Base EE

Year 1

Fall	Winter	Summer
MATH 1004 Calculus for Eng.	Elective Comp. Studies	
MATH 1104 Linear Algebra	CHEM 1101 Chemistry	
Elective Basic Science	PHYS 1004 Electromagnetism	
ECOR 1033 Statics	ECOR 1031 Prog & Data	
ECOR 1034 Dynamics	ECOR 1032 Circuits & Mech	
ECOR 1055 Intro to Eng I	ECOR 1056 Intro to Eng II	
ECOR 1057 Eng Profession		

Year 2

Fall	Winter	Summer
MATH 1005 Diff Eq & Series	MATH 3705 Math Methods I	
MATH 2004 Multivar Calculus	ELEC 2507 Electronics I	
ELEC 2501 Circuits & Signals	ELEC 2602 Elec Machines	
ELEC 2607 Switching Circuits	SYSC 2004 OO Software Dev	
SYSC 2006 Imperative Prog	CCDP 2100 Comm Skills	

Year 3

Fall	Winter	Summer
ELEC 3105 EM Fields	ELEC 3500 Digital Elec	
ELEC 3509 Electronics II	ELEC 3907 Eng Project	
ELEC 3908 Physical Elec	ELEC 3909 EM Waves	
SYSC 3006 Comp Org	SYSC 3501 Comm Theory	
SYSC 3600 Sys & Sim	ECOR 2050 Design of Exp	
ECOR 3800 Eng Economics		

Year 4

Fall	Winter
ELEC 4907 2-term Capstone Project	ELEC 4907 2-term Capstone Project
ELEC 4601 Microprocessors	Elective Comp. Studies
SYSC 4505 Auto Control	Elective Eng Elective
Elective Eng Elective	Elective Eng Elective
Elective Eng Elective	Elective Basic Sci/Eng
ECOR 4995 Prof Practice	
ECOR 2995 2-term Engineering Portfolio	ECOR 2995 2-term Engineering Portfolio

Photonics and Optoelectronics Stream

Year 1

Fall	Winter	Summer
MATH 1004 Calculus for Eng.	Elective Comp. Studies	
MATH 1104 Linear Algebra	CHEM 1101 Chemistry	
Elective Basic Science	PHYS 1004 Electromagnetism	
ECOR 1033 Statics	ECOR 1031 Prog & Data	
ECOR 1034 Dynamics	ECOR 1032 Circuits & Mech	
ECOR 1055 Intro to Eng I	ECOR 1056 Intro to Eng II	
ECOR 1057 Eng Profession		

Year 2

Fall	Winter	Summer
MATH 1005 Diff Eq & Series	MATH 3705 Math Methods I	
MATH 2004 Multivar Calculus	ELEC 2507 Electronics I	
ELEC 2501 Circuits & Signals	ELEC 2PH0 Introduction to Photonics	
ELEC 2607 Switching Circuits	SYSC 2004 OO Software Dev	
SYSC 2006 Imperative Prog	CCDP 2100 Comm Skills	

Year 3

Fall	Winter	Summer
ELEC 3105 EM Fields	ELEC 3500 Digital Elec	
ELEC 3509 Electronics II	ELEC 3907 Eng Project	
ELEC 3908 Physical Elec	ELEC 3909 EM Waves	
SYSC 3006 Comp Org	SYSC 3501 Comm Theory	
SYSC 3600 Sys & Sim	ECOR 2050 Design of Exp	
ECOR 3800 Eng Economics		

Year 4

Fall	Winter
ELEC 4909 2-term Capstone Project	ELEC 4909 2-term Capstone Project
ELEC 4601 Microprocessors	Elective Comp. Studies
SYSC 4505 Auto Control	ELEC 4702 Fiber Optic Comms
ELEC 4700 Adv Devices & Tech	ELEC 4SPD Silicon Photonics Design
ELEC 4CP0 Co-Packaged Optics	Elective Basic Sci/Eng
ECOR 4995 Prof Practice	
ECOR 2995 2-term Engineering Portfolio	ECOR 2995 2-term Engineering Portfolio

Program Tree Legend and Course Description Appendix

This appendix is generated from the current website program tree build and includes the course descriptions referenced by the active pathways.

