

Electrical and Computer Engineering: Curricula without Boundaries

Ed Schlesinger

David Edward Schramm Professor and Head

Department of Electrical

and Computer Engineering

Carnegie Mellon University

ed@ece.cmu.edu



Electrical & Computer
ENGINEERING

Carnegie Mellon University

Carnegie Mellon



10,402 undergraduate and graduate students

1,426 faculty members

8:1 student to faculty ratio

72,496 alumni

50 U.S. alumni chapters

20 international alumni chapters

10 degree programs in 12 countries

Carnegie Mellon



Research

- \$360+ million per year in sponsored research

Award Highlights

- 18 Nobel Prize Laureates
- 11 Turing Award Winners
- 42 National Academy of Engineering Members
- 12 National Academy of Sciences Members
- 18 American Academy of Arts & Sciences Members
- 36 Fulbright Scholars
- 96 Emmy Award Winners
- 24 Tony Award Winners
- 6 Academy Award Winners



CIT (College of Engineering)

- Biomedical Engineering
- Chemical Engineering
- Civil and Environmental Engineering
- Electrical and Computer Engineering
- Engineering and Public Policy
- Materials Science Engineering
- Mechanical Engineering

ECE by the numbers:



- ECE includes over 1000 individuals
- Faculty Members
 - 50 tenure-track
 - 10 research/teaching
 - 38 courtesy
 - 13 adjunct/special
- 80+ Staff members (technical and non-technical)
- 460+ undergraduate students (not incl. Freshmen)
- 500+ graduate students (M.S. and Ph. D.)
- More than \$32 M/year total research expenditures

Many Research Labs and Centers



CSSI Center for System System Implementation

ABOUT CSSI
RESEARCH
SERVICES
PAST
CONTACT

ABOUT TEAM RESEARCH DOCUMENTS NEWS & EVENTS

MEMBERS LOGIN SEARCH INFO PAGE

>>News

>>E252: Converting transistors into performance



General Motors Collaborative Research Lab

About the Lab
People
Research

Welcome to the GM Collaborative Research Lab @ Carnegie M

is \$3 million collaborative lab at E
up research efforts on the next g
eaved their commitment to the un
ship supplements GM initiatives to provide passengers safe and easy




DSSC DATA STORAGE SYSTEMS CENTER

Home Research Education People News

About the DSSC
The Data Storage Systems Center (DSSC) at Carnegie Mellon University is an interdisciplinary research and educational organization whose mission is to advance information

DSSC Spring Review Hosts Over 100 Attendees Events
Carnegie Mellon's Data Storage Systems Center (DSSC) hosted their spring technical review March 27-28. The agenda featured sessions in materials and devices, nanofabrication, metrology and instrumentation, modeling and

- 2007 Spring Technical Review March 27-28
- Summer 2007 Program June 4-August 10
- MOOSE 2007 September 24-26



SRC Semiconductor Research Corporation

Home My SRC Programs Student Center Calendar Library Newsroom About

Smart Grid Research Center

Overview

INTEL SCIENCE & TECHNOLOGY CENTER cloud computing

News Research Publications People Events Contact Insiders Home

The Intel Science and Technology Center for Cloud Computing (ISTC-CC) is an open community of leading researchers devising critical new underlying technologies for cloud computing of the future. It is headquartered at Carnegie Mellon and includes researchers from Georgia Tech, Intel, Princeton, and UC Berkeley.

Our research focuses on the foundation for future cloud and cloud applications. We are exploring system architectures, programming models, and automation mechanisms that enable dramatic efficiency, ubiquity, and productivity improvements. We organize our research into four inter-related "pillars" that hold up that foundation, enhancing efficiency/productivity via specialization and automation and focusing on dominant emerging trends toward Big Data analytics and adaptive cooperation among billions of edge devices and cloud resources. ... [more]

ISTC-CC White Paper

Recent ISTC-CC News

ISTC-CC SUMMER 2012 NEWSLETTER - PDF

ENHANCING EFFICIENCY/PRODUCTIVITY VIA SPECIALIZATION AND AUTOMATION



CyLab CONFIDENCE FOR A NETWORKED WORLD

Home Community Projects Press & Awards

Mission Research Themes Application Domains

Mission

APPLICATION DOMAINS

RESEARCH THEMES

- Collaborative Perception
- Real-time Knowledge Discovery
- Robotics
- Embedded Systems

CyLab news

At CyLab MRC Mobile Health Workshop, Leaders from Healthcare, Technology and Academia Develop "Shovel-Ready" Initiatives

CyLab Researcher Marios Savvides Selected to Join New CASIS


Call for Participants in IACS Program - deadline to apply March 30, 2009

RESEARCH EDUCATION PARTNERSHIP OUTREACH NEWS & EVENTS ABOUT CYLAB QUICK LINKS



PARALLEL DATA LABORATORY

School of Computer Science
Dept. Electrical & Computer Engineering
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213
412-268-6716



