

The ECE Curriculum

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ECE Core Courses

Freshman year

18-100
Introduction to
Electrical and
Computer Engineering

18-220
Fundamentals of
Electrical
Engineering

18-240
Fundamentals of
Computer Engineering

- physical devices
- analog circuits
- signal analysis
- electrical systems

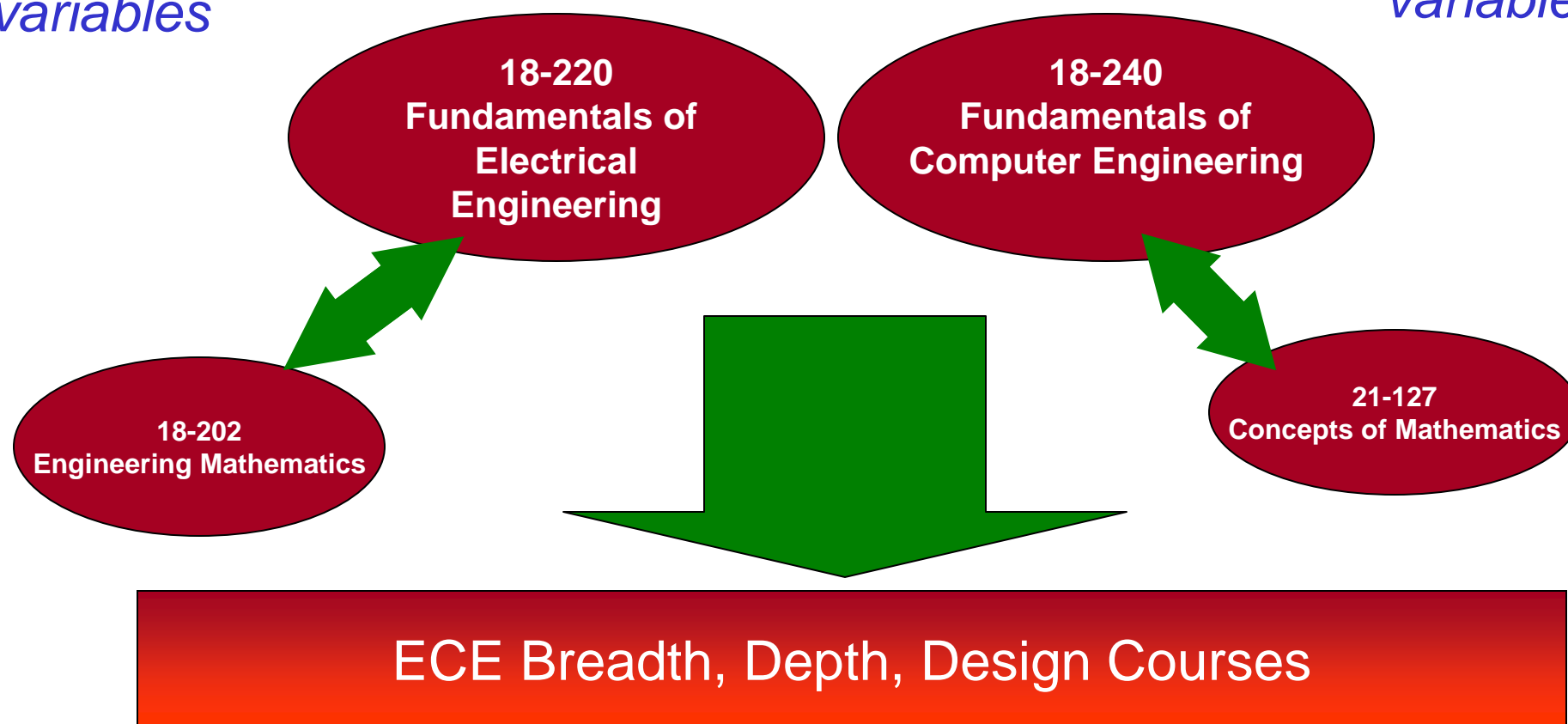
- logical devices
- digital circuits
- logic design
- computers

