3</td>
</tr>
<tr>
<td>Honors General Physics I</td>
<td>3</td>
</tr>
<tr>
<td>General Physics II</td>
<td>3</td>
</tr>
<tr>
<td>Honors General Physics II</td>
<td>3</td>
</tr>
</tbody>
</table>
### Required Course(s)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SENG 3-4</td>
<td>Engineering Introduction course (If the students take an introduction course included in their major, this course can be counted towards their major requirement.)</td>
<td>3-4</td>
</tr>
<tr>
<td>COMP 1021</td>
<td>Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 1100</td>
<td>Introduction to Electro-Robot Design</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 1200</td>
<td>A System View of Communications: from Signals to Packets</td>
<td>4</td>
</tr>
<tr>
<td>BIEN 1010</td>
<td>Introduction to Biomedical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CENG 1000</td>
<td>Introduction to Chemical and Biological Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CENG 1500</td>
<td>A First Course on Materials Science and Applications</td>
<td>3</td>
</tr>
<tr>
<td>CENG 1700</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CIVL 1100</td>
<td>Discovering Civil and Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CIVL 1210</td>
<td>Fundamental of Green Buildings</td>
<td>3</td>
</tr>
<tr>
<td>ENGG 1100</td>
<td>First Year Cornerstone Engineering Design Project Course</td>
<td>3</td>
</tr>
<tr>
<td>IEDA 2010</td>
<td>Introduction of Industrial Engineering and Decision Analytics</td>
<td>3</td>
</tr>
<tr>
<td>ISDN 1001</td>
<td>Introduction to Integrative Systems and Design</td>
<td>3</td>
</tr>
<tr>
<td>ISDN 1002</td>
<td>Redefining Problems for the Real Needs</td>
<td>3</td>
</tr>
<tr>
<td>ISDN 1006</td>
<td>Human-centered Innovation</td>
<td>3</td>
</tr>
<tr>
<td>MECH 1902</td>
<td>Energy Systems in a Sustainable World</td>
<td>3</td>
</tr>
<tr>
<td>MECH 1906</td>
<td>Mechanical Engineering for Modern Life</td>
<td>3</td>
</tr>
<tr>
<td>MECH 1907</td>
<td>Introduction to Aerospace Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CPEG 1971</td>
<td>Industrial Experience</td>
<td>0</td>
</tr>
<tr>
<td>CPEG 4901</td>
<td>Computer Engineering Final Year Project in COMP</td>
<td>6</td>
</tr>
<tr>
<td>CPEG 4902</td>
<td>Computer Engineering Final Year Thesis in COMP</td>
<td>6</td>
</tr>
<tr>
<td>CPEG 4910</td>
<td>Co-op Program</td>
<td>6</td>
</tr>
<tr>
<td>CPEG 4911</td>
<td>Computer Engineering Final Year Project in ELEC</td>
<td>6</td>
</tr>
<tr>
<td>CPEG 4912</td>
<td>Computer Engineering Final Year Thesis in ELEC</td>
<td>6</td>
</tr>
<tr>
<td>CPEG 2930</td>
<td>Academic and Professional Development I</td>
<td>0</td>
</tr>
<tr>
<td>CPEG 3930</td>
<td>Academic and Professional Development II</td>
<td>0</td>
</tr>
<tr>
<td>COMP 2011</td>
<td>Programming with C++</td>
<td>4</td>
</tr>
<tr>
<td>COMP 2012</td>
<td>Object-Oriented Programming and Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>COMP 2012H</td>
<td>Honors Object-Oriented Programming and Data Structures</td>
<td>5</td>
</tr>
<tr>
<td>COMP/ELEC 2011</td>
<td>Note: COMP 2611 OR ELEC 2350</td>
<td>4</td>
</tr>
<tr>
<td>COMP 2611</td>
<td>Computer Organization</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 2350</td>
<td>Introduction to Computer Organization and Design</td>
<td>4</td>
</tr>
<tr>
<td>COMP 2711</td>
<td>Discrete Mathematical Tools for Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>COMP 2711H</td>
<td>Honors Discrete Mathematical Tools for Computer Science</td>
<td>4</td>
</tr>
</tbody>
</table>

**Note:**
- CPEG 1971 AND (CPEG 4901 OR CPEG 4902 OR CPEG 4911 OR CPEG 4912) OR [CPEG 4910] (Students taking the Research Option must take either CPEG 4902 or CPEG 4912)
- COMP 2011 AND COMP 2012 OR COMP 2012H

**Credit(s) attained**
- 6
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 3511</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 1100</td>
<td>Introduction to Electro-Robot Design</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 2100</td>
<td>Signals and Systems</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 2400</td>
<td>Electronic Circuits</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 2600</td>
<td>Probability and Random Processes in Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 3300</td>
<td>Introduction to Embedded Systems</td>
<td>4</td>
</tr>
<tr>
<td>ENGG 2010</td>
<td>Engineering Seminar Series</td>
<td>0</td>
</tr>
<tr>
<td>LANG 4030</td>
<td>Note: LANG 4030 OR LANG 4031</td>
<td>3</td>
</tr>
<tr>
<td>LANG 4030</td>
<td>Technical Communication II for CSE, CPEG &amp; DSCT</td>
<td>3</td>
</tr>
<tr>
<td>LANG 4031</td>
<td>Technical Communication II for ECE &amp; CPEG</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective(s)**

Area Courses (At least 2 courses should be taken from one area and at least 1 course outside that area (including course(s) in the Courses without Associated Area).