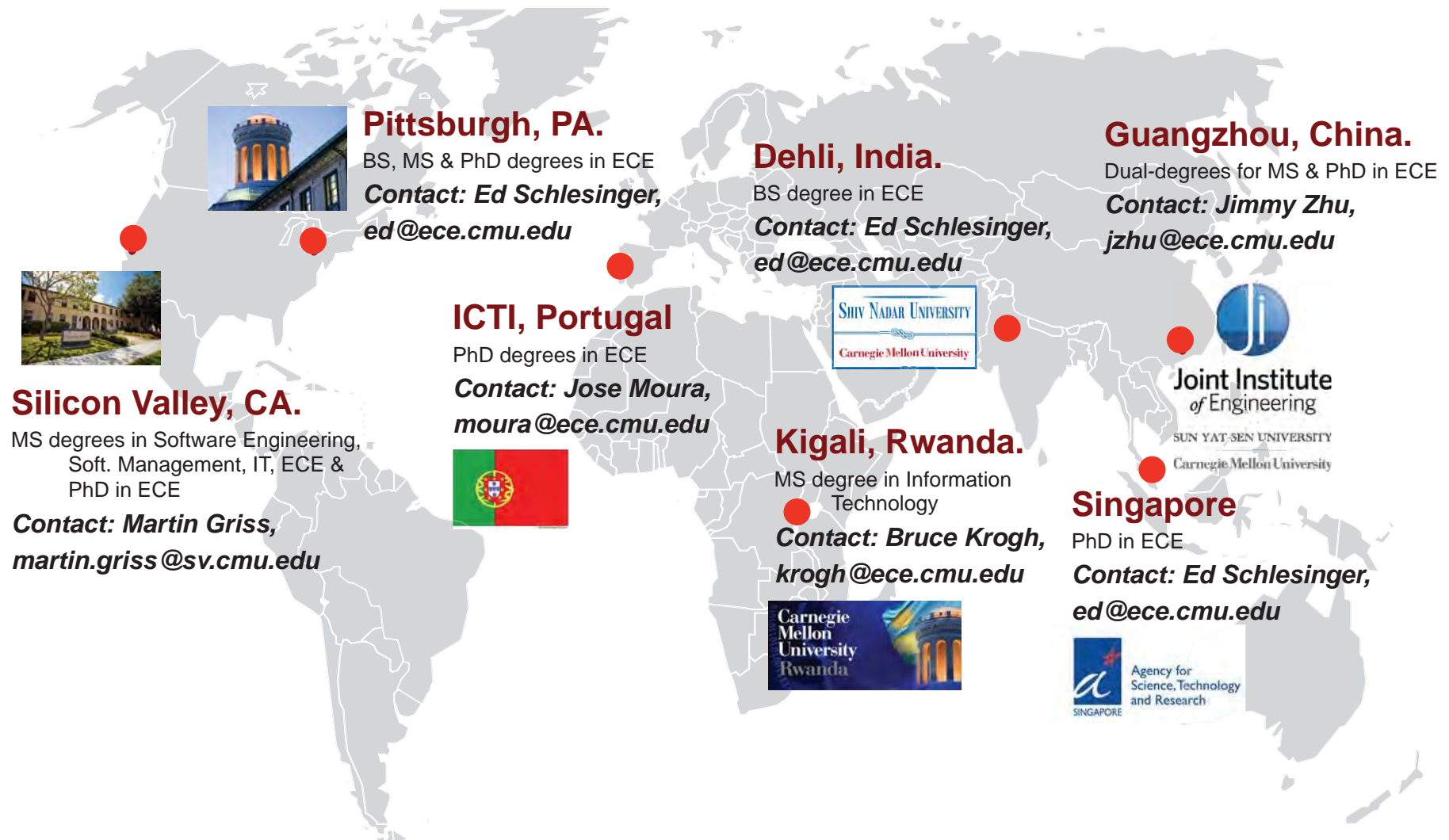
CALCM Computer Architecture Lab at Carnegie Mellon

Faculty Students Projects Seminar Reports Links Contacts



Carnegie Mellon University

ECE Programs – Physically Distributed



Entrepreneurship - ECE Spin Off Companies

- Ansoft (1984) Cendes
- Ultrasystems (1986) Siewiorek
- Dasys (1991) Thomas
- PDF Solutions (1991) Maly Strojwas
- Quantapoint Inc (1992) Khosla, Kanade
- Omniview (1992) Siewiorek
- Inmedius (1995) Siewiorek
- Scalable Networks (1996) Bianchini, Kim
- TimeSys (1996) Rajkumar
- Neolinear (1997) Rutenbar, Carley
- Xactix (1998) Gabriel
- Applied Electro Optics (1998) Schlesinger, Stancil
- Panasas (1999) Gibson
- Spinnaker Networks (1999) Bianchini
- Accelight Networks (1999) Kim
- Proxicast (2000) Peha
- Akustica (2001) Gabriel
- IC Mechanics (2001) Carley
- Verimetra (2001) Gabriel
- Cyphermint (2002) Peha

- Helium Networks (2002) Hills
- New Electricity Transmission Software Solutions (2002) Ilic
- Extreme DA (2003) Pileggi
- Fabbrix Inc (2004) Pileggi, Strojwas
- Cardiorobotics (2005) Choset
- Medrobotics (2005) Choset, Wolf, Zenati
- Xigmix Inc. (2005) Li, Pileggi
- Testworks (2007) Blanton
- Silicon Vox (2007) Rutenbar
- Wombat Security Technologies (2008) Cranor
- Butterfly Haptics (2008) Hollis
- X5 Systems (2008) Lohn
- SpiralGen (2009) Franchetti, Hoe, Pueschel, Voronenko, Moura
- YinzCam (2009) Narasimhan, Ghandi
- Virtual Traffic Lights (2009) Tonguz
- Apportable (2010) Jackson
- Transactional DA (2010) Hoe
- NoFuss Security (2011) Gligor, Perrig, Khosla
- ZetL Technology (2011) Zhu, Laughlin



The landscape



- The characteristic of scientific and technological development in the 21st century will be the continued erosion and elimination of “disciplinary” boundaries both intellectual and geographical
- Of all the engineering and science “disciplines” ECE is most well suited to this environment.
- ECE has “reinvented”, “refocused”, “redefined” itself and can most easily thrive in such an environment.

... more well defined in the past...