Color Legend

Blue - offerings outside of our Faculty of Engineering and Design (e.g. Math, Physics)

Purple - common core courses, offered within our Faculty of Engineering and Design (could be offered by any particular Department)

Orange - our standard EE courses offered by the Department of Electronics

Orange filled - new stream-specific courses to be offered by the Department of Electronics

Green - existing EE pathway courses taught outside the Department of Electronics

Dependency highlight legend: green highlights are prerequisites, orange highlights are courses unlocked by the selected course.

Course Descriptions

Descriptions below are grouped by subject prefix and include the common core and stream courses shown in the current program tree.

CCDP Courses

CCDP 2100 Communication Skills for Engineering Students

Development of competence in professional written and oral communication in engineering. Focus on written documents (proposals, technical explanations, research reports, summaries) and oral presentations. Attendance is mandatory. Includes: Experiential Learning Activity Prerequisite(s): restricted to students with second-year standing in the Bachelor of Engineering program. All ESL requirements must be successfully completed; this course may not be taken concurrently with any ESLA course. Not repeatable for credit when successfully completed with a grade of C or higher. Seminars three hours a week.

CHEM Courses

CHEM 1101 Chemistry for Engineering Students

Topics include stoichiometry, atomic and molecular structure, thermodynamics and chemical equilibrium, acid-base chemistry, carbon dioxide in water, alkalinity, precipitation, electrochemistry, kinetics and basic organic chemistry. Laboratory component emphasizes techniques and methods of basic experimental chemistry. Includes: Experiential Learning Activity Precludes additional credit for CHEM 1000 (no longer offered), CHEM 1001 , CHEM 1005 (no longer offered), CHEM 1011 . Prerequisite(s): Ontario 4U/M in Chemistry or equivalent. Lectures three hours a week, laboratory three hours every other week.

ECOR Courses

ECOR 1031 Programming and Data Management

Software development as an engineering discipline, modern programming language. Syntax and semantics. Tracing and visualizing program execution. Style and documentation. Testing and debugging. Binary number system. Container data types for data management. Introduction to designing and implementing numerical algorithms. Modules. Data files. Incremental, iterative development. Includes: Experiential Learning Activity Precludes additional credit for COMP 1005 , COMP 1405 , ECOR 1041 , ECOR 1042 , ECOR 1051 , ECOR 1606 , SYSC 1005 . Prerequisite(s): This course may not be taken concurrently with ESLA 1300 or ESLA 1500 . Lectures three hours per week, laboratories three hours per week.

ECOR 1032 Circuits and Mechatronics

Electrical circuit fundamentals: resistance, capacitance, inductance, voltage and current sources, Ohm’s law, nodal analysis, mesh analysis, source transformation, superposition. Components for mechatronics: filters, operational amplifiers, digital logic gates and combinatorial circuits, analog to digital converters, sensors, actuators, simple control schemes. Project in microcontroller-embedded mechatronic system:. Includes: Experiential Learning Activity Precludes additional credit for ECOR 1043 , ECOR 1044 , and ECOR 1052 . Prerequisite(s): This course may not be taken concurrently with ESLA 1300 or ESLA 1500 . Lectures three hours per week, laboratories three hours per week.

ECOR 1033 Statics

Force vectors, Dot product. Forces components and resultants. Particle equilibrium. Moments. Cross product. 2D Truss analysis. Centre of gravity and centroids. Rigid body equilibrium. 2D Frames and machines. Internal loads at a point. Includes: Experiential Learning Activity Precludes additional credit for ECOR 1045 , ECOR 1046 , ECOR 1053 , ECOR 1101 . Prerequisite(s): This course may not be taken concurrently with ESLA 1300 or ESLA 1500 . Lectures three hours per week, laboratories three hours per week.

