

**Approved BSIE Technical Electives  
May 24, 2023**

The following courses are approved technical electives for the BSIE program. When you register for a course on this list (except where you only get credit for 1 of 3 courses in a group as indicated below), it will automatically be recorded as a technical elective on your audit. Students must earn a “C” or better to receive technical elective credit.

**IE Undergraduate Courses**

**EIN 4545 ECS-IEMS 3(3,0)**

**Industrial Engineering Applications in The Service Industries:** PR: ESI 4312 with “C” or better; or C.I. Application of industrial engineering principles to improve the quality and productivity of service industries such as restaurants, banks, hotels, health care, etc. *Fall.*

**ESI 4322 ECS-IEMS 3(3,0)**

**Supply Chain Engineering:** PR: STA 3032 and ESI 4312 with “C” or better; or C.I. An introduction to basic principles and techniques of supply chain engineering through mathematical models and algorithms for Industrial Engineers. It includes industrial applications/case studies. *Occasional.*

**IE Graduate Courses**

***Can be taken by BSIE-MSIE students or seniors with a GPA  $\geq$  3.0 Note: You must pay the graduate rate per hour but Bright Futures Scholarships will pay for the UG portion. 5xxx courses will receive credit in the UG program with a “C” or better and also transfer toward an Industrial Engineering Master’s at UCF with a grade of “B” or better.***

**EIN 5117 ECS-IEMS 3(3,0)**

**Management Information Systems I:** PR: C.I. The design and implementation of computer-based Management Information Systems. Consideration is given to the organizational, managerial, and economic aspects of MIS. *Spring.*

**EIN 5140 ECS-IEMS 3(3,0)**

**Project Engineering:** PR: Graduate standing or C.I. Role of engineer in project management with emphasis on project life cycle, quantitative and qualitative methods of cost, schedule, and performance control. *Fall, Spring.*

**EIN 5251 ECS-IEMS 3(3,0)**

**Usability Engineering:** PR: STA 3032 or equivalent. Usability paradigms/principles; cognitive walk-throughs; heuristic, review-based, model-based, empirical and storyboard evaluation; techniques; query techniques; laboratory techniques; and field study approaches. *Fall.*

**EIN 5255C ECS-IEMS 3(2,2)**

**Interactive Simulation:** PR: Graduate standing or C.I. Introduction to significant topics relative to the development and use of simulators for knowledge transfer in the technical environment. *Occasional.*

**EIN 5346 ECS-IEMS 3(3,0)**

**Engineering Logistics:** Study of the logistics life cycle involving planning, analysis and design, testing, production, distribution, and support. *Occasional.*

**ESI 5227 ECS-IEMS 3(3,0)**

**Total Quality Improvement:** PR: STA 3032 or equivalent. Quality improvement (QI) tools and techniques, advanced QI techniques, quality improvement systems, total quality management concepts and implementation, planning and management tools, and case studies. *Occasional.*

**ESI 5236 ECS-IEMS 3(3,0)**

**Reliability Engineering:** PR: ESI 4234 or equivalent, or C.I. Reliability theory and modeling approaches. Topics include: failure data analysis, maintainability, reliability standards (DOD), software reliability, reliability in design, and electronic systems reliability. *Fall.*

**Entrepreneurship/Selling**

***You may receive technical elective credit for one of the following three courses:***

**EGN 4641C ECS-ECS 3(2,2)**

**Engineering Entrepreneurship:** PR: Senior standing, ENT 4183, or C.I. All aspects of a successful engineering entrepreneurship enterprise. Content includes lectures, case studies, and seminars. Active student participation. Course material is augmented through seminars given by engineers, business people, and specialists, based on their own experiences. *Occasional.*

**ENT 4183 BA-MAN 3(3,0)**

**Technological Entrepreneurship:** PR: Junior Standing. How technology and innovation processes affect social and organizational change, and the distinct challenges associated with launching, managing and growing technology-based business ventures. *Fall, Spring.*

**MAR 3391 BA-MAR 3(3,0)**

**Selling for Engineers:** PR: Sophomore standing in a STEM major with a grade of C (2.0) or better. Written and verbal communications skills applied to marketing settings. A significant portion of the course is devoted to the study of professional selling. **(Special STEM section for engineers – contact [cmassiah@ucf.edu](mailto:cmassiah@ucf.edu) and provide your UCF ID number to obtain permission number for registration).** *Spring.*

## **Other Relevant Courses for IEs**

### **General Engineering**

#### **EGN 3331 ECS-CECE 3(3,0)**

**Mechanics of Materials:** PR: EGN 3310 with a grade of “C” or better; CR: MAP 2302. Concepts of stress, strain, strength, deflection of axial force members, shafts in torsion, beams in flexure, combined stress, stability of columns, and design of simple elements. *Fall, Spring.*