ECE Breadth, Depth, Design Courses

Math Co-Requisites

*continuous
variables*

*discreet
variables*



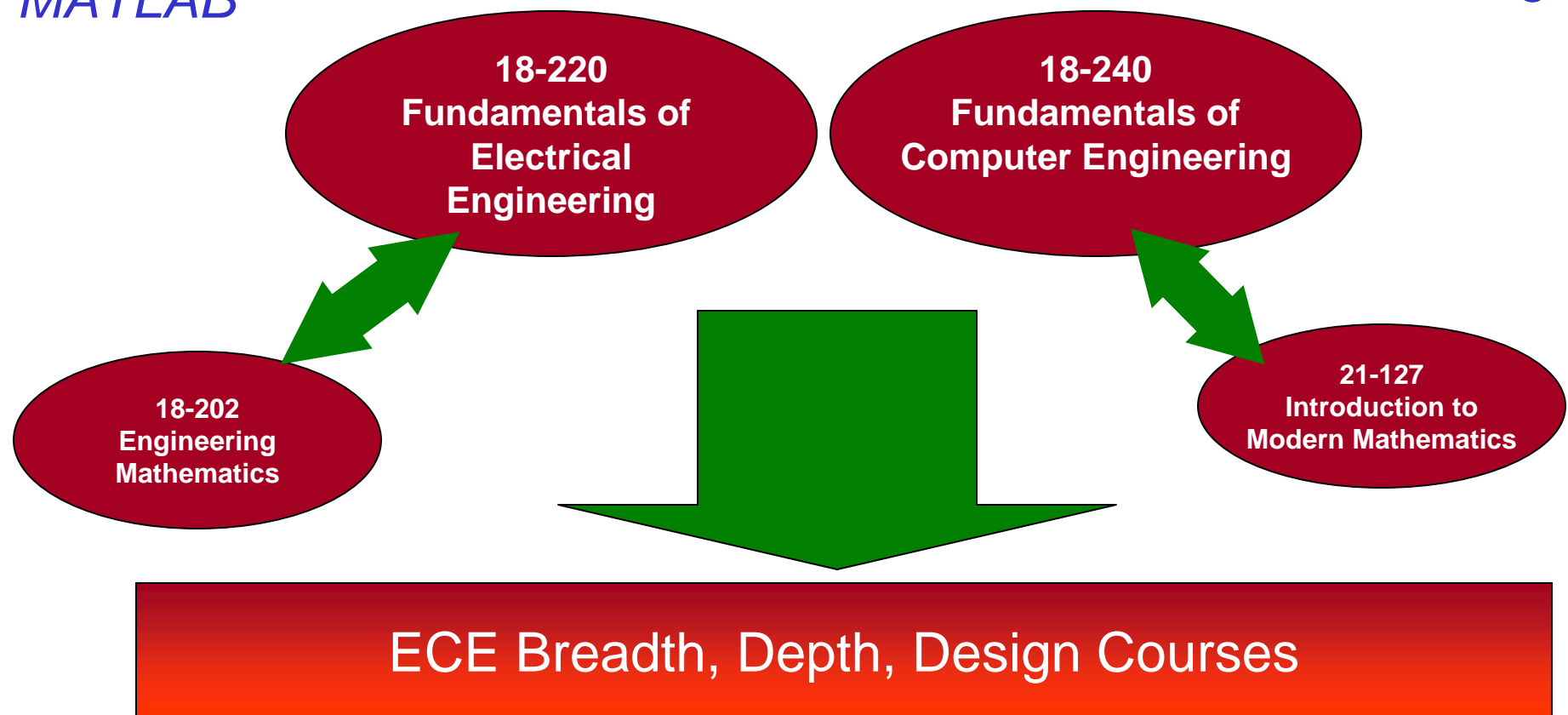
ECE Math – A Sampling of Topics

- Continuous math (18-202)
 - calculus in 3D
 - used to describe electro-magnetic waves
 - complex variables
 - used to describe electrical signals and systems
 - matrices
 - used to model and analyze circuits and systems
- Discrete math (21-127)
 - logic
 - used to model and design digital circuits
 - induction
 - used to analyze computer algorithms and programs

ECE Tools

MATLAB

Verilog



ECE Tools

- MATLAB
 - high-level numerical programming environment
 - industry standard for analysis, simulation and design of systems for signal processing and control
 - <http://www.mathworks.com/>
- Verilog
 - hardware description language (HDL)
 - widely used HDL for designing and documenting electronic systems
 - <http://www.verilog.com/>

The Rest of the Curriculum



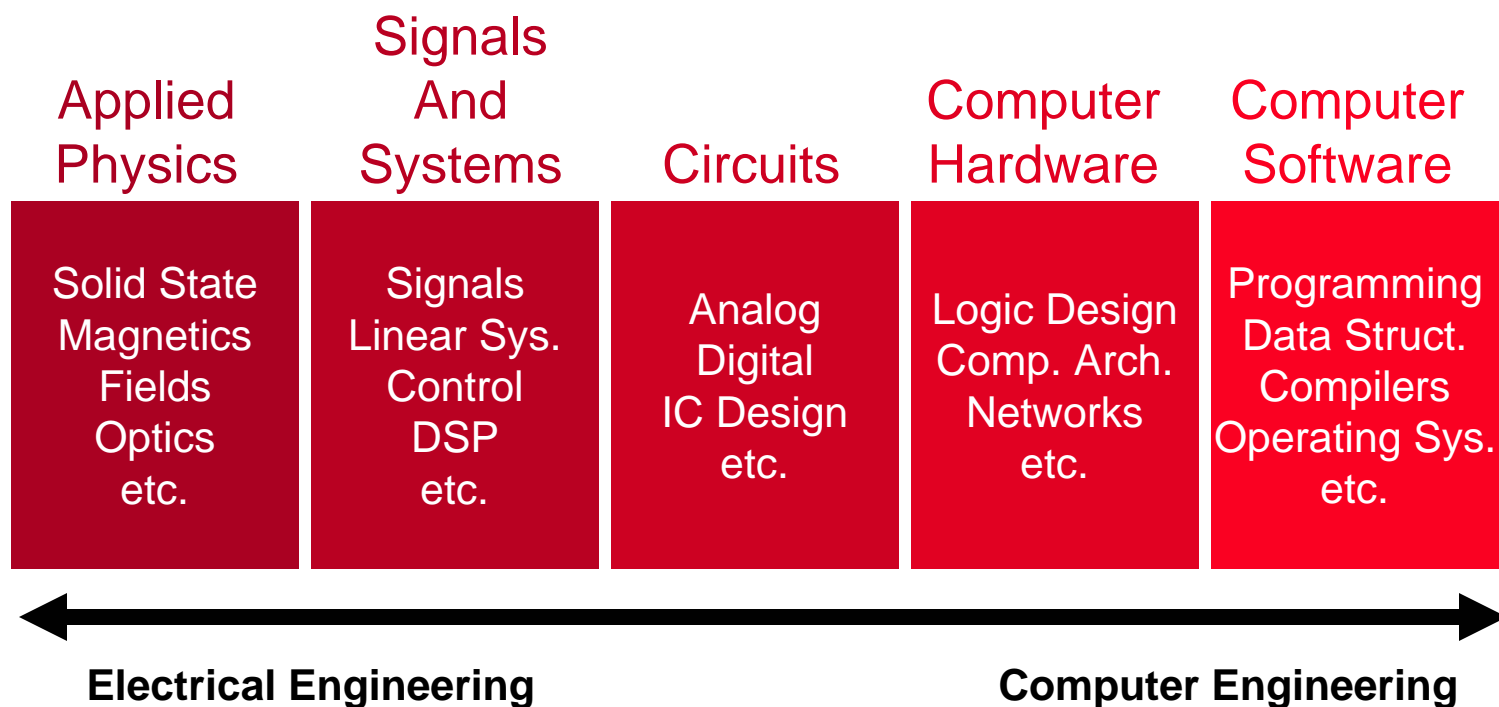
ECE Breadth, Depth, Design Courses

Breadth, Depth, Coverage

Requirements

- Breadth
 - 3 courses from three different areas
- Depth
 - 1 course with a Breadth course as a pre-requisite
- Coverage
 - 2 additional ECE courses