ECOR 1034 Dynamics

Kinematics and Kinetics of a particle. Position velocity and acceleration using cartesian path and polar coordinates. Force and Acceleration. Mechanical work and energy conservation of energy. Principle of impulse and momentum, conservation of momentum. Systems of particles. Harmonic motion. Design Project on Projectile motion. Includes: Experiential Learning Activity Precludes additional credit for ECOR 1047 , ECOR 1048 , ECOR 1054 , ECOR 1101 , ECOR 1010 . Prerequisite(s): This course may not be taken concurrently with ESLA 1300 or ESLA 1500 . Lectures three hours per week, laboratories three hours per week.

ECOR 1055 Introduction to Engineering Disciplines I

Overview of professional activities oriented to the student's discipline of study: Architectural Conservation and Sustainability. Civil and Environmental. Aerospace and Mechanical. Electrical. Engineering Physics. Computer Systems, Communications and Software. Biomedical (Electrical and Mechanical). Sustainable and Renewable Energy. Graded SAT/UNS. Prerequisite(s): This course may not be taken concurrently with ESLA 1300 or ESLA 1500 . Lectures 1.5 hours per week.

ECOR 1056 Introduction to Engineering Disciplines II

Selected lectures designed to provide students with exposure to the breadth of Engineering disciplines. Graded SAT/UNS. Online course.

ECOR 1057 Engineering Profession

Professional Engineers Act. Engineering documentation. History of the profession. Engineering practice: system life cycle, practice within the discipline, designing with others. Health and safety. Engineering Ethics, Equity and Diversity. Introduction to engineering law : Business, Entrepreneurship and Intellectual Property. Graded SAT/UNS. Online course

ECOR 2050 Design and Analysis of Engineering Experiments

Statistics and the design of engineering experiments. Basic exploratory data analysis. Central limit theorem. Hypothesis testing: t-test, chi-square test, type-I and type-II errors, multiple-comparison problem. Statistical bias. Design of experiments: randomization, blocking and replication, randomized blocking designs, factorial design. Statistical software packages. Includes: Experiential Learning Activity Prerequisite(s): 2nd Year Status in Engineering. Lectures three hours a week, problem analysis and laboratory three hours a week.

ECOR 2995 Engineering Portfolio

Students will be asked to reflect on their skills, strengths and weaknesses as preparation for the professional practice course. Engineering students must submit samples of their writing and communications (including, for example, laboratory reports and professional memos). Online

ECOR 3800 Engineering Economics

Introduction to engineering economics; cash flow calculations; methods of comparison of alternatives; structural analysis; replacement analysis; public projects; depreciation and income tax; effects of inflation; sensitivity analysis; break-even analysis; decision making under risk and uncertainty. Prerequisite(s): third-year status in Engineering or (second-year status in Engineering and permission of the department). Lectures three hours a week.

ECOR 4995 Professional Practice

Presentations by faculty and external lecturers on the Professional Engineers Act, professional ethics and responsibilities, practice within the discipline and its relationship with other disciplines and to society, health and safety, environmental stewardship, principles and practice of sustainable development. Communication skills are emphasized. Precludes additional credit for MAAE 4905, CIVE 4905, SYSC 3905 or ELEC 3905 (all no longer offered). Prerequisite(s): ECOR 2995 and fourth-year status in Engineering. Lectures three hours a week.

ELEC Courses

ELEC 2501 Circuits and Signals

Properties of signals. Basic circuit elements: voltage and current sources. Kirchhoff's laws, linearity, superposition. Thevenin and Norton's theorems. Circuit simplification. AC steady-state analysis: impedance, admittance, phasors, frequency response. Transient response of RL and RC circuits: form of response, initial and final conditions. RLC circuits: resonance. Includes: Experiential Learning Activity Precludes additional credit for ELEC 3605 . Prerequisite(s): MATH 1005 (may be taken concurrently) and (PHYS 1004 or PHYS 1002), and second-year status in Engineering. Lectures three hours a week, laboratory and problem analysis three hours a week.

