

List of electives of BEng in Computer Engineering for 4-year curriculum

**\*\*Remark: If a CPEG elective course is categorized into 2 areas, it can only be counted in exactly one area towards graduation.**

| Course Code | Course Title                                                  | Area                 |                     |                      |             |                   |                |                      |                            |
|-------------|---------------------------------------------------------------|----------------------|---------------------|----------------------|-------------|-------------------|----------------|----------------------|----------------------------|
|             |                                                               | Graphic / Multimedia | Software / Database | Systems / Networking | AI / Theory | Signal Processing | Communications | Semiconductor / VLSI | Embedded System / Robotics |
| COMP 1001   | Exploring Multimedia and Internet Computing                   |                      |                     |                      |             |                   |                |                      |                            |
| COMP 1021   | Introduction to Computer Science                              |                      |                     |                      |             |                   |                |                      |                            |
| COMP 1022P  | Introduction to Computing with Java                           |                      |                     |                      |             |                   |                |                      |                            |
| COMP 1022Q  | Introduction to Computing with Excel VBA                      |                      |                     |                      |             |                   |                |                      |                            |
| COMP 1023   | Introduction to Python Programming [2025-26 cohort and after] |                      |                     |                      |             |                   |                |                      |                            |
| COMP 1941   | Great Ideas in Computing                                      |                      |                     |                      |             |                   |                |                      |                            |
| COMP 1942   | Exploring and Visualizing Data                                |                      |                     |                      |             |                   |                |                      |                            |
| COMP 2011   | Programming with C++                                          |                      |                     |                      |             |                   |                |                      |                            |
| COMP 2012   | Object-Oriented Programming and Data Structures               |                      |                     |                      |             |                   |                |                      |                            |
| COMP 2012H  | Honors Object-Oriented Programming and Data Structures        |                      |                     |                      |             |                   |                |                      |                            |
| COMP 2611   | Computer Organization                                         |                      |                     |                      |             |                   |                |                      |                            |
| COMP 2711   | Discrete Mathematical Tools for Computer Science              |                      |                     |                      |             |                   |                |                      |                            |
| COMP 2711H  | Honors Discrete Mathematical Tools for Computer Science       |                      |                     |                      |             |                   |                |                      |                            |
| COMP 3021   | Java Programming                                              |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 3031   | Principles of Programming Languages                           |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 3071   | Honors Competitive Programming                                |                      |                     |                      |             |                   |                |                      |                            |
| COMP 3111   | Software Engineering                                          |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 3111H  | Honors Software Engineering                                   |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 3211   | Fundamentals of Artificial Intelligence                       |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 3311   | Database Management Systems                                   |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 3511   | Operating Systems                                             |                      |                     |                      |             |                   |                |                      |                            |
| COMP 3631   | Cryptography and Security                                     |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 3711   | Design and Analysis of Algorithms                             |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 3711H  | Honors Design and Analysis of Algorithms                      |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 3721   | Theory of Computation                                         |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 4021   | Internet Computing                                            |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 4121   | Modern Compiler Construction                                  |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 4211   | Machine Learning                                              |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 4221   | Introduction to Natural Language Processing                   |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 4222   | Machine Learning with Structured Data                         |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 4321   | Search Engines for Web and Enterprise Data                    |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 4331   | Data Mining                                                   |                      | √                   |                      | √           |                   |                |                      |                            |
| COMP 4332   | Big Data Mining and Management                                |                      | √                   |                      | √           |                   |                |                      |                            |
| COMP 4411   | Computer Graphics                                             | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 4421   | Image Processing                                              | √                    |                     |                      | √           |                   |                |                      |                            |
| COMP 4431   | Multimedia Computing                                          | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 4441   | Computer Music                                                | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 4451   | Game Programming                                              | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 4461   | Human-Computer Interaction                                    | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 4462   | Data Visualization                                            | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 4471   | Deep Learning in Computer Vision                              | √                    |                     |                      | √           |                   |                |                      |                            |
| COMP 4541   | Blockchain, Cryptocurrencies and Smart Contracts              |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 4521   | Mobile Application Development                                |                      | √                   | √                    |             |                   |                |                      | √                          |
| COMP 4531   | IoT and Smart Sensing                                         |                      |                     | √                    |             |                   |                |                      | √                          |
| COMP 4541   | Blockchain, Cryptocurrencies and Smart Contracts              |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 4611   | Design and Analysis of Computer Architectures                 |                      |                     | √                    |             |                   |                |                      | √                          |

