

(For students admitted in 2018-19 under the 4-year degree)

## 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.

Some courses can be used to fulfill both Major and University Common Core Requirements. Students may reuse a maximum of 9 credits of these courses to count towards both Requirements.

Students may use no more than 6 credits earned from courses offered in pure 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.

### Major Requirements

#### Engineering Fundamental Course(s)

|      |       |  | Credit(s)<br>attained |
|------|-------|--|-----------------------|
| COMP |       | Note: COMP 1021 <u>OR</u> COMP 1022P <u>OR</u> COMP 1022Q  | 3                     |
| COMP | 1021  | Introduction to Computer Science   | 3                     |
| COMP | 1022P | Introduction to Computing with Java  | 3                     |
| COMP | 1022Q | Introduction to Computing with Excel VBA   | 3                     |
| ENGG | 1010  | Academic Orientation   | 0                     |
| LANG | 2030  | Technical Communication I  | 3                     |
| MATH |       | Note: [(MATH 1012 <u>OR</u> MATH 1013 <u>OR</u> MATH 1023) <u>AND</u> (MATH 1014 <u>OR</u> MATH 1024)] <u>OR</u> [MATH 1020] | 4-7                   |
| MATH | 1012  | Calculus IA  | 4                     |
| MATH | 1013  | Calculus IB  | 3                     |
| MATH | 1014  | Calculus II  | 3                     |
| MATH | 1020  | Accelerated Calculus   | 4                     |
| MATH | 1023  | Honors Calculus I  | 3                     |
| MATH | 1024  | Honors Calculus II   | 3                     |
| MATH | 2011  | Introduction to Multivariable Calculus   | 3                     |
| MATH | 2111  | Matrix Algebra and Applications  | 3                     |
| PHYS |       | Note: PHYS 1112 <u>OR</u> PHYS 1312  | 3                     |
| PHYS | 1112  | General Physics I with Calculus  | 3                     |
| PHYS | 1312  | Honors General Physics I   | 3                     |
| PHYS |       | Note: PHYS 1114 <u>OR</u> PHYS 1314  | 3                     |
| PHYS | 1114  | General Physics II   | 3                     |
| PHYS | 1314  | Honors General Physics II  | 3                     |

|      |      |  |     |
|------|------|--|-----|
| SENG |      | Engineering Introduction course (If the students take an introduction course included in their major, this course can be counted towards their major requirement.) | 3-4 |
| COMP | 1021 | Introduction to Computer Science   | 3   |
| ELEC | 1100 | Introduction to Electro-Robot Design   | 4   |
| ELEC | 1200 | A System View of Communications: from Signals to Packets   | 4   |
| BIEN | 1010 | Introduction to Biomedical Engineering   | 3   |
| CENG | 1000 | Introduction to Chemical and Biological Engineering  | 3   |
| CIVL | 1100 | Discovering Civil and Environmental Engineering  | 3   |
| ENGG | 1100 | First Year Cornerstone Engineering Design Project Course   | 3   |
| IEDA | 2010 | Industrial Engineering and Decision Analytics  | 3   |
| IEDA | 2200 | Engineering Management   | 3   |
| MECH | 1901 | Automotive Engineering   | 3   |
| MECH | 1902 | Energy Systems in a Sustainable World  | 3   |
| MECH | 1905 | Buildings for Contemporary Living  | 3   |
| MECH | 1906 | Mechanical Engineering for Modern Life   | 3   |