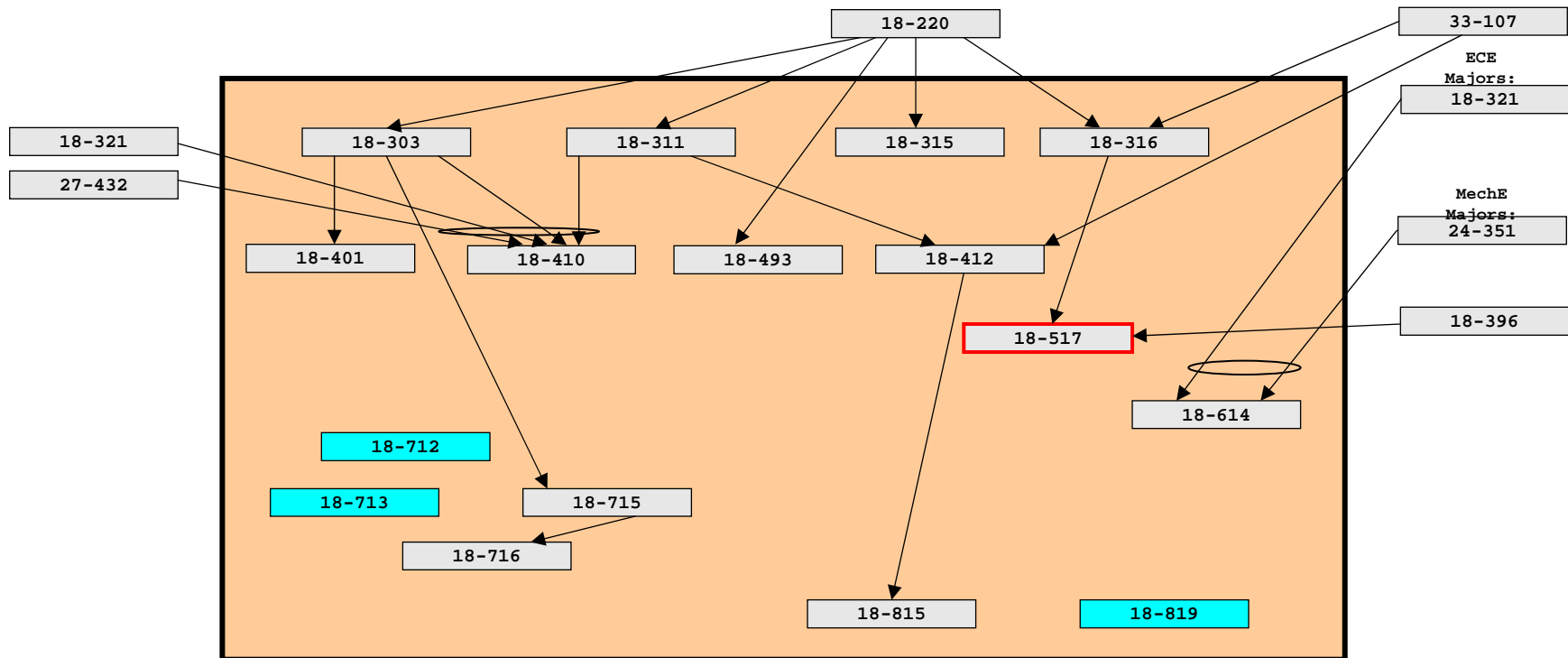
ECE Course Areas



Applied Physics

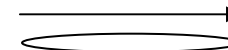
- 18303 Engineering Electromagnetics
- 18311 Semiconductor Devices I
- 18315 Introduction to Optical Communication Systems
- 18316 Introduction to Data Storage Systems Technology
- 18401 Electromechanics
- 18410 Physical Sensors, Transducers and Instrumentation
- 18412 Semiconductor Devices II
- 18493 Electroacoustics
- 18517 Data Storage Systems Design
- 18614 Microelectromechanical Systems
- 18712 Opto-Electronics for Networks
- 18713 Optical Networks
- 18715 Applied Magnetism and Magnetic Materials
- 18716 Advanced Applied Magnetism

Applied Physics (Course Prerequisite Tree)

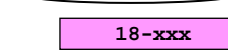


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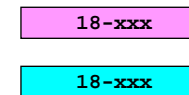
Prerequisites



