

Courses and technical electives for specific industry sectors recommended by ECE Industrial Advisory Board

I. ANALOG/RF CIRCUIT DESIGN

Undergraduate:

Science/Engineering Electives:

1. CS 156 – Intro to C Programming
2. MATH 229 – Matrices and Linear Equations
3. MATH 332 – Partial Differential Equations
4. RTL Development/FPGA course

Electrical and Computer Engineering Electives:

1. ECE 412 – Digital Control and Digital Filters
2. ECE 534 Analog IC Design and ECE 535 Analog IC Laboratory
3. ECE 571 – VLSI System Design I
4. ECE 524 – Wireless Telecommunication or ECE 536 – RF Integrated Circuit Design

Graduate:

1. ECE 512 – Digital Signal Processing
2. ECE 520 – Optimization Methods for Control and Communication
3. ECE 548 – Microwave Theory and Component Design
4. ECE 550 A-B – Microprocessor Based Systems
5. ECE 562 – Power Electronics I
6. ECE 614 – Principles of Digital Communication
7. ECE 652 – Estimation and Filtering Theory
8. STAT 511 – Design and Data Analysis for Researchers

Other suggested courses not on list:

- Mandarin
- Modeling
- Data Converters
- Design for Testability

II. ASIC DESIGN

Undergraduate:

Science/Engineering Electives:

1. CS 156 – Intro to C Programming or CS 157 – Intro to C Programming II
2. CS 200 – Algorithms and Data Structures
3. RTL Development/FPGA course
4. Combine Unix with some other class
5. ECE 554 – Computer Architecture – pipelines and caches are critical to ASIC/CPU design (Linux not Unix)
6. Mixed Signal course – PLLs, SERDES, etc.

Electrical and Computer Engineering Electives:

1. ECE 451 – Digital System Design and ECE 450 – Digital System Design Laboratory
2. ECE 472 – MOS Integrated Circuits
3. ECE 550 A-B – Microprocessor Based Systems
4. ECE 561 – Hardware/Software Design of Embedded Systems
5. ECE 571 VLSI System Design I and ECE575 – Experiments in VLSI System Design

Graduate:

1. ECE 550 A-B – Microprocessor Based Systems
2. ECE 571 – VLSI System Design I and ECE 575 – Experiments in VLSI System Design
3. CS 533 – Database Management Systems
4. CS 575 – Parallel Processing
5. MATH 560 – Linear Algebra I
6. STAT 501 – Statistical Science
7. MGT 305 – Business Management
8. CS 414 – Object Oriented Programming
9. a Communication Class – e.g., Technical Writing or Public Speaking
10. ECE 512 – Digital Signal Processing
11. ECE 534 – Analog IC Design
12. ECE 536 – RF Integrated Circuit Design
13. ECE 561 – Hardware/Software Design of Embedded Systems
14. ECE 571 – VLSI System Design
15. ECE 575 – Experiments in VLSI System Design I
16. ECE 614 – Principles of Digital Communications

III. SYSTEMS ENGINEERING

Undergraduate:

Science/Engineering Electives:

1. MATH 350 – Intro Numerical Anly. I
2. BMS 301 – Human Gross Anatomy (need to understand as system of systems)
3. Product lifecycle course – cradle to grave with small teams that must present design reviews to other teams, reinforcing written and verbal communication skills, requirements, development, etc.

Electrical and Computer Engineering Electives:

1. CS 155 – Intro to Unix
2. CS 156 – Intro to C Programming
3. CS 160 Foundations in Programming and CS161 Object Oriented Programming
4. MECH 237 – Intro to Thermal Sciences
5. PH 353 – Optics and Waves

Other suggestions:

6. CS 301 – Foundations of Computer Science
7. CS 314 – Software Development Methods
8. ECE 423 – DSP for Communications
9. ECE 411 – Control Systems
10. CS 420 – Intro to Analysis of Algorithms

Graduate:

1. CS 514 – Software Product and Process Evaluation
2. CS 517 – Software Specification and Design
3. CS 518 – Distributed Software System Development
4. CS 556 – Computer Security
5. CS 614 – A-B – Microprocessor Based Systems
6. CS/ECE 658 – Internet Engineering
7. CS/ECE 670 – Topics in Architecture/Systems
8. MATH 517 – Intro Mathematical Analysis I
9. STAT 511 – Design and Data Analysis for Researchers
10. STAT 515 – Statistical Science and Process Improvement

Other suggestions:

11. MATH 540 – Dynamical Systems
12. CS 656 – Advanced Topics in Computer Security
13. STAT 540 – Data Analysis and Regression
14. STAT 675 – Topics in Statistical Methods

IV. CONTROLS/EMBEDDED SYSTEMS

Undergraduate:

Science/Engineering Electives:

1. CS 156 – Intro to C Programming
2. CS 160 Foundations in Programming and CS161 Object Oriented Programming
3. CS 200 – Algorithms and Data Structures

Electrical and Computer Engineering Electives:

1. CS 460 – Embedded Systems
2. ECE 550 – Microprocessor Based Systems
3. ECE 512 – Digital Signal Processing
4. ECE 451 – Digital Systems Design
5. ECE 412 – Digital Control and Digital Filters
6. ECE 561 – Hardware/Software Design of Embedded Systems

Graduate:

1. ECE 512 – Digital Signal Processing
2. ECE 550 A-B – Microprocessor Based Systems
3. ECE 614 – Principles of Digital Communication
4. CS 518 – Distributed Software System Development
5. CS 570 – Advanced Computer Architecture
6. CS 518 – Distributed Software System Development
7. MATH 510 – Linear Program and Network Flows
8. ECE 560 – Reconfigurable Computing
9. ECE 561 – Hardware/Software Design of Embedded Systems

V. POWER

Undergraduate:

Science/Engineering Electives:

1. PH 314 – Modern Physics and PH 315 – Modern Physics Lab
2. CS 156 – Intro to C Programming
3. MATH 369 – Linear Algebra

Electrical and Computer Engineering Electives:

1. ECE 461 – Power Systems I
2. ECE 562 – Power Electronics I
3. ECE 563 – Power Electronics II
4. Power Systems II (suggested adding this class to curriculum)
5. ECE 411 – Control Systems

Graduate:

1. CS 614 – Principles of Digital Communication
2. ECE 612 – Robust Controls Systems
3. PH 642 – Electromagnetism II
4. STAT 675 – Topics in Statistical Methods
5. ECE 562 – Power Electronics I
6. ECE 563 – Power Electronics II
7. ECE 520 – Optimization Methods for Control and Communication
8. ECE 641 – Electromagnetics
9. CS 518 – Distributed Software System Development
10. CS 656 – Advanced Topics in Computer Security

VI. ENGINEERING MANAGEMENT

Undergraduate:

Science/Engineering Electives:

1. CIVE262 – Engineering Management

Electrical and Computer Engineering Electives:

1. ECE 411 – Control Systems
2. ECE 554 – Computer Architecture
3. CS 430 – Database Systems
4. ECE 461 – Power Systems I
5. ECE 456 – Computer Networks

Graduate:

1. CS/ECE 658 – Internet Engineering
2. STAT 500 – Statistical Computer Packages
3. ECE 521/524/525 – Satellite, Wireless, and Fiber Optic Communications
4. ECE/CS 674 – Heterogeneous Computing
5. CS 517 – Software Specification and Design

6. CS 514 – Software Product and Process Evaluation
7. STAT 501 – Statistical Science
8. ECE 571 – VLSI System Design I
9. ECE 512 – Digital Signal Processing
10. Business or Engineering Management course, e.g., BUS 635 Business Economics for the World Market

VII. SOFTWARE/NETWORKING

Undergraduate:

Science/Engineering Electives:

1. CS155 – Intro to Unix
2. CS200 – Algorithms and Data Structures
3. MATH369 – Linear Algebra

Electrical and Computer Engineering Electives:

1. CS 457 – Computer Networks and the Internet
2. Fundamentals of Computer Network Security (Computer Science department offers CS 556 – Computer Security)
3. CS 314 – Software Development Methods
4. CS 410 – Fundamentals of the computer graphics pipeline
5. ECE 452, ECE 554 – Computer architecture
6. CS 460 – Embedded Systems
7. CS 475, 575 – Parallel computing
8. ECE 554 – Computer Architecture
9. ECE 411 – Control Systems
10. CS 430 – Database Systems
11. ECE 456 – Computer Networks

Other suggestions:

Develop course on Systems-level Design for Networking Devices – teaches how to build networking systems-level devices (routers, switches, firewalls, etc) that rely on socket and file-level technologies.

Graduate:

1. ECE 554 – Computer Architecture
2. ECE 658 – Internet Engineering
3. CS 556 – Computer Security
4. CS 580 – Advanced Networking
5. CS 656 – Advanced Topics in Computer Security
6. ECE 614 – Principles of Digital Communication
7. ECE 524 – Wireless Telecommunication
8. STAT 520 – Introduction to Probability Theory and STAT 720 – Probability Theory
9. CS 517 – Software Specification and Design and CS 518 – Distributed Software System Development

VIII. LASERS AND OPTICAL ENGINEERING

Undergraduate:

Science/Engineering Electives:

1. MATH 229 – Matrices and Linear Equations
2. MATH 332 – Partial and Differential Equations
3. MATH 369 – Linear Algebra
4. MATH 345 – Differential Equations
5. PH 314 – Intro Modern Physics
6. PH 451 – Introductory Quantum Mechanics I
7. PH 452 – Introductory Quantum Mechanics II

Electrical and Computer Engineering Electives:

1. ECE 441 – Optical Electronics
2. ECE 404 – Lab Optical Electronics
3. ECE 457 – Fourier Optics
4. ECE 503 – Ultrafast Optics
5. ECE 504 – Physical Optics
6. ECE 505 – Nanostructures Fundamentals and Applications
7. ECE 506 – Optical Interferometry and Laser Metrology
8. ECE 507 – Plasma Physics and Applications
9. ECE 525 – Fiber Optics Communications
10. ECE 546 – Laser Fundamentals and Devices
11. ECE 574 – Optical Materials and Devices

Graduate:

1. ECE 641 – Electromagnetics
2. ECE 642 – Time Harmonic Electromagnetics
3. ECE 650 – Extreme Ultraviolet and Soft X-ray Radiation
4. ECE 604 – Nonlinear Optics
5. PH 651/652 - Quantum Mechanics I&II
6. PH 571/572 - Mathematical Methods I&II
7. M 560 - Linear Algebra
8. C 563A - Physical Methods in Inorganic Chemistry
9. C 571 - Quantum Chemistry
10. C 532 - Advanced Chemical Analysis II
11. C 773 - Quantum Mechanics II-Spectroscopy