ELEC 2507 Electronics I

Qualitative semiconductor physics, leading to the diode equation. Diode applications. Operational amplifiers and their application in feedback configurations including active filters. Introduction to bipolar transistors and MOSFETs, analysis of biasing circuits. Transistor applications including small signal amplifiers. Includes: Experiential Learning Activity Precludes additional credit for OSS 2006 , PLT 2006 (no longer offered). Prerequisite(s): MATH 1005 , ELEC 2501 , and second-year status in Engineering. Lectures

three hours a week, laboratory and problem analysis three hours a week.

ELEC 2PHO Introduction to Photonics for Electrical Engineers

Proposed course

Foundations of photonics for electrical engineers. Optical propagation concepts relevant to guided-wave systems, sources and detectors, modulation, noise and sensitivity, optical power measurement, and introductory fiber and link-budget concepts. Laboratory work emphasizes safe optical handling and characterization of optoelectronic components.

ELEC 2602 Electric Machines and Power

Modeling and analysis of basic electric power systems. Single-phase and three-phase circuits: real and reactive power, per-phase analysis, power factor correction. Electro-mechanical energy conversion: operation, characteristics and analysis of transformers, DC-, induction-, and synchronous electric machines. Motor and generator operation. Includes: Experiential Learning Activity Prerequisite(s): PHYS 1004 and ELEC 2501 , and second-year status in Engineering. Lectures 3 hours per week. Laboratory and problem analysis 3 hours per week alternate weeks.

ELEC 2607 Switching Circuits

Boolean algebra, gate, combinatorial circuits. DeMorgan notation, sum-of-product and product-of-sum forms. Logic arrays, PLAs and PALs. Flip-flops, latches, sequential circuits, state graphs and state minimization. Counters and controllers. Hazards. Asynchronous sequential circuits, race free assignment, realization. Includes: Experiential Learning Activity Precludes additional credit for SYSC 2310 . Prerequisite(s): PHYS 1004 or PHYS 1002 and second-year status in Engineering. Lectures three hours a week, laboratory three hours alternate weeks.

ELEC 3105 Electromagnetic Fields

Vector calculus: gradient, divergence, curl, integration of vector fields. Electrostatics, magnetostatics. Boundary conditions. Poisson's and Laplace's equations: method of images, separation of variables, iterative method. Electric and magnetic properties of matter. Magnetic circuits. Lorentz force. Motional emf, electromagnetic induction. Maxwell’s equations. Includes: Experiential Learning Activity Prerequisite(s): MATH 1005 , MATH 2004 , and (PHYS 1004 or PHYS 1002), and second-year status in Engineering. Lectures three hours a week, laboratory and problem analysis three hours alternate weeks.

ELEC 3500 Digital Electronics

Digital circuit design using verilog and logic synthesis, the electronic properties of logic gates, electrical interfacing between logic families, asynchronous to synchronous interfacing, clock distribution and timing, VLSI design options. Students implement substantial circuits with field-programmable gate arrays. Includes: Experiential Learning Activity Prerequisite(s): ELEC 2507 and ELEC 2607 . Lectures three hours a week, laboratory three hours a week.

ELEC 3509 Electronics II

Introduction to semiconductor devices and ICs. DC, AC and switching properties of BJTs. Linear amplifiers; bandwidth considerations; two-port analysis. Large signal amplifiers; power amplifiers; transformerless circuits. Feedback and operational amplifiers; gain, sensitivity, distortion and stability. Filter design. Oscillators. Includes: Experiential Learning Activity Precludes additional credit for : ELEC 3509 may not be taken for credit by students in the Biomedical and Electrical Engineering or Biomedical and Mechanical Engineering programs. Prerequisite(s): ELEC 2507 . Lectures three hours a week, laboratory three hours a week.

ELEC 3907 Engineering Project

Student teams work on open-ended projects based on previously acquired knowledge. Lectures are devoted to discussing project-related issues and student presentations. A project proposal, a series of project reports, and oral presentations, and a comprehensive final report are required. Includes: Experiential Learning Activity Prerequisite(s): ELEC 2507 , ELEC 2607 , third year status in Engineering, and enrolment in the Electrical Engineering or Engineering Physics program. Lecture two hours per week, laboratory six hours per week.