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 3211</td>
<td>Fundamentals of Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>COMP 3711</td>
<td>Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>COMP 3711H</td>
<td>Honors Design and Analysis of Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>COMP 3721</td>
<td>Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4211</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4221</td>
<td>Introduction to Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4222</td>
<td>Machine Learning with Structured Data</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4331</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4332</td>
<td>Big Data Mining and Management</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4421</td>
<td>Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4471</td>
<td>Deep Learning in Computer Vision</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5211</td>
<td>Advanced Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5212</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5213</td>
<td>Introduction to Bayesian Networks</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5221</td>
<td>Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5223</td>
<td>Perception and Information Processing for Robotics</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5331</td>
<td>Knowledge Discovery in Databases</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5421</td>
<td>Computer Vision</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5711</td>
<td>Introduction to Advanced Algorithmic Techniques</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5712</td>
<td>Introduction to Combinatorial Optimization</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5713</td>
<td>Computational Geometry</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 3180</td>
<td>Data-Driven Portfolio Optimization</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 3210</td>
<td>Machine Learning and Information Processing for Robotics</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 4230</td>
<td>Deep Learning for Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 4240</td>
<td>Deep Learning in Computer Vision</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC 3100</td>
<td>Signal Processing and Communications</td>
<td>4</td>
</tr>
</tbody>
</table>

Minimum credit(s) required: 12
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC 3600</td>
<td>Electromagnetics: From Wireless to Photonic Applications</td>
</tr>
<tr>
<td>ELEC 4110</td>
<td>Digital Communications and Wireless Systems</td>
</tr>
<tr>
<td>ELEC 4150</td>
<td>Information Theory and Error-Correcting Codes</td>
</tr>
<tr>
<td>ELEC 4610</td>
<td>Engineering Optics</td>
</tr>
<tr>
<td>ELEC 4620</td>
<td>Photonics and Optical Communications</td>
</tr>
</tbody>
</table>

**Embedded System / Robotics Area**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 4511</td>
<td>System and Kernel Programming in Linux</td>
</tr>
<tr>
<td>COMP 4521</td>
<td>Mobile Application Development</td>
</tr>
<tr>
<td>COMP 4611</td>
<td>Design and Analysis of Computer Architectures</td>
</tr>
<tr>
<td>ELEC 3200</td>
<td>System Modeling, Analysis and Control</td>
</tr>
<tr>
<td>ELEC 3210</td>
<td>Machine Learning and Information Processing for Robotics</td>
</tr>
<tr>
<td>ELEC 4210</td>
<td>Control System Design</td>
</tr>
<tr>
<td>ELEC 4220</td>
<td>Introduction to Robotics: From Mobile Robots to Manipulators</td>
</tr>
<tr>
<td>ELEC 4310</td>
<td>Embedded System Design</td>
</tr>
<tr>
<td>ELEC 4320</td>
<td>FPGA-based Design: From Theory to Practice</td>
</tr>
<tr>
<td>ELEC 4330**</td>
<td>Mobile Embedded Systems: Hardware Platform, Software Development, and Applications</td>
</tr>
<tr>
<td>ENGG 3960</td>
<td>Robotics Special Project</td>
</tr>
<tr>
<td>ENGG 4950</td>
<td>Engineering Special Project</td>
</tr>
</tbody>
</table>

**Graphic / Multimedia Area**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 4411</td>
<td>Computer Graphics</td>
</tr>
<tr>
<td>COMP 4421</td>
<td>Image Processing</td>
</tr>
<tr>
<td>COMP 4431</td>
<td>Multimedia Computing</td>
</tr>
<tr>
<td>COMP 4441</td>
<td>Computer Music</td>
</tr>
<tr>
<td>COMP 4451</td>
<td>Game Programming</td>
</tr>
<tr>
<td>COMP 4461</td>
<td>Human-Computer Interaction</td>
</tr>
<tr>
<td>COMP 4462</td>
<td>Data Visualization</td>
</tr>
<tr>
<td>COMP 4471</td>
<td>Deep Learning in Computer Vision</td>
</tr>
<tr>
<td>COMP 5411</td>
<td>Advanced Computer Graphics</td>
</tr>
<tr>
<td>COMP 5421</td>
<td>Computer Vision</td>
</tr>
</tbody>
</table>