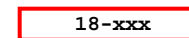
Or



At least senior standing



Grad. standing or permission of the instructor



Capstone Design

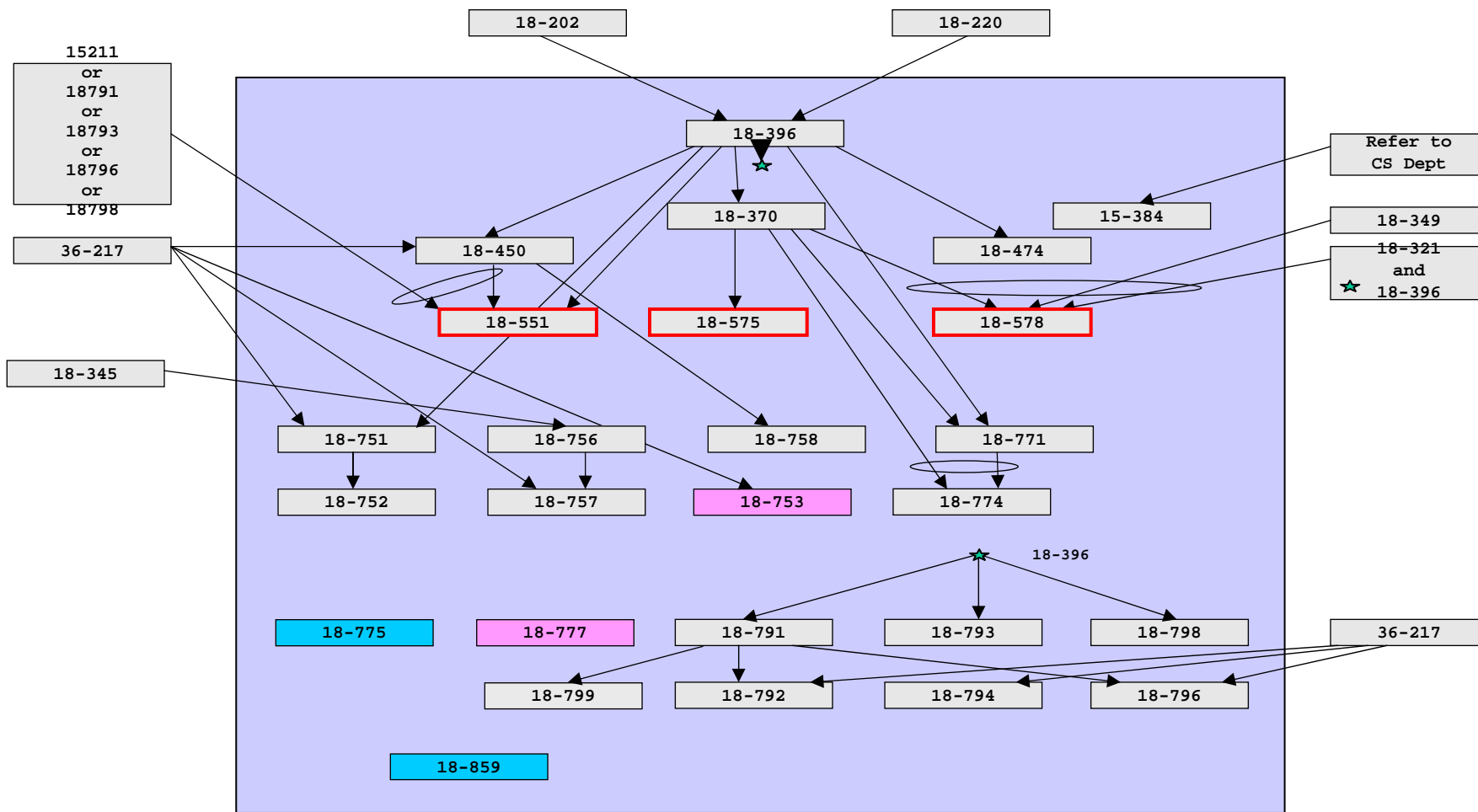


What types of ECE jobs require knowledge of the "Applied Physics" area?

Signals & Systems

18370	Fundamentals of Control
18396	Signals and Systems
18450	Digital Wireless Communications
18474	Embedded Control Systems
18551	Digital Communications and Signal Processing Systems Design
18575	Control System Design
18578	Mechatronic Design
18751	Applied Stochastic Processes
18752	Estimation, Detection and Identification
18753	Information Theory and Coding
18756	Packet Switching and Computer Networks
18757	Principles of Broadband Communications
18758	Wireless Communication
18771	Linear Systems
18777	Complex Large-Scale Dynamic Systems
18791	Digital Signal Processing I
18792	Advanced Digital Signal Processing
18793	Optical Imaging and Radar Processing
18794	Pattern Recognition Theory
18796	Multimedia Comm, Coding Systems, & Networking
18798	Image and Video Processing

Signals and Systems (Course Prerequisite Tree)



Key:

- Prerequisites
- Or
- At least senior standing 18-xxx
- Grad. standing or permission of the instructor 18-xxx
- Grad. standing or permission of the instructor 18-xxx

What types of ECE jobs require knowledge of the "Signals and Systems" area?