ELEC 3908 Physical Electronics

Fundamentals of device physics and operation of the pn junction, bipolar transistor and MOSFET. Basic integrated circuit processing and application to diodes, BJTs and MOSFETs. Correlation between processing, structure, operation and modeling. Consideration of parasitic and small-geometry effects, reliability and process variation. Includes: Experiential Learning Activity Precludes additional credit for ELEC 4705. Prerequisite(s): ELEC 2507 . Lectures three hours a week, laboratory and problem analysis three hours alternate weeks.

ELEC 3909 Electromagnetic Waves

Maxwell's equations and EM wave solutions. Polarization. Poynting vector. EM waves in dielectrics and conductors; skin depth. Reflection and refraction. Standing waves. Fresnel relations, Brewster angle. Transmission lines. Line termination, basic impedance matching and transformation. Smith charts. Introduction to guided waves; slab waveguide. Includes: Experiential Learning Activity Precludes additional credit for PHYS 3308 . Prerequisite(s): ELEC 3105 or permission of the Department. Lectures three hours a week, problem analysis three hours alternate weeks.

ELEC 4601 Microprocessor Systems

Interfacing aspects in microprocessor systems. Microprocessors and bus structures, internal architecture, instruction set and pin functions. Memory interfacing, input-output, interrupts, direct memory accesses, special processors and multiprocessor systems. Includes: Experiential Learning Activity Precludes additional credit for COMP 3006 (no longer offered), SYSC 3320 , SYSC 3601 . Prerequisite(s): ELEC 2607 and one of SYSC 2003 or SYSC 3003 (no longer offered) or SYSC 3006 or permission of the Department. Lectures three hours a week, laboratory three hours alternate weeks.

ELEC 4700 The Physics and Modeling of Advanced Devices and Technologies

Fabrication, operation and modeling of advanced devices for information technology. Topics: physics of materials, quantum mechanics of solids, optical transitions, physical analysis and models for state-of-the-art electronic/optical technologies and materials. Technologies: MOS and III-V based transistors, solid-state optical devices, MEMS and nano-technology based devices. Prerequisite(s): ELEC 3908 . Lectures three hours a week, problem analysis two hours alternate weeks.

ELEC 4702 Fiber Optic Communications

Fundamentals of optoelectronics with application to fiber optic communications. Optical fibre: modes, losses, dispersion, splices, coupling to sources. Optical sources: LEDs, laser diodes. Optical detectors: photoconductor, pin and avalanche photodiodes. Optical receiver design. Fiber optic communications systems: intensity modulation/direct detection; coherent homodyne or heterodyne detection. Includes: Experiential Learning Activity Prerequisite(s): ELEC 3908 and ELEC 3909 . Lectures three hours a week, laboratory three hours alternate weeks.

ELEC 4907 Engineering Project

Student teams develop professional-level experience by applying, honing, integrating, and extending previously acquired knowledge in a major design project. Lectures are devoted to discussing project-related issues and student presentations. A project proposal, interim report, oral presentations, and a comprehensive final report are required. Includes: Experiential Learning Activity Prerequisite(s): (ELEC 3907 or SYSC 3010) and fourth-year status in Engineering.

ELEC 4909 Photonics and Optoelectronics Capstone Project

Proposed course

A two-term capstone design project in photonics and optoelectronics. Student teams develop professional-level experience by applying, integrating, and extending previously acquired knowledge in a major design project focused on photonic, optoelectronic, optical-link, optical-packaging, optical-test, silicon-photonics, or related systems. A project proposal, interim report, oral presentations, verification activities, and a comprehensive final report are required.

MATH Courses

MATH 1004 Calculus for Engineering or Physics

Limits. Differentiation of the elementary functions. Rules of differentiation. Inverse trigonometric functions. Applications of differentiation: max-min problems, curve sketching, approximations. Definite and indefinite integrals, techniques of integration. Applications to areas and volumes. Precludes additional credit for BIT 1000 , BIT 1100 , BIT 1200 , MATH 1002 (no longer offered), MATH 1007 , MATH 1052 . Prerequisite(s): Ontario Grade 12 Mathematics: Advanced Functions, or MATH 0005 and MATH 0006 , or equivalent. Restricted to students in the Faculty of Engineering, or in certain B.Sc. and B.A.S. programs where specified. Lectures three hours a week, tutorial one hour a week.