## Required Course(s)

|           |       |  | <b>Credit(s)<br/>attained</b> |
|-----------|-------|--|-------------------------------|
| CPEG      |       | Note: [CPEG 1971 <u>AND</u> (CPEG 4901 <u>OR</u> CPEG 4902 <u>OR</u> CPEG 4911 <u>OR</u> CPEG 4912)] <u>OR</u> [CPEG 4910] (Students taking the Research Option must take either CPEG 4902 or CPEG 4912) | 6                             |
| CPEG      | 1971  | Industrial Experience  | 0                             |
| CPEG      | 4901  | Computer Engineering Final Year Project in COMP  | 6                             |
| CPEG      | 4902  | Computer Engineering Final Year Thesis in COMP   | 6                             |
| CPEG      | 4910  | Co-op Program  | 6                             |
| CPEG      | 4911  | Computer Engineering Final Year Project in ELEC  | 6                             |
| CPEG      | 4912  | Computer Engineering Final Year Thesis in ELEC   | 6                             |
| CPEG      | 2930  | Academic and Professional Development I  | 0                             |
| CPEG      | 3930  | Academic and Professional Development II   | 0                             |
| COMP      |       | Note: (COMP 2011 <u>AND</u> COMP 2012) <u>OR</u> COMP 2012H  | 5-8                           |
| COMP      | 2011  | Programming with C++   | 4                             |
| COMP      | 2012  | Object-Oriented Programming and Data Structures  | 4                             |
| COMP      | 2012H | Honors Object-Oriented Programming and Data Structures   | 5                             |
| COMP/ELEC |       | Note: COMP 2611 <u>OR</u> ELEC 2350  | 4                             |
| COMP      | 2611  | Computer Organization  | 4                             |
| ELEC      | 2350  | Introduction to Computer Organization and Design   | 4                             |
| COMP/ELEC |       | Note: COMP 2711 <u>OR</u> COMP 2711H <u>OR</u> ELEC 2600   | 4                             |
| COMP      | 2711  | Discrete Mathematical Tools for Computer Science   | 4                             |
| COMP      | 2711H | Honors Discrete Mathematical Tools for Computer Science  | 4                             |
| ELEC      | 2600  | Probability and Random Processes in Engineering  | 4                             |

|      |      |  |   |
|------|------|--|---|
| COMP | 3511 | Operating Systems  | 3 |
| ELEC | 1100 | Introduction to Electro-Robot Design   | 4 |
| ELEC |      | Note: ELEC 1200 <u>OR</u> ELEC 2100 <u>OR</u> ELEC 2400 (2 out of 3 courses) | 8 |
| ELEC | 1200 | A System View of Communications: from Signals to Packets                     | 4 |
| ELEC | 2100 | Signals and Systems  | 4 |
| ELEC | 2400 | Electronic Circuits  | 4 |
| ELEC | 3300 | Introduction to Embedded Systems   | 4 |
| ENGG | 2010 | Engineering Seminar Series   | 0 |
| LANG |      | Note: LANG 4030 <u>OR</u> LANG 4031  | 3 |
| LANG | 4030 | Technical Communication II for CSE & CPEG                                    | 3 |
| LANG | 4031 | Technical Communication II for ECE & CPEG                                    | 3 |

### Elective(s)

|  |       |  | <b>Minimum credit(s) required</b> |
|--|-------|--|-----------------------------------|
| COMP/ELEC                                    |       | CPEG Restricted Elective (1 course from the specified elective list)   | 3                                 |
| COMP   | 4521  | Mobile Application Development   | 3                                 |
| COMP   | 4611  | Design and Analysis of Computer Architectures  | 3                                 |
| ELEC   | 4310  | Embedded System Design   | 4                                 |
| ELEC   | 4320  | FPGA-based Design: From Theory to Practice   | 3                                 |
| ELEC   | 4330  | Mobile Embedded Systems: Hardware Platform, Software Development, and Applications   | 3                                 |
| COMP/ELEC                                    |       | Area Courses (At least 4 courses from the specified elective list , of which at least 2 courses should be taken from one single area and at least 2 courses outside that area. Courses taken as Major Required Courses may not be counted towards the elective requirement.) | 15                                |
| <b>Artificial Intelligence / Theory Area</b> |       |  |                                   |
| COMP   | 3211  | Fundamentals of Artificial Intelligence  | 3                                 |
| COMP   | 3711  | Design and Analysis of Algorithms  | 3                                 |
| COMP   | 3711H | Honors Design and Analysis of Algorithms   | 4                                 |
| COMP   | 3721  | Theory of Computation  | 3                                 |
| COMP   | 4211  | Machine Learning   | 3                                 |
| COMP   | 4221  | Introduction to Natural Language Processing  | 3                                 |
| COMP   | 4331  | Data Mining  | 3                                 |
| COMP   | 4332  | Big Data Mining and Management   | 3                                 |
| COMP   | 4421  | Image Processing   | 3                                 |
| COMP   | 5211  | Advanced Artificial Intelligence   | 3                                 |
| COMP   | 5212  | Machine Learning   | 3                                 |
| COMP   | 5213  | Introduction to Bayesian Networks  | 3                                 |
| COMP   | 5221  | Natural Language Processing  | 3                                 |