THEORETICAL ELEMENTS OF ELECTRICAL ENGINEERING

BY
CHARLES PROTEUS STEINMETZ, A.M., Ph.D.

THIRD EDITION
THOROUGHLY REVISED AND GREATLY CORRECTED

NEW YORK
MCGRAW-HILL BOOK COMPANY
239 WEST 39th STREET
1909

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IX. Magnetic Characteristic or Saturation Curve.	
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XI. Unbalancing of Polyphase Synchronous Machines.	
XII. Starting of Synchronous Motors.	
XIII. Parallel Operation.	
XIV. Division of Load in Parallel Operation.	
XV. Fluctuating Cross-Currents in Parallel Operation.	
XVI. High Frequency Cross-Currents between Synchronous Machines.	
XVII. Short-Circuit Currents of Alternators.	

B. DIRECT-CURRENT COMMUTATING MACHINES.

I. General.	
II. Armature Winding.	
III. Generated Electromotive Forces.	
IV. Distribution of Magnetic Flux.	
V. Effect of Saturation on Magnetic Distribution.	
VI. Effect of Commutating Poles.	
VII. Effect of Slots on Magnetic Flux.	
VIII. Armature Reaction.	
IX. Saturation Curves.	
X. Compounding.	
XI. Characteristic Curves.	
XII. Efficiency and Losses.	
XIII. Commutation.	
XIV. Types of Commutating Machines.	
A. Generators. Separately excited and Magneto, Shunt, Series, Compound.	
B. Motors. Shunt, Series, Compound.	

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I. General.	
II. Power Factor.	
III. Field Winding and Compensation Winding.	
IV. Types of Varying Speed Single-Phase Commutator Motors.	
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The Evolution of ECE



- The focus of Electrical and Computer Engineering as an academic field has evolved over the last hundred years.
 - Initially focused on electric machines and power, then radar and communications (radio, television), then electronics and computers
 - Today ECE as a field permeates nearly all aspects of society and the academic work done by practitioners of this field impacts peoples lives deeply and broadly

ECE Today I



- *adaptive algorithm infrastructure*
- *adaptive computing systems*
- *agent-based computational economics*
- *agricultural meteorology*
- *algorithms in computational electromagnetics*
- *amorphous silicon and nanocrystalline materials for renewable energy*
- *analog and mixed-signal VLSI*
- *analog to digital (ADC) and digital to analog (DAC) converters*
- *antenna analysis and design*
- *applied algorithms*
- *applied electromagnetism*
- *applied software engineering*
- *architectural support for security*
- *architectures and compiler techniques for software protection*
- *atomistic modeling of microelectronic processes*
- *automation tools for improving productivity and reliability of software*
- *bandwidth recycling*
- *Bayesian approaches*
- *big data and cloud computing*
- *bioinformatics*
- *calculation of properties of bulk materials and surfaces*
- *chemical sensors from nano-membranes and micro-cantilevers*
- *chemical-mechanical planarization*
- *code division multiple access (CDMA)*
- *collaborative networks for applications in product development and complex system operation*
- *combinatorial scientific computing*
- *compilers*
- *computational electromagnetics*
- *computer and network forensics*
- *computer architecture*
- *computer graphics*
- *computer networks*
- *computer vision*
- *computer-aided design of VLSI circuits*
- *conductivity of polymers loaded with conducting particles*
- *control of discrete event systems*

ECE Today II



- *control of nonlinear dynamical systems*
- *control theory*
- *cooperative communications*
- *counter-example analysis*
- *cross-layer design*
- *cross-layer jamming*
- *cryptography*
- *cyber security*
- *cyber-physical security of smart grid*
- *cyberphysical systems*
- *data mining*
- *data storage systems*
- *data visualization*
- *data-intensive scientific computing*
- *dependable computing*
- *design and analysis of algorithms*
- *design and layout strategies for performance optimization and yield enhancement*
- *design and simulation of photonic band gap crystals*
- *design of infrared sources and emitters*
- *design of magnets for magnetic resonance imaging diagnosis/prognosis*
- *digital signal processing*
- *directional antennas and receivers*
- *discrete and continuous optimization*
- *distributed and cloud computing*
- *distributed compression*
- *distributed systems*
- *domain decomposition methods*
- *dynamic memory management*
- *dynamical systems*
- *dynamics of rarefied gases*
- *economic theory*
- *electric machinery*
- *electric power markets*
- *electromagnetic aspects of high speed electronics and networking*
- *electromagnetic energy conversion*
- *electromagnetic methods of NDE*
- *electromagnetic simulations and wave propagation*
- *electromagnetic wave propagation and scattering*
- *electronic materials*
- *embedded systems*

ECE Today III



- *embedded systems software*
- *energy-aware computing*
- *error control coding*
- *evaluation of high performance computing systems*
- *fabrication and application of memristors in circuit design*
- *fault tolerant systems*
- *fault-tolerance*
- *finite-difference-time-domain simulations*
- *formal methods in intrusion detection*
- *genome assembly*
- *geometric modeling*
- *hardware/software co-design*
- *high- throughput DNA sequencing*
- *high-performance computing*
- *high-sensitivity miniaturized on-chip plasmonic MEMS sensors*
- *human computer interaction technologies*
- *hybrid organic/inorganic electronics*
- *image and video processing*
- *information assurance*
- *information retrieval*
- *inspection methods for the detection of cracks and corrosion in aircraft and nuclear power plants*
- *integrated filter design*
- *interconnection networks*
- *inverse scattering and nondestructive evaluation*
- *joint denial of service*
- *large scale and parallel computation*
- *light-induced defects and hydrogen motion in solar cell materials and devices*
- *local area networks*
- *low-density parity-check code design & analysis*
- *macroeconomics*
- *magneto optics and optical switching*
- *market coordination and learning*
- *materials informatics*
- *medical imaging*
- *metastability*
- *microelectronics/ semiconductors*
- *microprocessor off-load hardware for application acceleration*
- *microwave remote sensing*