Circuits

18321 Analysis and Design of Analog Circuits

18322 Analysis and Design of Digital Circuits

18410 Physical Sensors, Transducers and Instrumentation

18523 Analog Integrated Circuit Design

18525 Integrated Circuit Design Project

18723 Advanced Analog IC Design

18724 Microelectromechanical System Design

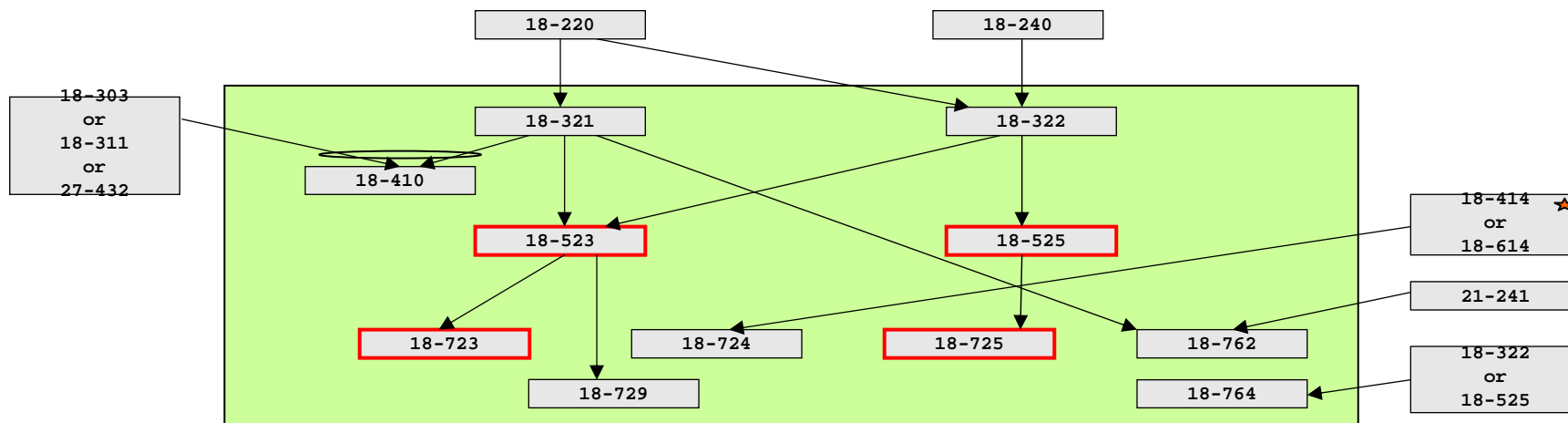
18725 Digital Integrated Circuit Design

18762 Circuit Simulation: Theory and Practice


18764 In Between Design & Manufacturing of SM ICs

Circuits

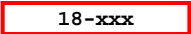
(Course Prerequisite Tree)



Key:

Prerequisites 

Or 

★ Canstone Design 

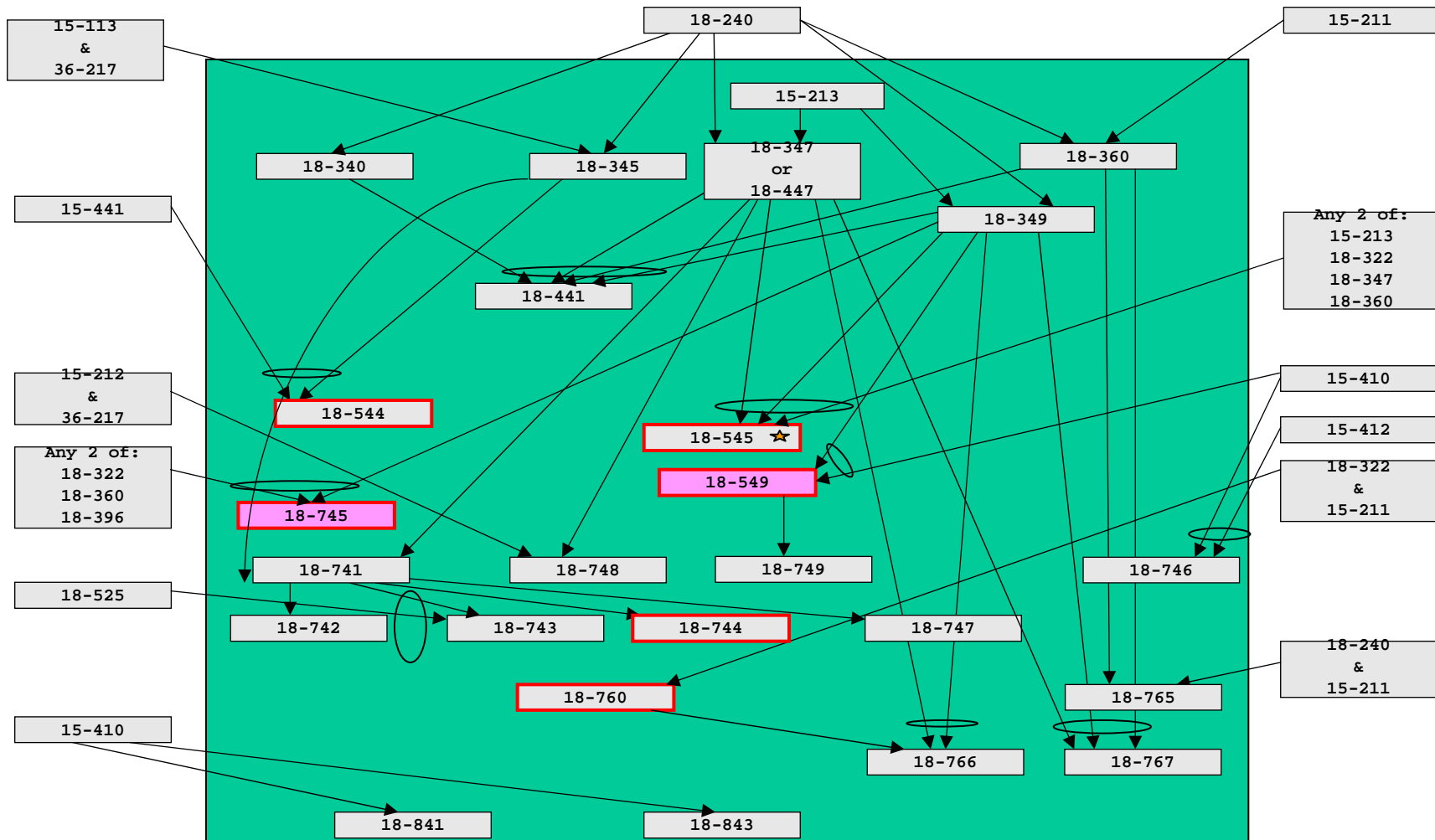
18-414 will be replaced by 18-614 in
Fall 2004

What types of ECE jobs require knowledge of the "Circuits" area?