|  |      |  |     |
|--|------|--|-----|
| COMP                                   | 5331 | Knowledge Discovery in Databases   | 3   |
| COMP                                   | 5421 | Computer Vision  | 3   |
| COMP                                   | 5711 | Introduction to Advanced Algorithmic Techniques                                    | 3   |
| COMP                                   | 5712 | Introduction to Combinatorial Optimization   | 3   |
| COMP                                   | 5713 | Computational Geometry   | 3   |
| <b>Communications Area</b>             |      |  |     |
| ELEC                                   | 3100 | Signal Processing and Communications   | 4   |
| ELEC                                   | 3600 | Electromagnetics: From Wireless to Photonic Applications                           | 4   |
| ELEC                                   | 4110 | Digital Communications and Wireless Systems  | 3   |
| ELEC                                   | 4150 | Information Theory and Error-Correcting Codes                                      | 3   |
| ELEC                                   | 4610 | Engineering Optics   | 4   |
| ELEC                                   | 4620 | Photonics and Optical Communications   | 4   |
| ELEC                                   | 4630 | Radio Frequency Engineering  | 4   |
| <b>Embedded System / Robotics Area</b> |      |  |     |
| COMP                                   | 4521 | Mobile Application Development   | 3   |
| COMP                                   | 4611 | Design and Analysis of Computer Architectures                                      | 3   |
| ELEC                                   | 3200 | System Modeling, Analysis and Control  | 4   |
| ELEC                                   | 4220 | Introduction to Robotics: From Mobile Robots to Manipulators                       | 4   |
| ELEC                                   | 4310 | Embedded System Design   | 4   |
| ELEC                                   | 4320 | FPGA-based Design: From Theory to Practice   | 3   |
| ELEC                                   | 4330 | Mobile Embedded Systems: Hardware Platform, Software Development, and Applications | 3   |
| ENGG                                   | 4950 | Engineering Special Project  | 1-4 |
| <b>Graphic / Multimedia Area</b>       |      |  |     |
| COMP                                   | 4411 | Computer Graphics  | 3   |
| COMP                                   | 4421 | Image Processing   | 3   |
| COMP                                   | 4431 | Multimedia Computing   | 3   |
| COMP                                   | 4441 | Computer Music   | 3   |
| COMP                                   | 4451 | Game Programming   | 3   |
| COMP                                   | 4461 | Human-Computer Interaction   | 3   |
| COMP                                   | 4462 | Data Visualization   | 3   |
| COMP                                   | 5411 | Advanced Computer Graphics   | 3   |
| COMP                                   | 5421 | Computer Vision  | 3   |
| ELEC                                   | 3170 | Digital Media and Multimedia Applications  | 4   |
| <b>Semiconductor / VLSI Area</b>       |      |  |     |
| ELEC                                   | 3400 | Introduction to Integrated Circuits and Systems                                    | 4   |
| ELEC                                   | 3450 | Introduction to Smart Electric Power Systems                                       | 3   |
| ELEC                                   | 3500 | Microelectronic Devices and Technology   | 4   |
| ELEC                                   | 4410 | CMOS VLSI Design   | 3   |
| ELEC                                   | 4420 | Analogue Integrated Circuits Design and Analysis                                   | 4   |
| ELEC                                   | 4430 | Integrated Power Electronics   | 3   |
| ELEC                                   | 4510 | Semiconductor Materials and Devices  | 3   |
| ELEC                                   | 4520 | Integrated Circuit Fabrication Technology  | 3   |