ECE Today IV



- *MIMO Systems*
- *mining software repositories*
- *mobile computing*
- *model checking*
- *modeling matter and processes*
- *modeling of VLSI interconnects*
- *molecular dynamics simulations at the nanoscale.*
- *multi-user detection*
- *nanoscale phenomena*
- *nanostructured materials and ceramics for nano-photonics applications*
- *network analysis*
- *network coding – theory and applications*
- *network identity*
- *network inference methods*
- *network information theory*
- *network integrity modeling*
- *intrusion detection*
- *network testbeds*
- *network/channel coding*
- *networking*
- *neutron diffraction*
- *novel electromagnetic applications in microwave, millimeter-wave, infrared and optical wavelengths*
- *nuclear magnetic resonance in solids*
- *object-oriented systems*
- *op amp design*
- *open system verification*
- *optical communication and networking*
- *optical networks*
- *optical studies of solid*
- *optimized FPGA architectures*
- *optoelectronic materials and devices*
- *P2P networks*
- *parallel algorithms*
- *parallel and distributed computing*
- *parallel computer system design*
- *parallel methods in computational biology*
- *parallel numerical algorithms*
- *parallel tools*
- *parallel-computing methodologies*
- *pattern recognition*
- *pedigree assurance*
- *performance analysis of wireless sensor networks*
- *performance and scalability analysis*
- *performance evaluation*
- *pervasive computing applications*

ECE Today V



- *photonic band gap structures*
- *photonic crystals*
- *photronics*
- *physical layer based security and finger printing issues*
- *physical layer secrecy*
- *physical layers of optical and wireless networks*
- *power electronics*
- *power systems*
- *power systems analysis*
- *precision farming*
- *privacy-enhancing technologies for the Internet*
- *processing massive data sets and data streams*
- *program analysis*
- *program verification*
- *properties of electrically conducting composite materials*
- *QoS/overlay networks*
- *radio-frequency analog and mixed-signal integrated circuit design*
- *real-time systems*
- *reconfigurable circuits and systems for cognitive radio applications*
- *reconfigurable computing*
- *reconfigurable hardware*
- *regrowth of amorphized layers*
- *robotics*
- *scattering matrix formulations*
- *scientific computing in parallel fast multipole method*
- *secure real-time computing and communication*
- *security education*
- *security of distributed/*
- *networked event-driven, real-time and hybrid systems*
- *semiconductor and polymer physics*
- *semiconductor process modeling*
- *sensor and embedded networks sensors*
- *signal processing for nanotechnology*
- *small scale technologies applied to energy infrastructure*
- *social networks*
- *software engineering*
- *software maintenance and evolution*
- *software product-line verification*
- *space-born applications*
- *spatial data structures*