Computer Hardware

18340	Digital Computation
18345	Introduction to Telecommunications Networks
18360	Introduction to Computer Aided Digital Design
18441	Verification of Computer Hardware Systems
18447	Introduction to Computer Architecture
18544	Network Design and Evaluation
18545	Advanced Digital Design Project
18741	Advanced Computer Architecture
18742	Multiprocessor Architecture
18743	Energy Aware Computing
18744	Hardware Systems Engineering
18745	Rapid Prototyping of Computer Systems
18746	Advanced Storage Systems
18747	Advanced Techniques in Microprocessors
18748	Dependable System Design
18760	VLSI CAD: Logic to Layout
18765	Digital System Testing and Testable Design
18766	Formal Methods for System on a Chip Design
18767	VLSI CAD: Software to Logic
18841	Advanced Operating Systems and Distributed Systems
18843	Mobile Computing Systems and Applications

Computer Hardware (Course Prerequisite Tree)

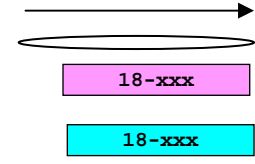


Key: ☆

18-347 can be used as a prerequisite for 18-545 only in conjunction with either 15-213, 18-322, or 18-360. 18-347 will be replaced by 18-447 in Fall 2004.

18-xxx

Prerequisites
Or
At least senior standing
Grad. standing



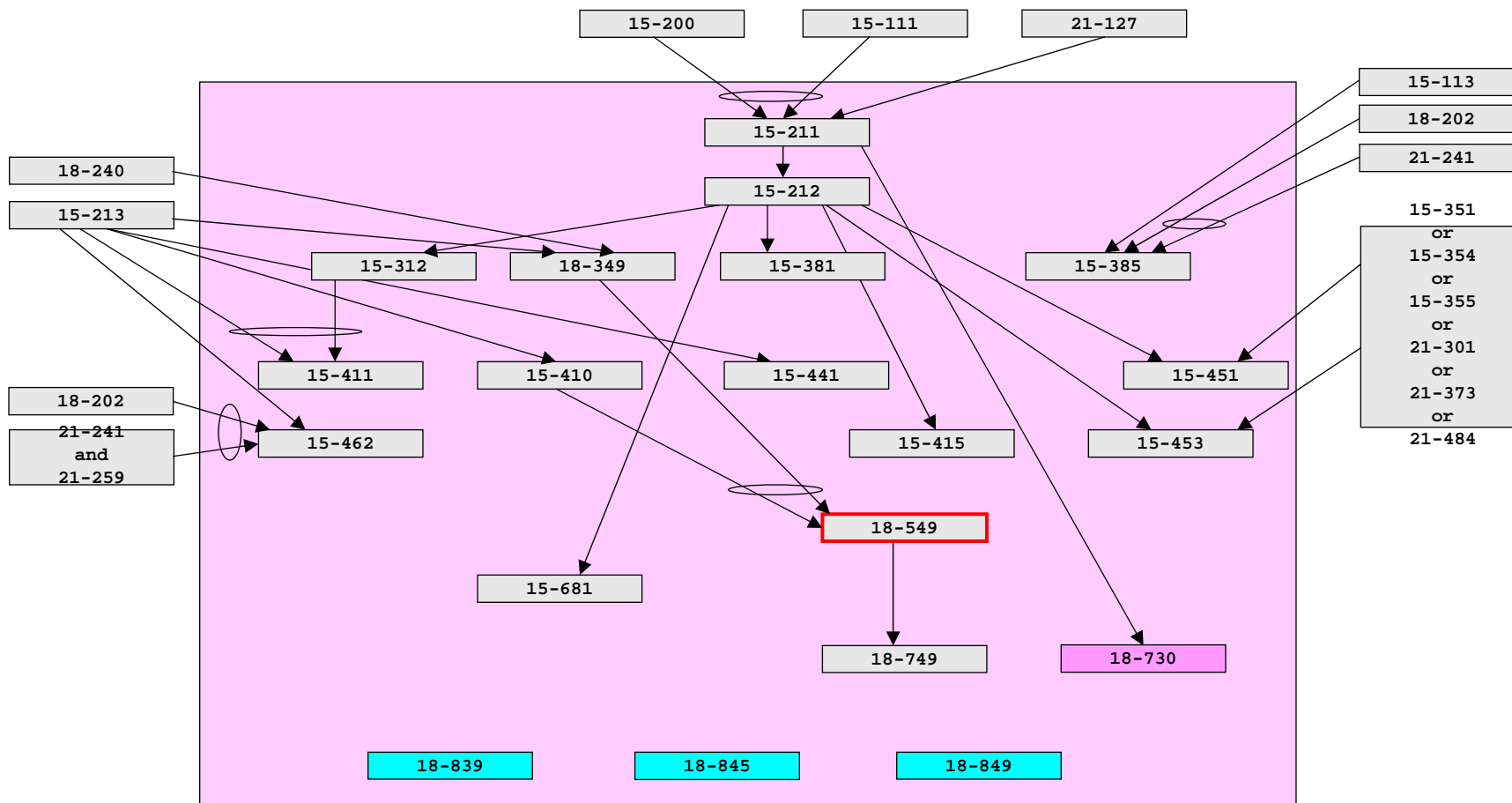
What types of ECE jobs require knowledge of the "Computer Hardware" area?