MATH 1005 Differential Equations and Infinite Series for Engineering or Physics

First-order differential equations. Second-order linear equations with constant coefficients, undetermined coefficients, variation of parameters. Sequences and series, convergence tests, estimation of sums. Power series, Taylor series, remainders. Fourier series. Precludes additional credit for BIT 2004 (no longer offered), BIT 2007 (no longer offered), MATH 1002 (no longer offered), MATH 2007 , MATH 2052 , and MATH 2404 . Prerequisite(s): i) MATH 1004 ; and ii) MATH 1104 (or MATH 1107), either previously or concurrently; or equivalents; or permission of the School. Restricted to students in the Faculty of Engineering, or in certain B.Sc. programs where specified. Lectures three hours a week, tutorial one hour a week.

MATH 1104 Linear Algebra for Engineering or Science

Systems of linear equations. Matrix algebra. Determinants. Invertible matrix theorem. Cramer’s rule. Vector space R^n; subspaces, bases. Eigenvalues, diagonalization. Linear transformations, kernel, range. Complex numbers (including De Moivre’s theorem). Inner product spaces and orthogonality. Applications. Precludes additional credit for BIT 1001 , BIT 1101 , BIT 1201 , MATH 1102 (no longer offered), MATH 1107 , MATH 1119 , MATH 1401 / ECON 1401 , MATH 1402 / ECON 1402 , MATH 1152 . Note: MATH 1119 is not an acceptable substitute for MATH 1104 . Prerequisite(s): Ontario Grade 12 Mathematics: Advanced Functions, or MATH 0005 , or equivalent, or permission of the School. Restricted to students in the Faculty of Engineering, the School of Computer Science, or in certain B.Sc. and B.A.S. programs where specified. Lectures three hours a week and tutorial one hour a week.

MATH 2004 Multivariable Calculus for Engineering or Physics

Curves and surfaces. Polar, cylindrical and spherical coordinates. Partial derivatives, gradients, extrema and Lagrange multipliers. Exact differentials. Multiple integrals over rectangular and general regions. Integrals over surfaces. Line integrals. Vector differential operators. Green’s Theorem, Stokes’ theorem, Divergence Theorem. Applications.

Precludes additional credit for BIT 2005, MATH 2000 , and MATH 2008 . Prerequisite(s): i) MATH 1005 or MATH 2007 ; and ii) MATH 1104 or MATH 1107 ; or permission of the School. Restricted to students in the Faculty of Engineering, or in certain B.Sc. programs where specified. Lectures three hours a week, tutorial one hour a week.

MATH 3705 Mathematical Methods I

Laplace transforms, series solutions of ordinary differential equations, the Frobenius method. Fourier series and Fourier transforms, solutions of partial differential equations of mathematical physics, boundary value problems, applications. Precludes additional credit for PHYS 3808 . This course may be taken for credit as a 3000-level Honours Mathematics course by students in any Honours program in the School of Mathematics and Statistics. Prerequisite(s): i) MATH 1005 or MATH 2404 , and ii) MATH 2004 or MATH 2008 or MATH 2009; or permission of the School. Lectures three hours a week and one hour tutorial.

PHYS Courses

PHYS 1004 Introductory Electromagnetism and Wave Motion

This calculus-based course introduces potential energy, work, electricity, magnetism, oscillations and waves. Includes: Experiential Learning Activity Precludes additional credit for BIT 1003 (no longer offered), BIT 1007 , BIT 1204 , PHYS 1002 , PHYS 1008 , PHYS 1108 . Prerequisite(s): MATH 1004 , ECOR 1101 or ECOR 1053 or (ECOR 1045 and ECOR 1048) or (ECOR 1033 and ECOR 1034)(the ECOR courses may be taken concurrently) or PHYS 1001 or PHYS 1003 or PHYS 1007 (a grade of at least B- is required for PHYS 1007), or permission of the Department. Lectures three hours a week, laboratory or tutorial three hours a week.