ECE Today VI



- *statistical and sequential signal processing*

- *statistical networks*

Biology

- *strained silicon substrates for CMOS devices*

- *subwavelength arrays*

- *superconductivity*

- *suppression of distortion in loudspeakers*

- *surface physics*

- *synthesis and characterization of magneto-optic materials*

Humanities

- *systems biology*

- *theoretical and computational*

models to support developments in eddy-current inspection

- *the solid state of semiconductors*

- *verification*

- *version control and configuration management*

- *large scale multicore*

Mechanical Engineering

- *voltage references*

- *web engineering*

- *web services*

- *wireless and mobile networks*

- *wireless and sensor network security*

- *wireless networks*

- *wireless networks*

- *wireless networks*

Mathematics

- *Wireless security*

- *wireless sensor networks*

- *x-ray physics*

Physics

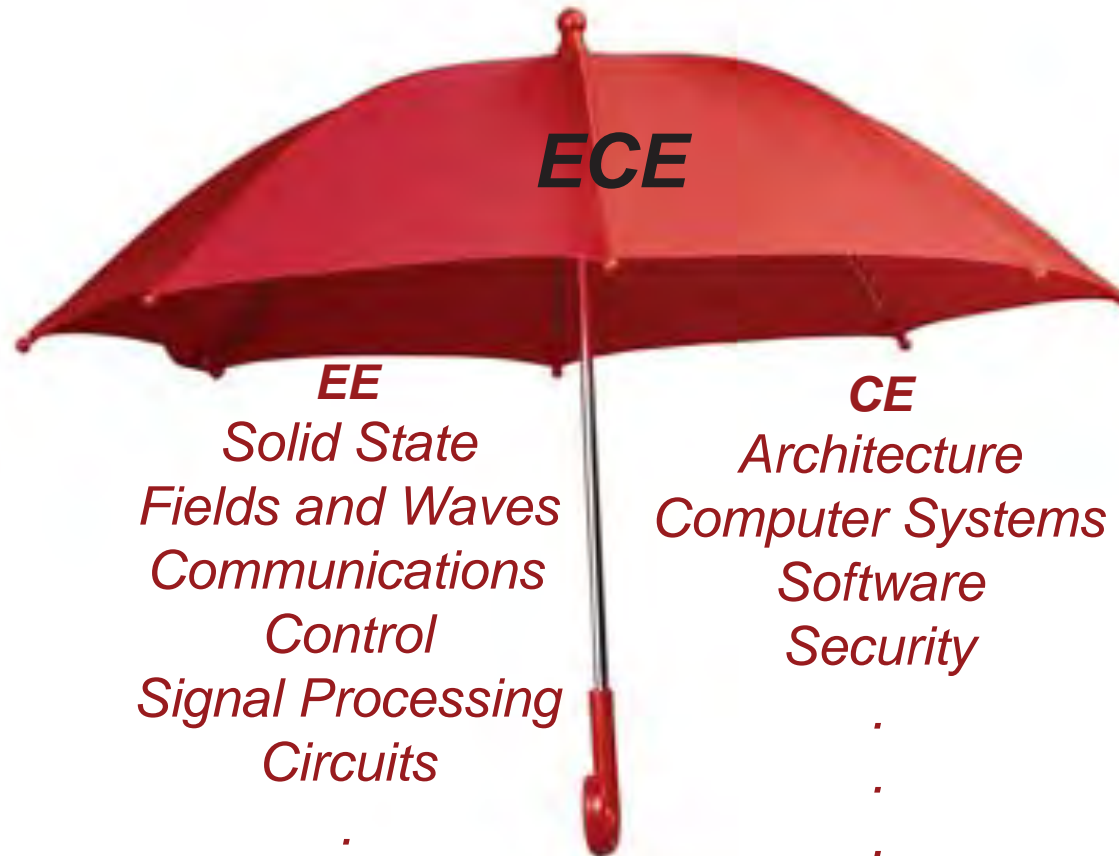
Computer Science

Materials Science

Many overlapping “disciplines” ...



The “Traditional” View



Undergraduate Education: Our View



***There is no demarcation between EE and CE or indeed between
ECE and CS***

ECE and CS “The Fuzzy Boundary”



COMPUTER SCIENCE DEPARTMENT
SCHOOL OF COMPUTER SCIENCE



Freshman
“basics”

18-100
Introduction to Electrical
And Computer
Engineering

15-122
Principles of
Imperative
Computation

15-150
Principles of
Functional Programming

18-220
Electronic
Devices and
Analog Circuits

18-240
Structure and
Design of
Digital Systems

18-290
Signals and
Systems

18-213/15-213
Introduction to
Computer
Systems

15-210
Parallel and
Sequential Data
Structures and Algorithms

15-251
Great Theoretical
Ideas in
Computer Science

15-451
Algorithm Design
And Analysis

The “Core”



Carnegie Mellon University

Motivation to “Eliminate the Boundaries”

- For students who will practice this profession:
 - Students need to see the breadth as well as depth of Electrical and Computer Engineering. They must be prepared to understand that application domains do not easily “fit” into narrowly defined subfields such as “Electrical Engineering” or “Computer Engineering”
- For students who will NOT practice this profession:
 - Electrical and Computer Engineering is the new “liberal arts”. Many fields today have aspects of Electrical and Computer Engineering as their underpinning and it is important that practitioners of these fields understand how technology enables and defines their field.

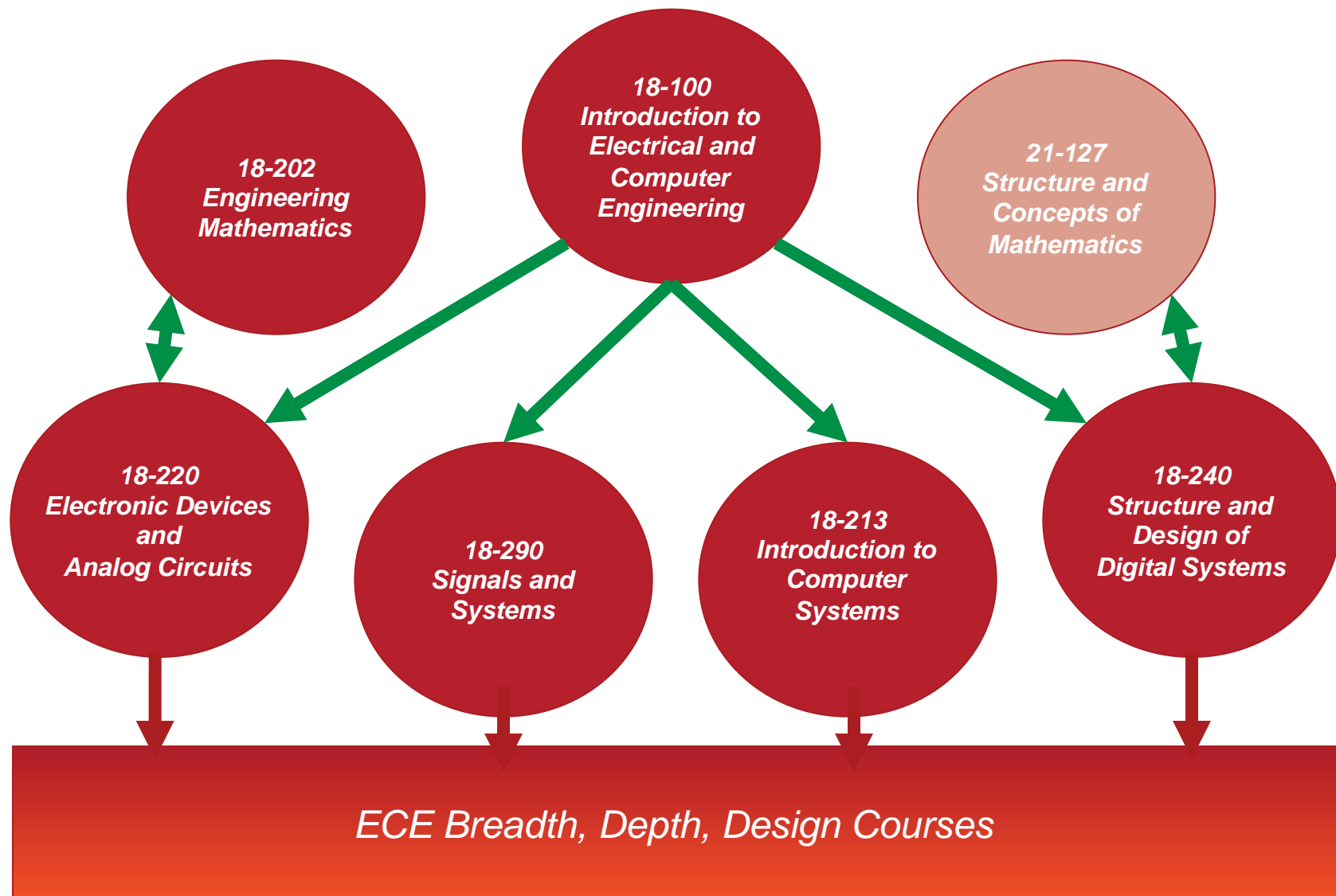
Electrical and Computer Engineering (ECE)