Computer Software

18730	Introduction to Computer Security
18342	Fundamentals of Embedded Systems*
18349	Embedded Real-Time Systems*
18549	Distributed Embedded Systems*
18749	Dependable Embedded Systems*
18845	Internet Services
15-211	Fundamental Data Structures and Algorithms
15-212	Principles of Programming
15-312	Programming Language Design and Processing
15-381	Artificial Intelligence: Representation and Problem Solving
15-385	Artificial Intelligence: Computer Vision
15-410	Operating System Design & Implementation
15-411	Compiler Design
15-415	Database Applications
15-441	Computer Networks
15-451	Algorithm Design & Analysis
15-453	Formal Languages and Automata
15-462	Computer Graphics I
15-681	Machine Learning

* The embedded systems courses are also listed under "Computer Hardware"

Computer Software (Course Prerequisite Tree)



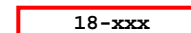
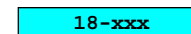
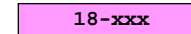
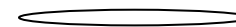
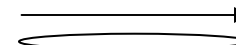
Key:

Prerequisites

Or

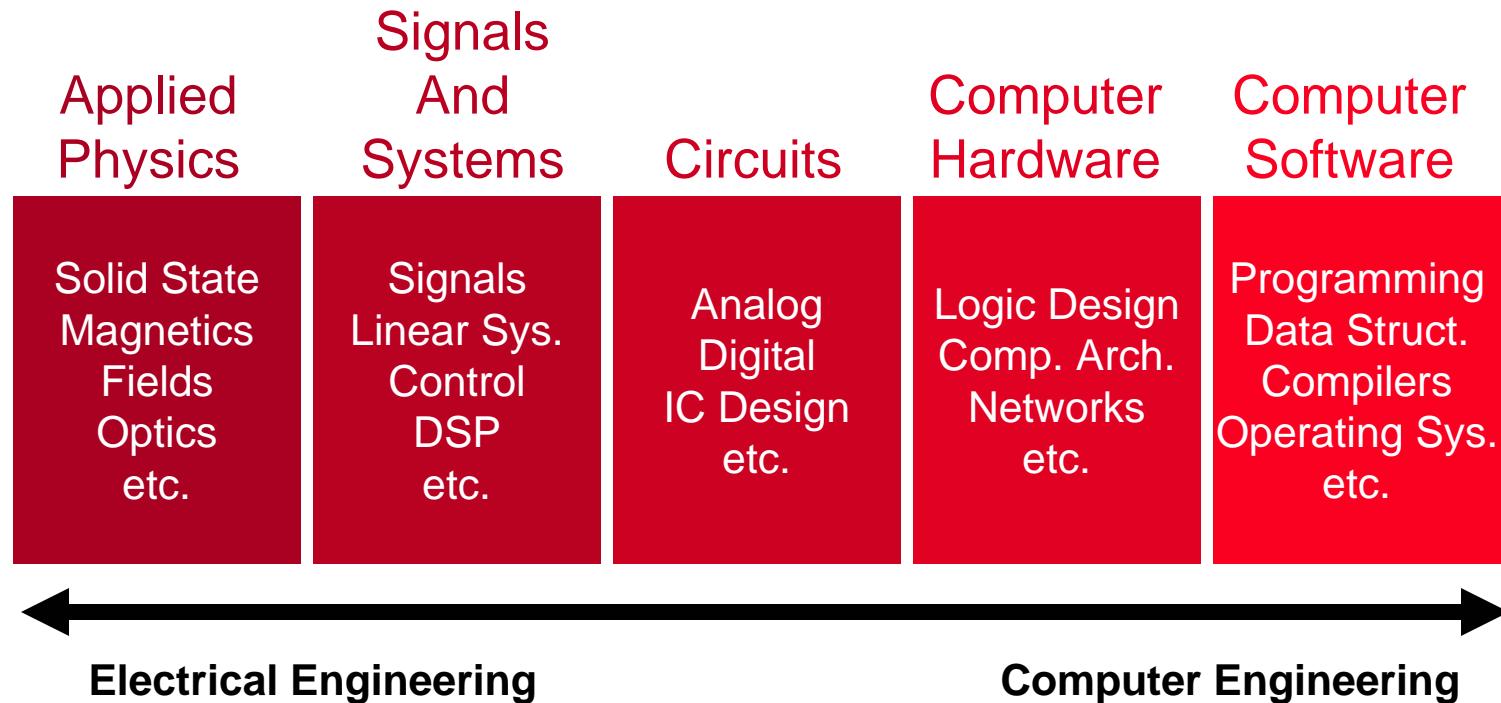
At least senior standing

Grad. standing or permission of the instructor



What types of ECE jobs require knowledge of the "Computer Software" area?

ECE Course Areas



Requirements

- Breadth: 3 courses from three different areas
- Depth: 1 course with a Breadth course as a pre-requisite
- Coverage: 2 additional ECE courses

1 Required Capstone Design Course

- 18-517 **Data Storage Systems Design**
- 18-523 **Analog Integrated Circuit Design**
- 18-525 **Integrated Circuit Design Project**
- 18-544 **Network Design and Evaluation**
- 18-545 **Advanced Digital Design Project**
- 18-549 **Distributed Embedded Systems**
- 18-551 **Digital Communications and Signal Processing Systems**
- 18-578 **Mechatronic Design**
- 39-500 **CIT Honors Research Project**

Putting It All Together: A Typical Schedule

Freshman Year		Sophomore Year	
Fall	Spring	Fall	Spring
Introduction to Electrical & Computer Engineering (12)	Introductory Engineering Elective (12)	Emerging Trends in ECE (1)	ECE Core Course (12)
Introductory/Intermediate Programming (10)	Physics for Engineering Students I (12)	ECE Core Course (12)	Concepts of Mathematics/Mathematical Foundations of EE (9/12)
Calculus (10)	Calculus (10)	Mathematical Foundations of EE /Concepts of Mathematics (12/9)	Probability and Statistics (9)
Writing/Expression Course (9)	General Education Course (9)	Physics for Engineering Students II (12)	General Education Course (9)
Computer Skills Workshop (3)		General Education Course (9)	Free Elective (9)
Total Units: 44	43	46/43	48/51

Putting It All Together - continued

Junior Year		Senior Year	
Fall	Spring	Fall	Spring
ECE Breadth Course 1 (12)	ECE Breadth Course 3 (12)	ECE Coverage Course 1 (12)	ECE Capstone Design/Coverage Course 2 (12)
ECE Breadth Course 2 (12)	ECE Depth Course (12)	Engineering Elective (12)	Engineering Elective (12)
Math/Science Elective 1 (9)	Math/Science Elective 2 (9)	General Education (9)	General Education Course (9)
General Education Course (9)	General Education Course (9)	Free Elective (9)	Free Elective (9)
Free Elective (3/6/9)	Free Elective (3/6/9)	Free Elective (3/6/9)	Free Elective (3/6/9)
45/48/51	45/48/51	45/48/51	45/48/51

Lot's of flexibility!!!