**Semiconductor / VLSI Area**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC 3310</td>
<td>Digital Fundamentals and System Design</td>
</tr>
<tr>
<td>ELEC 3400</td>
<td>Introduction to Integrated Circuits and Systems</td>
</tr>
<tr>
<td>ELEC 3450</td>
<td>Introduction to Smart Electric Power Systems</td>
</tr>
<tr>
<td>ELEC 3500</td>
<td>Integrated Circuit Devices</td>
</tr>
<tr>
<td>ELEC 4410</td>
<td>CMOS VLSI Design</td>
</tr>
<tr>
<td>ELEC 4420</td>
<td>Analogue Integrated Circuits Design and Analysis</td>
</tr>
<tr>
<td>ELEC 4430</td>
<td>Integrated Power Electronics</td>
</tr>
<tr>
<td>ELEC 4510</td>
<td>Semiconductor Materials and Devices</td>
</tr>
<tr>
<td>ELEC 4520</td>
<td>Integrated Circuit Fabrication Technology</td>
</tr>
<tr>
<td>ELEC 4530</td>
<td>Fundamentals of Photovoltaic and Renewable Energy</td>
</tr>
</tbody>
</table>

**Signal Processing Area**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC 3100</td>
<td>Signal Processing and Communications</td>
</tr>
<tr>
<td>ELEC 4130</td>
<td>Machine Learning on Images</td>
</tr>
<tr>
<td>ELEC 4810</td>
<td>Introduction to Biosensors and Bioinstrumentation</td>
</tr>
<tr>
<td>ELEC 4820</td>
<td>Medical Imaging</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>ELEC 4830</td>
<td>Statistical Signal Analysis and Applications in Neural Engineering</td>
</tr>
</tbody>
</table>

### Software / Database Area

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 3021</td>
<td>Java Programming</td>
<td>3</td>
</tr>
<tr>
<td>COMP 3031</td>
<td>Principles of Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>COMP 3111</td>
<td>Software Engineering</td>
<td>4</td>
</tr>
<tr>
<td>COMP 3111H</td>
<td>Honors Software Engineering</td>
<td>4</td>
</tr>
<tr>
<td>COMP 3311</td>
<td>Database Management Systems</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4021</td>
<td>Internet Computing</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4111</td>
<td>Software Engineering Practices</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4321</td>
<td>Search Engines for Web and Enterprise Data</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4331</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4332</td>
<td>Big Data Mining and Management</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4521</td>
<td>Mobile Application Development</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4651</td>
<td>Cloud Computing and Big Data Systems</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5111</td>
<td>Fundamentals of Software Analysis</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5112</td>
<td>Parallel Programming</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5311</td>
<td>Database Architecture and Implementation</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5331</td>
<td>Knowledge Discovery in Databases</td>
<td>3</td>
</tr>
</tbody>
</table>

### Systems / Networking Area

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 3632</td>
<td>Principles of Cybersecurity</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4511</td>
<td>System and Kernel Programming in Linux</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4521</td>
<td>Mobile Application Development</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4611</td>
<td>Design and Analysis of Computer Architectures</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4621</td>
<td>Computer and Communication Networks</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4631</td>
<td>Computer and Communication Security</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4632</td>
<td>Practicing Cybersecurity: Attacks and Counter-measures</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4641</td>
<td>Social Information Network Analysis and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>COMP 4651</td>
<td>Cloud Computing and Big Data Systems</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5621</td>
<td>Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5622</td>
<td>Advanced Computer Communications and Networking</td>
<td>3</td>
</tr>
<tr>
<td>COMP 5631</td>
<td>Cryptography and Security</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 3120</td>
<td>Computer Communication Networks</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 4310</td>
<td>Embedded System Design</td>
<td>4</td>
</tr>
</tbody>
</table>

### Courses Without Associated Area

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 4911</td>
<td>IT Entrepreneurship</td>
<td>3</td>
</tr>
</tbody>
</table>

COMP/ELEC 2000-level or above Elective (Any course(s) of the subject and level as specified) | 3 |
Students may opt to graduate with or without an option. Students who take an option MUST complete all requirements specified in addition to the major requirements.

**Option(s)**

**Research Option**

Students in the Research Option should also take either CPEG 4902 or CPEG 4912 as specified in the major requirements.

<table>
<thead>
<tr>
<th>Elective Course(s)</th>
<th>Minimum credit(s) required</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP/ELEC/UROP</td>
<td>3-4</td>
</tr>
<tr>
<td>COMP</td>
<td>Any COMP course at 5000-level</td>
</tr>
<tr>
<td>ELEC 5900</td>
<td>Modern Engineering Research Methodologies 3</td>
</tr>
<tr>
<td>UROP 1100</td>
<td>Undergraduate Research Opportunities Series 1 1</td>
</tr>
<tr>
<td>COMP/ELEC</td>
<td>CPEG Electives (1 PG-level course as approved by advisor) 3</td>
</tr>
</tbody>
</table>

**Remarks on course(s):**

- ELEC 4330: The course was last offered in 2018-19 and was deleted subsequently.