- Despite the large number of “electrical and computer engineering” and similarly named departments at US universities, a recent review of ABET accredited programs showed that only **19** universities offered accredited BS degrees in Electrical and Computer Engineering and **13** in Computer Science and Engineering
- Most universities continue to have separate BS degree programs in Electrical Engineering (**297**) and Computer Engineering or Computer Systems Engineering (**198**)
- Our university introduced the BS in ECE as a single degree nearly 20 years ago.

ECE as a Unified Discipline

- The evolution of the field of electrical and computer engineering demands a **new** breed of ECE graduates with a broad set of competencies that cannot be classified into “EE” and “CE”.
- The core requirements should assure students have a foundation in a set of essential concepts and skills for an ECE career.
- The breadth, coverage, depth and capstone design requirements should assure students have a sufficiently rich ECE education.
- The number of free electives should be sufficient to encourage students to:
 - specialize deeply in a particular area of ECE; OR
 - become broadly educated in a number of areas of ECE; OR
 - complement their ECE experience with education in another field (e.g., biomedical engineering, public policy, computer science, business, life sciences, humanities, music, etc.).

ECE “Named” Courses



Intro + Core ECE Courses

- **18-100: Introduction to Electrical and Computer Engineering**
 - Provides an overview of the field of ECE and introduces some of the fundamental tools needed to solve problems in this field.

- **18-220: Fundamentals of ECE: Devices and Circuits**
 - Provides an introduction to semiconductor devices and circuit analysis with links to digital electronics and signal processing.
- **18-240: Fundamentals of ECE: Structure and Design of Digital Systems**
 - Provides a foundation and working knowledge in the application, operation and implementation of digital systems.
- **18-290: Fundamentals of ECE: Signals & Systems**
 - Provides mathematical and computational tools for processing signals and information.
- **18-213: Fundamentals of ECE: Introduction to Computer Systems**
 - Provides concepts underlying how programs are executed on computer systems

18-200 – Emerging Trends in ECE (1 Unit)

- This class consists of a series of individual lectures given by different faculty members or distinguished alumni. The lectures are designed to serve the following purposes:
 - Introduce to students to the faculty member's research field and the most current world advancements in engineering and technology in that area;
 - Provide students a good understanding of our curriculum structure and the courses in various areas;
 - Present correlations between the present technological developments and our courses for each course area;
 - Introduce new undergraduate courses;
 - Advertise on-campus/off-campus research opportunities for undergraduate students and explain the corresponding research projects;
 - Motivate students with positive presentations on the importance of obtaining education and gaining self-learning ability;
 - Provide basic education on learning and working ethics.
- The class comprises 12 lectures from our own faculty, 2 lectures on learning and working ethics, and 2 lectures from our alumni.

ECE “Breadth” Areas

*Device Science
&
Nanofabrication*

*Solid State
Magnetics
Fields
Optics
etc.*

*Signals
And
Systems*

*Signals
Linear Sys.
Control
DSP
etc.*

Circuits

*Analog
Digital
IC Design
etc.*

*Hardware
Systems*

*Logic Design
Comp. Arch.
Networks
etc.*

*Software
Systems*

*Programming
Data Struct.
Compilers
Operating Sys.
etc.*



“Electrical and Computer Engineering”