Freshman Year		Sophomore Year	
Fall	Spring	Fall	Spring
Introduction to Electrical & Computer Engineering (12)	Introductory Engineering Elective (12)	Emerging Trends in ECE (1)	ECE Core Course (12)
Introductory/Intermediate Programming (10)	Physics for Engineering Students I (12)	ECE Core Course (12)	Concepts of Mathematics/Mathematical Foundations of EE (9/12)
Calculus (10)	Calculus (10)	Mathematical Foundations of EE /Concepts of Mathematics (12/9)	Probability and Statistics (9)
Writing/Expression Course (9)	General Education Course (9)	Physics for Engineering Students II (12)	General Education Course (9)
Computer Skills Workshop (3)		General Education Course (9)	Free Elective (9)
Total Units: 44	43	46/43	48/51

Flexibility continued!!!

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ECE Breadth Course 2 (12)	ECE Depth Course (12)	Engineering Elective (12)	Engineering Elective (12)
Math/Science Elective 1 (9)	Math/Science Elective 2 (9)	General Education (9)	General Education Course (9)
General Education Course (9)	General Education Course (9)	Free Elective (9)	Free Elective (9)
Free Elective (3/6/9)	Free Elective (3/6/9)	Free Elective (3/6/9)	Free Elective (3/6/9)
45/48/51	45/48/51	45/48/51	45/48/51

Counting your beans ...

Carnegie Mellon University Degree Audit		Run Date: 10/23/03
Major: 2001:CIT:BS:ECE		For BS Electrical & Computer Engineering 2001 Catalog Year
Advisor: JMPETERS Department: ECE School: CIT		CIT Core Requirements
ANDREW_ID: CLASSLEVEL: CUM_QPA: UNITPASSED: UNIT_INPRG: UPCOMING: Student ID: Full Name: Major:		1. Computing Skills Workshop : 99-101 Fall '02 P 3.0 2. Programming : 15-100 Fall '02 A 10.0 3. Freshmen Math I : 21-115 Fall '02 AP 5.0 21-116 Fall '02 AP 5.0 4. Freshmen Math II : 21-117 Fall '02 A 5.0 21-118 Fall '02 A 5.0 5. Math Corequisite : 18-202 Fall '03 * 12.0 21-127 Spring '03 A 9.0 6. Math\Sci Electives : 21-259 Spring '03 A 9.0 21-260 Fall '03 * 9.0 7. Prob & Statistics :1 unfiled course 8. Physics I : 33-106 Spring '03 A 12.0 9. Physics II : 33-107 Sum1 '03 TR 12.0 10. Writing/Expression : 82-085 Spring '03 A 9.0 11. Humanistic Studies : 79-104 Fall '02 B 9.0 12. Cognition and Institutions : 73-100 Sum1 '03 TR 9.0 13. Depth Seq in H&SS/FA :27.00 unfiled Units 14. Non Tech Electives : 73-250 Fall '03 * 9.0 85-219 Sum1 '03 TR 9.0 15. Intro_to_ECE : 18-100 Fall '02 A 12.0 16. Intro Engineering Elect : 24-101 Spring '03 A 12.0 17. ECE Core : 18-220 Fall '03 * 12.0 1 unfiled course 18. ECE Breadth : 15-211 Fall '03 * 12.0 2 unfiled courses 19. ECE Coverage :24.00 unfiled Units 20. Capstone Design Elective :12.00 unfiled Units 21. Engineering Elective : 15-200 Spring '03 A 9.0 3.00 unfiled Units 22. Free Electives : 15-113 Fall '03 * 5.0 21-125 Fall '02 A 3.0 21-257 Fall '03 * 9.0 37.00 unfiled Units
Not Matched:		
		ECE Depth Requirement
		1. ECE Depth : 15-211 Fall '03 * 12.0 1 unfiled course

Academic Audit –

- accessible from the ECE web site
- go to "Current Students /Undergraduate"

A Few More things ...

Minors, Majors, Double Degrees

- Double degrees: **MORE CREDITS**

ECE Industry CO-OP

- Open to **juniors** with QPA of 3.0 and above
- **8 month period January to August**
- Additional summer period (optional)

Summer Internships

- Regular **on-campus recruiting** events

Integrated M.S./B.S. (IMB) Program

- Open to students with QPA of 3.0 and above
- Requirements of “Course Option” M.S. degree

The IMB Program

- Simply a way for CMU ECE Juniors to be admitted to the MS program without submitting a full application
- The BS and MS (course option) requirements apply
- Courses taken any time can be applied to the MS degree (i.e., don't have to have completed the BS degree for courses to count toward the MS)
- No courses can be counted double
- Need to carefully consider when to switch to "graduate standing" (it may affect financial aid)
- For excellent students, the regular MS program may be better than the IMB (you might get paid as a Research Assistant, rather than paying tuition in the IMB program)

Projects

- It's a good way to have some professor(s) know you personally (you are going to want recommendations some day!)
- Start looking for opportunities
 - go to web sites
 - talk to other students
 - visit the professors
 - look outside of ECE
- Don't just talk to professors teaching your courses!!!

Getting More Information:

www.ece.cmu.edu