**EGN 3365 ECS-MMAE 3(3,0) Structure and Properties of Materials:** PR: (CHS 1440 or CHM 2045C) and MAC 2312 with grades of “C” (2.0) or better in both. Atomic structure and bonding, crystal structure and imperfections, solidification, phase transformations, phase diagrams, heat treatment, mechanical & electrical properties, materials characterization techniques. *Fall, Spring.*

#### **EGN 4060C ECS-ECS 3(2,3)**

**Introduction to Robotics:** PR: COP 3223 or EGN 3211; and EEL 3657 or EEL 4742C or COP 3503C or EGN 3321 or EML 3217. Theory and application of robotics topics including; architecture, path planning, sensing and manipulation. *Fall.*

#### **EGS 4633 ECS-IEMS 3(1,4)**

**Engineering Consumer Products:** PR: Senior Standing. The courses focus is design and engineering of consumer-based products. The course emphasizes the aesthetics, user interface, ergonomics and safety of the proposed product. *Occasional.*

### **Aerospace Engineering**

#### **EML 3701 ECS-MECH/AERO 3(3,0)**

**Fluid Mechanics I:** PR: “C” (2.0) or better in all of the following: MAC 2311C, MAC 2312, MAC 2313, MAP 2302, PHY 2048C, EGN 3321 and EGN 3343. Principles of continuum fluid mechanics. Integral and differential forms of governing equations, fluid statics, dimensional analysis, measurements, internal flows. *Fall, Spring.*

#### **EAS 3955H 3(3,0)**

**Contemporary Projects in Aerospace Manufacturing:** PR: Instructor consent. Students will participate in presentations and field excursions that will enhance their understanding of aerospace manufacturing. *Spring.*

## **Bioengineering**

### **BME 3211 3(3,0)**

**Engineering Biomechanics:** PR: "C" (2.0) or better required in all of the following: EGN 3310, EGN 3321 and EGM 3601. Knowledge of engineering approaches and tools that are used in the different aspects of biomechanics. *Fall*

## **Computer Science**

### **CIS 3360 ECS-EECS 3(3,0)**

**Security in Computing:** PR: COP 3223 or EGN 3211 or CET 2364. Security theory. Legal and human factors, Malware, Intrusion patterns and tools, Windows, Unix, TCP/IP, and applications vulnerabilities. Detection. Policies and enforcement. Protection and assurance. *Fall, Spring.*

### **COP 3330 ECS-CS 3(3,0)**

**Object Oriented Programming:** PR: COP 3223 or EGN 3211 with a grade of "C" (2.0) or better. Object oriented programming concepts (classes, objects, methods, encapsulating, inheritance, interfaces) and the expression of these concepts in the programming languages such as JAVA. *Fall, Spring.*

### **COP 3502C ECS-CS 3(3,1)**

**Computer Science I:** PR: (COP 3223 or EGN 3211) and MAC 1105C all with a grade of "C" (2.0) or better. Problem solving techniques, order analysis and notation, abstract data types, and recursion. *Fall, Spring.*

### **COT 3100C ECS-CS 3(3,1)**

**Introduction to Discrete Structures:** PR: MAC 2311C with a grade of "C" (2.0) or better. Logic, sets, functions, relations, combinatorics, graphics, Boolean algebras, finite-state machines, Turing machines, unsolvability, computational complexity. *Fall, Spring.*

## **Environmental Engineering**

### **ENV 3001 ECS-CECE 3(3,0)**

#### **Introduction to Environmental Engineering:**

PR: A grade of "C" (2.0) or better in MAC 2312 and CHM 2045C or CHS 1440 or CHM 2041. Introduction to concepts and terminology of environmental engineering. Stresses material and energy balances. Covers air, water and land pollution. *Fall, Spring.*

### **EES 4111C 4(4,3)**

#### **Biological Process Control:** PR: ENV 3001 with a grade of "C" (2.0) or better.

Engineering design, measurements and analysis of biological systems in environmental engineering for water management, bioenergy products, wastewater treatment, and others. *Spring*

## **Electrical Engineering**

### **EEE 3342C ECS-ECE 3(2,3)**

**Digital Systems:** PR: MAC 2311C, MAC 2312, PHY 2048C, PHY 2049C all with a "C" (2.0) or better grade. Combinational and sequential logic circuits including registers, arithmetic units, memories, finite state machines, and design with programmable logic devices. *Fall, Spring.* M&S fee \$9.00

## **Mathematics**

### **MAP 4103 COS-MATH 3(3,0)**

**Mathematical Modeling I:** PR: MAS 3105 and MAP 2302, or C.I. An introduction to the study of mathematical modeling. *Spring.*