Requirements

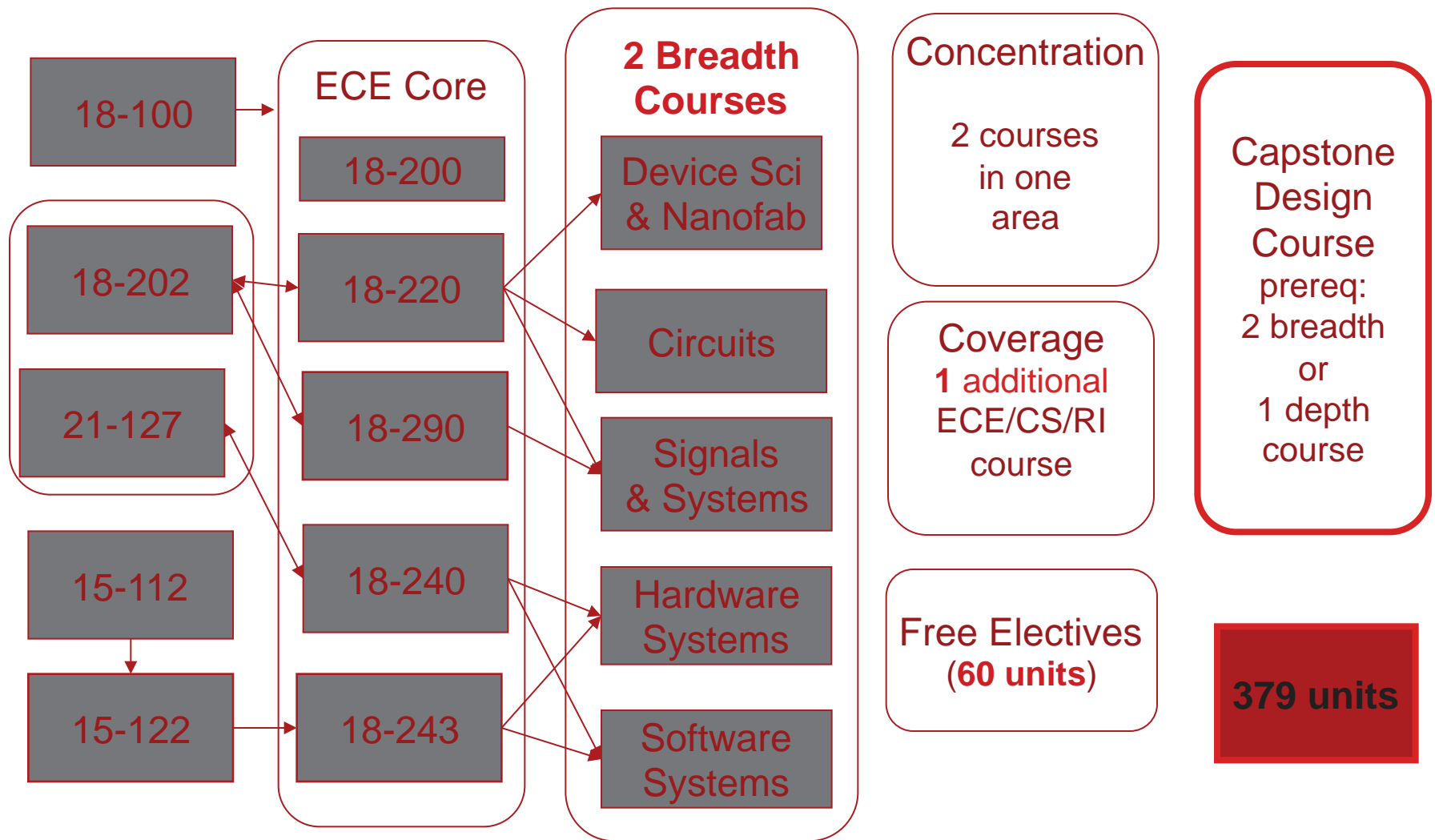
breadth: one course from two different areas

concentration: two courses in one area

coverage: one additional ECE course

*capstone: design experience**

ECE Curriculum at Carnegie Mellon



ECE Curriculum – 379 Units

~Four Courses per Semester

Eight Semesters

H&SS	Intro to ECE	Math, Sci, Comp. Prog.	Math, Sci, Comp. Prog.		Fall Freshman
H&SS	Intro to Eng	Math, Sci, Comp. Prog.	Math, Sci, Comp. Prog.		Spring Freshman
H&SS	Fund of ECE	Eng Math	Math, Sci, Comp. Prog.		Fall Sophomore
H&SS	Fund of ECE	Math, Sci, Comp. Prog.	Math, Sci, Comp. Prog.	Math, Sci, Comp. Prog.	Spring Sophomore
H&SS	Fund of ECE	Fund of ECE	Math, Sci, Comp. Prog.		Fall Junior
H&SS	ECE Breadth	ECE Breadth	ECE Depth		Spring Junior
H&SS	ECE Coverage	Free Elective	Free Elective		Fall Senior
H&SS	Free Elective	ECE Capstone	Free Elective	Free Elective	Spring Senior

$$99 + 75 + 12 + 73 + 60 + 60 = 379 \text{ Units}$$

Capstone Design Courses

18-510 Sensor Systems Design

18-513 RF Circuits and Antennas for Wireless Systems

18-525 Integrated Circuit Design Project

18-540 Rapid Prototyping of Computer Systems

18-545 Advanced Digital Design Project

18-549 Embedded Systems Design

18-551 Digital Communication and Signal Processing Systems Design

18-578 Mechatronic Design

18-587 Electrical Energy Conversion, Control, and Management

Example Projects

- HOME
- ADMINISTRIVIA
- POLICIES
- HARDWARE
- LECTURES
- RESOURCES
- PROJECTS
- FAQ

Carnegie Mellon Links:
[ECE Department](#)
[Blackboard](#)
[The Hub](#)
Search Carnegie Mellon:

[Search](#) [Help](#)

This site is created and
maintained by Priya
Narasimhan.

18-549: Embedded Systems Design

COURSE DESCRIPTION

This *capstone* course comprises a semester-long project experience geared towards systems and applications. Students will work in teams on an innovative project that involves implementation and testing of a prototype of an embedded system of their choice. Students will learn from other courses, particularly with regard to embedded real-time principles and design skills in system architecture, modular system design, software engineering, subsystem

From inception to demonstration of the prototype, the course will follow industrial reviews and quality assurance plans. The lecture content will cover background material, lessons learned from case studies of industrial practices and incidents. The remaining milestones, current project status, a final project presentation and functional demonstration will be developed.

Pre-requisites: 18-348 or 18-349

Format: 4 hrs lecture, 8 hrs lab

Lectures: Wed & Fri 10.30-12.20pm, HH B103 (Spring 2012)


INSTRUCTOR

[Prof. Priya Narasimhan](#), is an Associate Professor in the Electrical and Computer Engineering Department. She is interested in embedded/mobile systems to cloud computing and fault-tolerant distributed systems. She is currently working on [Embedded Computing](#) based at Carnegie Mellon University. She has real-world experience including her current company, [YinzCam, Inc.](#), focused on mobile live video experience technology as well as assistive embedded technologies to help the blind and the deaf.