|                                  |        |  |   |
|----------------------------------|--------|--|---|
| ELEC                             | 4530   | Fundamentals of Photovoltaic and Renewable Energy                  | 3 |
| <b>Signal Processing Area</b>    |        |  |   |
| ELEC                             | 3100   | Signal Processing and Communications                               | 4 |
| ELEC                             | 4130   | Digital Image Processing   | 3 |
| ELEC                             | 4140** | Speech and Image Compression                                       | 3 |
| ELEC                             | 4810   | Introduction to Biosensors and Bioinstrumentation                  | 4 |
| ELEC                             | 4820   | Medical Imaging  | 3 |
| ELEC                             | 4830   | Statistical Signal Analysis and Applications in Neural Engineering | 3 |
| <b>Software / Database Area</b>  |        |  |   |
| COMP                             | 3021   | Java Programming   | 3 |
| COMP                             | 3031   | Principles of Programming Languages                                | 3 |
| COMP                             | 3111   | Software Engineering   | 4 |
| COMP                             | 3111H  | Honors Software Engineering  | 4 |
| COMP                             | 3311   | Database Management Systems  | 3 |
| COMP                             | 4021   | Internet Computing   | 3 |
| COMP                             | 4111   | Software Engineering Practices                                     | 3 |
| COMP                             | 4311   | Principles of Database Design                                      | 3 |
| COMP                             | 4321   | Search Engines for Web and Enterprise Data                         | 3 |
| COMP                             | 4331   | Data Mining  | 3 |
| COMP                             | 4332   | Big Data Mining and Management                                     | 3 |
| COMP                             | 4521   | Mobile Application Development                                     | 3 |
| COMP                             | 4651   | Cloud Computing and Big Data Systems                               | 3 |
| COMP                             | 5111   | Fundamentals of Software Analysis                                  | 3 |
| COMP                             | 5112   | Parallel Programming   | 3 |
| COMP                             | 5311   | Database Architecture and Implementation                           | 3 |
| COMP                             | 5331   | Knowledge Discovery in Databases                                   | 3 |
| <b>Systems / Networking Area</b> |        |  |   |
| COMP                             | 3632   | Principles of Cybersecurity  | 3 |
| COMP                             | 4511   | System and Kernel Programming in Linux                             | 3 |
| COMP                             | 4521   | Mobile Application Development                                     | 3 |
| COMP                             | 4611   | Design and Analysis of Computer Architectures                      | 3 |
| COMP                             | 4621   | Computer Communication Networks I                                  | 3 |
| COMP                             | 4631   | Computer and Communication Security                                | 3 |
| COMP                             | 4632   | Practicing Cybersecurity: Attacks and Counter-measures             | 3 |
| COMP                             | 4641   | Social Information Network Analysis and Engineering                | 3 |
| COMP                             | 4651   | Cloud Computing and Big Data Systems                               | 3 |
| COMP                             | 5621   | Computer Networks  | 3 |
| COMP                             | 5622   | Advanced Computer Communications and Networking                    | 3 |
| COMP                             | 5631   | Cryptography and Security  | 3 |
| ELEC                             | 3120   | Computer Communication Networks                                    | 3 |
| ELEC                             | 4310   | Embedded System Design   | 4 |

Student 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.

| <i>Elective Course(s)</i> | <b>Minimum credit(s) required</b>   |
|---------------------------|---|
| COMP/ELEC/<br>UROP        | Research Electives [Students should take either (ELEC 5900 AND UROP 1100) or a 3-credit COMP 5000-level course to fulfill this requirement.]<br>2-3 |
| COMP                      | Any COMP course at 5000-level   |
| ELEC     5900             | Modern Engineering Research Methodologies     1   |
| UROP     1100             | Undergraduate Research Opportunities Series 1     1   |
| COMP/ELEC                 | CPEG Electives (1 PG-level course as approved by advisor)     3   |

**\*\*Remarks on course(s):**  
 -     ELEC 4140:     The course was last offered in 2014-15 and was deleted subsequently.