| Course Code | Course Title                                              | Area                 |                     |                      |             |                   |                |                      |                            |
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|             |                                                           | Graphic / Multimedia | Software / Database | Systems / Networking | AI / Theory | Signal Processing | Communications | Semiconductor / VLSI | Embedded System / Robotics |
| COMP 4621   | Computer Communication Networks                           |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 4632   | Practicing Cybersecurity: Attacks and Counter-measures    |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 4634   | Cybersecurity                                             |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 4635   | Practical Cloud Computing Security                        |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 4641   | Social Information Network Analysis and Engineering       |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 4651   | Cloud Computing and Big Data Systems                      |                      | √                   | √                    |             |                   |                |                      |                            |
| COMP 4911   | IT Entrepreneurship                                       | No associated area.  |                     |                      |             |                   |                |                      |                            |
| COMP 4971   | Independent Work                                          |                      |                     |                      |             |                   |                |                      |                            |
| COMP 5111   | Fundamentals of Software Analysis                         |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 5112   | Parallel Programming                                      |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 4551   | Large-Scale Machine Learning System for Foundation Models |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5211   | Advanced Artificial Intelligence                          |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5212   | Machine Learning                                          |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5214   | Advanced Deep Learning Architectures                      |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5215   | Perception and Information Processing for Robotics        |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5221   | Natural Language Processing                               |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5311   | Database Architecture and Implementation                  |                      | √                   |                      |             |                   |                |                      |                            |
| COMP 5331   | Knowledge Discovery in Databases                          |                      | √                   |                      | √           |                   |                |                      |                            |
| COMP 5411   | Advanced Computer Graphics                                | √                    |                     |                      |             |                   |                |                      |                            |
| COMP 5421   | Computer Vision                                           | √                    |                     |                      | √           |                   |                |                      |                            |
| COMP 5621   | Computer Networks                                         |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 5631   | Cryptography and Security                                 |                      |                     | √                    |             |                   |                |                      |                            |
| COMP 5711   | Introduction to Advanced Algorithmic Techniques           |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5712   | Introduction to Combinatorial Optimization                |                      |                     |                      | √           |                   |                |                      |                            |
| COMP 5713   | Computational Geometry                                    |                      |                     |                      | √           |                   |                |                      |                            |
| ELEC 1010   | Electronic and Information Technology                     |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 1020   | Media Production: Technology and Design                   |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 1100   | Introduction to Electro-Robot Design                      |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 1200   | A System View of Communications: from Signals to Packets  |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 2100   | Signals and Systems                                       |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 2300   | Computer Organization                                     |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 2350   | Introduction to Computer Organization and Design          |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 2400   | Electronic Circuits                                       |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 2420   | Basic Electronics                                         |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 2600   | Probability and Random Processes in Engineering           |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 3100   | Signal Processing and Communications                      |                      |                     |                      |             | √                 | √              |                      |                            |
| ELEC 3120   | Computer Communication Networks                           |                      |                     | √                    |             |                   |                |                      |                            |
| ELEC 3130   | Digital Image Processing                                  |                      |                     |                      |             | √                 |                |                      |                            |
| ELEC 3180   | Data-Driven Portfolio Optimization                        |                      |                     |                      | √           |                   |                |                      |                            |
| ELEC 3200   | System Modeling, Analysis and Control                     |                      |                     |                      |             |                   |                |                      | √                          |
| ELEC 3210   | Machine Learning and Information Processing for Robotics  |                      |                     |                      | √           |                   |                |                      | √                          |
| ELEC 3300   | Introduction to Embedded Systems                          |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 3350   | Principles of Machine Learning                            |                      |                     |                      | √           |                   |                |                      |                            |
| ELEC 3310   | Digital Fundamentals and System Design                    |                      |                     |                      |             |                   |                |                      | √                          |
| ELEC 3400   | Introduction to Integrated Circuits and Systems           |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 3410   | CMOS VLSI Design                                          |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 3500   | Integrated Circuit Devices and                            |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 3600   | Electromagnetics: From Wireless to Photonic Applications  |                      |                     |                      |             |                   | √              |                      |                            |
| ELEC 3710   | Hi-Tech Entrepreneurship                                  |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 3810   | Data Science for Neural Engineering                       |                      | √                   |                      |             |                   |                |                      |                            |