### **MAP 4113 COS-MATH 3(3,0)**

**Probability, Random Processes and Applications:** PR: MAC 2313. Elementary probability theory; modes of convergence; martingales, Gaussian, Wiener, and diffusion processes; Brownian motion; applications. *Occasional.*

### **MAP 4153 COS-MATH 3(3,0)**

**Vector and Tensor Analysis:** PR: MAP 2302 and MAS 3105, or C.I. Vector calculus. The theorems of Green, Gauss and Stokes. Introduction to tensors. Application in engineering and physical sciences. *Fall.*

### **MAP 4171 COS-MATH 3(3,0)**

**Optimization:** PR: MAC 2313, MAP 2302, and MAS 3105, or C.I. Linear programming, dynamic programming, control theory, integer programming. *Occasional.*

### **MAP 4191 COS-MATH 3(3,0)**

**Mathematical Modeling of Data:** PR: MAC 2313 and MAS 3105 or equivalent. Modeling methodologies: choosing, applying, and interpreting mathematical models and analysis for data problems. *Fall*

### **MAP 4303 COS-MATH 3(3,0)**

**Ordinary Differential Equations II:** PR: MAP 2302, and MAS 3105 or MAS 3106, or C.I. Systems of linear differential equations, introduction to numerical solutions, stability theory and phase plane analysis, an introduction to limit cycles, bifurcations and chaos, power series solutions of differential equations. *Occasional.*

### **MAP 4341 COS-MATH 3(3,0)**

**Introduction to Partial Differential Equations:** PR: MAC 2313 and MAP 2302 and MAS 3105, or C.I. Introduction to second-order linear partial differential equations - heat, wave and Laplace equations, separation of variables in PDEs, Sturm-Liouville eigenvalue problems, Fourier series analysis and Green's functions, Laplace and Fourier transform methods. *Occasional.*

**MAP 4371 COS-MATH 3(3,0)**

**Numerical Methods for Differential Equations:** PR: MAC 2313, MAP 2302, MAS 3105, and COP 3223, or C.I. Numerical theory and practices used in solving ordinary differential equations and PDE. Covers Euler's method, trapezoidal rule, multi-step methods, Runge-Kutta, error control, finite differences, implicit and explicit schemes, iterative methods, and stability. *Fall*.

**MAP 4384 COS-MATH 3(3,0)**

**Numerical Methods for Computational Sciences:** PR: MAP 2302, MAS 3105, and COP 3223, or C.I. Theory of modern methods of numerical computation and numerical analysis in linear algebra and differential equations; non-linear optimization, finite element methods, adaptive quadrature. *Fall*.

**MHF 3302 COS-MATH 3(3,0)**

**Logic and Proof in Mathematics:** PR: MAC 2311C. Corequisite(s): MAC 2312. Prerequisite(s) or Corequisite(s): None. Basic mathematical logic. Methods of proof in mathematics. Application of proofs to elementary mathematical structures. *Spring*.

**Psychology****EXP 3250 COS-PSYCH 3(3,0)**

**Principles of Human Factors Psychology:** PR: PSY 2012. The study of human performance in human-machine-environment systems. Topics will include human factors psychology in the design of displays and controls, human information processing, and the effects of some environmental variables on human performance. *Spring*.

**Statistics****STA 4164 COS-STAT 3(3,0)**

**Statistical Methods III:** PR: STA 4163. (STA 3032 does not qualify.) A continuation of STA 4163, including further study of regression, analysis of variance and covariance and multiple comparisons. *Fall, Spring*.

**STA 4222 COS-STAT 3(3,0)**

**Sample Survey Methods:** PR: STA 2023 or STA 3032. Constructing and analyzing survey designs. Sampling and non-sampling errors. Simple random, stratified, systematic, and multiphase sampling. Methods of estimation. *Occasional*.

**STA 4502 COS-STAT 3(3,0)**

**Nonparametric Statistical Methods:** PR: STA 2023 or STA 3032. Distribution-free tests on location and dispersion, goodness of fit tests, tests of independence, measures of association, nonparametric analysis of variance. *Occasional*.

**STA 4724 COS-STAT 4(4,0)**

**Big Data Analytics Methods:** PR: STA 2023 Statistical Methods I. Principles of algorithms in analyzing data, computational concerns with statistics, principles of

classification, association rules, belief networks, clustering, use of trees in decision making, visualization techniques, and the understanding of randomness in datasets. *Occasional*.

**STA 4852 COS-STAT 3(3,0)**

**Applied Time Series:** PR: STA 4163. (STA 3032 may qualify - See Statistics Dept.). Forecasting methods, time series analysis, stationary and nonstationary time series, ARIMA models, forecasting processes. *Occasional*.