SYSC Courses

SYSC 2004 Object-Oriented Software Development

Designing and implementing small-scale programs as communities of collaborating objects, using a dynamically-typed or statically-typed programming language. Fundamental concepts: classes, objects, encapsulation, information hiding, inheritance, polymorphism. Iterative, incremental development and test-driven development. Includes: Experiential Learning Activity Precludes additional credit for COMP 1006 and COMP 1406 . Prerequisite(s): SYSC 1006 or SYSC 2006 or permission of the department, and second-year status in Engineering. Lectures three hours a week, laboratory two hours a week.

SYSC 2006 Foundations of Imperative Programming

The imperative programming paradigm: assignment and state, types and variables, static and dynamic typing. Memory management and object lifetimes: static allocation, automatic allocation in activation frames, dynamic allocation. Function argument passing. Recursion. Data structures: dynamic arrays, linked lists, hash tables. Encapsulation and information hiding. Includes: Experiential Learning Activity Also listed as SYSC 1006 . Precludes additional credit for COMP 2401 , SYSC 4006 . Prerequisite(s): Second-year status in Engineering. Lectures three hours a week, laboratory two hours a week.

SYSC 3006 Computer Organization

Computer organization: processor, memory, input/output, system bus. Number systems: binary, decimal, hexadecimal. Assembly language programming: representation of data, instruction encoding, execution. Devices: keyboard, programmable timer, parallel interface. Input/output methods: polling, hardware/software interrupts. Includes: Experiential Learning Activity Precludes additional credit for SYSC 2320 . Prerequisite(s): (SYSC 1006 or SYSC 2006) and (SYSC 2310 or ELEC 2607). Lectures three hours a week, laboratory three hours a week.

SYSC 3501 Communication Theory

Review of signals, linear systems and Fourier theory; signal bandwidth and spectra; digital waveform coding; introduction to analog and digital modulation systems; synchronization; characterization and effects of noise; link budgets; communications media and circuits; applications to current communications systems. Includes: Experiential Learning Activity Precludes additional credit for SYSC 3503 . Prerequisite(s): SYSC 3600 or SYSC 3610 . Lectures three hours a week, laboratory three hours alternate weeks.

SYSC 3600 Systems and Simulation

Properties of linear systems. Linear dynamic models of engineering systems. Applications of the Laplace transform. Transfer functions. Block diagrams. Frequency and time response. System simulation with digital computers. Includes: Experiential Learning Activity Precludes additional credit for SYSC 3500 or SYSC 3610 . Prerequisite(s): MATH 1005 and second-year status in Engineering. Lectures three hours a week, laboratory three hours a week.

SYSC 4505 Automatic Control Systems I

Review of Laplace transform techniques. Effects of feedback: frequency response, pole-zero positions. Compensation: root locus, Bode plots. State variables: formulation, solution of linear systems, examples of simple second-order non-linear systems. Discrete time systems: z-transforms. Signal reconstruction. Includes: Experiential Learning Activity Precludes additional credit for MAAE 3500 , MAAE 4500 (no longer offered). Prerequisite(s): MATH 2004 and (SYSC 3500 or SYSC 3600 or SYSC 3610). Lectures three hours a week, laboratory three hours alternate weeks.

ELEC Courses

ELEC 4CPO Co-Packaged Optics

Proposed course

Architectures and engineering constraints for co-packaged optics and related optical I/O. Partitioning between electrical and photonic domains, packaging and assembly constraints, thermal and mechanical considerations, signal integrity and power delivery at high speeds, and test/validation strategies from prototype to production. Emphasis on system-level trade-offs and design-for-test.

ELEC 4SPD Silicon Photonics Design

Proposed course

Silicon photonics design methodology using foundry design flows. Photonic building blocks, circuit composition, simulation and verification, layout constraints, and design-for-manufacture considerations. Students complete a substantial design exercise with documented specifications and verification.