|                |                                                                    | Area                 |                     |                      |             |                   |                |                      |                            |
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| ELEC 4010      | Special Topics                                                     |                      |                     |                      |             |                   |                |                      |                            |
| ELEC 4110      | Digital Communications and Wireless Systems                        |                      |                     |                      |             |                   | √              |                      |                            |
| ELEC 4210      | Control System Design                                              |                      |                     |                      |             |                   |                |                      | √                          |
| ELEC 4220      | Introduction to Robotics: From Mobile Robots to Manipulators       |                      |                     |                      |             |                   |                |                      | √                          |
| ELEC 4240      | Deep Learning in Computer Vision                                   |                      |                     |                      | √           |                   |                |                      |                            |
| ELEC 4260      | Intelligent Robotics and Embodied AI                               |                      |                     |                      |             |                   |                |                      | √                          |
| ELEC 4320      | FPGA-based Design: From Theory to Practice                         |                      |                     |                      |             |                   |                |                      | √                          |
| ELEC 4350      | AI Processor Architecture                                          |                      |                     | √                    |             |                   |                |                      |                            |
| ELEC 3610      | Quantum Mechanics for Electronic Engineers                         |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4420      | Analogue Integrated Circuits Design and Analysis                   |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4430      | Integrated Power Electronics                                       |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4450      | Practical Considerations of Analog Integrated Circuit Design       |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4510      | Semiconductor Materials and Devices                                |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4520      | Integrated Circuit Fabrication Technology                          |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4530      | Fundamentals of Photovoltaic and Renewable Energy                  |                      |                     |                      |             |                   |                | √                    |                            |
| ELEC 4610      | Engineering Optics                                                 |                      |                     |                      |             |                   | √              |                      |                            |
| ELEC 4620      | Photonics and Optical Communications                               |                      |                     |                      |             |                   | √              |                      |                            |
| ELEC 4810      | Introduction to Biosensors and Bioinstrumentation                  |                      |                     |                      |             | √                 |                |                      |                            |
| ELEC 4820      | Medical Imaging                                                    |                      |                     |                      |             | √                 |                |                      |                            |
| ELEC 4830      | Statistical Signal Analysis and Applications in Neural Engineering |                      |                     |                      |             | √                 |                |                      |                            |
| ELEC 4840      | Artificial Intelligence for Medical Image Analysis                 |                      |                     |                      | √           |                   |                |                      |                            |
| ELEC 4940      | Independent Study                                                  |                      |                     |                      |             |                   |                |                      |                            |
| ENGG 3960-3962 | Robotics Special Project                                           |                      |                     |                      |             |                   |                |                      | √                          |
| ENGG 4950      | Engineering Special Project                                        |                      |                     |                      |             |                   |                |                      | √                          |

No. of course in each area: 11 17 15 28 5 5 10 12

**Remarks:**

Courses in red font are Program Required Courses