Office: CIC 2202

Tel: 412-268-8801

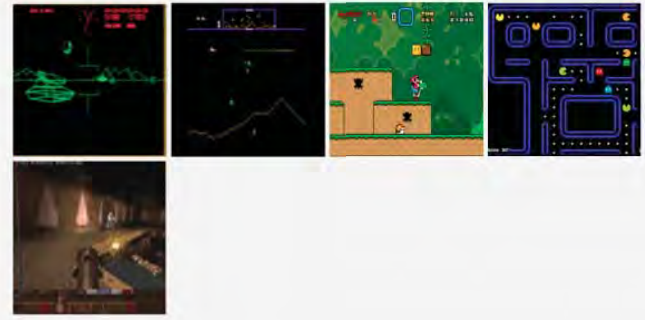
Email: priya@cs.cmu.edu



18-545: Advanced Digital Design

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
Welcome to 18-545

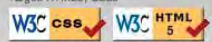


Course Description

In this capstone design project course, students will design and implement a large digital system with video output, sound output, and user input. The course will teach the technical skill to accomplish this, as well as enhance project planning and group management skills. To that end, students will participate in design reviews, weekly status reports, and final project presentations. The project will result in a working system implemented on an FPGA prototyping board. The completed projects will be shown in a public demonstration session at the end of the semester. Students should enter with a good grasp of computer architecture, Verilog programming, and hardware lab skills. Experience in FPGA programming, computer graphics, and/or VLSI design would also be useful.

Bill Nace
Email: wnace@cmu.edu
Office: D-207 Hamerslag Hall
Facebook: Yes
Web: [Right here](#)
Email sent to ee6545-staff@ece.cmu.edu gets sent to the professor and TA

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Caveats
Target: HTML5, CSS3

Tested using Safari 5.1, Chrome 13. <big number>
IE can bite me
Site generated on: 18 Aug 2011

Additional Opportunities for Students

Integrated M.S./B.S. Program

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

Minors, Majors, Double Degrees

- *Double degrees: MORE CREDITS*

Summer Internships

- *Regular on-campus recruiting events*
- *Several international opportunities*

ECE Industry CO-OP

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

Study Abroad



ECE Opportunities

- National Chiao-Tung University & Industrial Internships, Taiwan
- Shanghai Jiao Tong University & Microsoft Research Asia, China
- Ecole Polytechnique Federale de Lausanne, Switzerland
- Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico

General Education

- Many other opportunities through our Office of International Education

Objection 1: Students Won't Know What to Take

- Students WILL know what to take.
 - Advising is key
 - Content of the core courses is crucial
 - Course descriptions are important
 - The seminar course offered in the Fall of the sophomore year is important

Undergraduate Advising



- **Full-time staff**
 - Associate Department Head: Prof. James Hoe
 - Educational Program Assistant: Leona Kass-O'Rourke
 - Assistants for Undergraduate Education: Janet Peters, Schauntae Yankasky
 - Director for Student and Alumni Affairs: Susan Farrington
- **Faculty advisors**
 - For Sophomores (assigned Spring of Freshman year)
- **Faculty mentors**
 - For Juniors and Seniors (assigned according to interests)
- **ECE Website** – authoritative source of information
- **Electronic media** for rapid communication
- **Student feedback** actively sought
 - ECE Student Advisory Council
 - IEEE Student Chapter, HKN, WinECE
 - Educational Assessment Tool, etc.

Objection 2: Students won't have to take....

- You mean to tell me that students are not required to take [fill in the blank]?
 - For the “blank” fill in “an important subject I took which I can’t imagine students would graduate without and still be called Electrical and Computer Engineers”
 - Yes. Not all the students have to take every course you took.
 - What they will do in terms of their career will be different from you.
 - What they will do in terms of their careers will be different from each other!
 - Employers will actually have to understand students as individuals

Objection 3: Students will take the “easy” courses.

- No They Won't
 - Our data show that students take challenging courses and understand why they need to pursue these they are advised well as to what the courses are given good information and have a clear understanding of careers and options
 - Which are the “easy” courses? (For “easy” read not technically deep and of limited value to the student)
 -I meant the humanities courses....

Objection 4: Structure can't be accredited!

- Only one ABET accreditation (ECE) not (EE and CE).
- Existence proof that this can be accredited quite successfully
- Requires resources
 - Department Head and Associate Department Head
 - Standing Committee
 - Program Assessment Committee
 - Three Faculty Members
 - Undergraduate Program Staff
 - Educational Program Assistant
 - Assistant for Undergraduate Education
 - Director of Alumni and Student Relations
 - Web team
 - Students
 - Student organizations

Our ABET “Philosophy”



- Guiding Philosophy
 - Are we doing “this” just for ABET or is there independent value?
 - Lowers “cost”
 - Ensures follow through
 - Faculty buy-in
 - Minimizes “ABET-only” activities
- Holistic approach tell the whole story to all our constituencies including ABET not just “ABET-centric” activities

Objection 5: Usually not said out loud...

- What happens if students don't choose to take “my” course?
 - The burden is on the faculty to create courses that attract students and to make clear to the students why they need the course.
 - Students no longer sit in a class because they have been “forced” to be there.
- There is a very interesting administrative challenge to this.

Conclusion



- Electrical and Computer Engineering is a unified discipline
- ECE is at the center of many important application domains today
- Far too many to expect all students to be trained identically
- This curriculum provides;
 - fundamentals, depth and breadth
 - great flexibility and choice for students
- Course offerings in the specific areas such as security, communications, sensors, energy systems, and more.
- ECE is uniquely positioned to train students for leadership and impact not only in the field of Electrical and Computer Engineering but other career paths as well.

Questions?

