EECS 1

Introduction to

Electrical Engineering

And Computer Science

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The Henry Samueli School of **E**ngineering 1

Goals for the Course

- **Learn about the EECS Dept and our 3 programs**
  - ➢ Electrical Engineering
  - ➢ Computer Engineering
  - ➢ Computer Science and Engineering

- **Meet some of the faculty**

- **Learn about research going on in EECS at UCI**

- **Start to plan YOUR program**
  - ➢ What part of EE, CpE or CSE do YOU want to focus on?
  - ➢ What courses do I want to take?
  - ➢ How do I arrange my schedule so I can take them?

- **Explore one area of EECS in more detail**

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Course Schedule

April 1	Intro (Profs. Ender Ayanoglu and Rainer Doemer)
8	Electronic Circuit Design (Prof. Payam Heydari)
15	RF, Antennas, Microwaves (Prof. Filippo Capolino)
22	Semiconductors and Optoelectronics (Prof. Ozdal Boyraz)
29	Programming (Prof. Rainer Doemer)
May 6	Software Systems (Prof. Brian Demsky)
13	Hardware Systems (Prof. Nader Bagerzadeh)
20	Chip Design (Prof. Fadi Kurdahi)
27	Communications and DSP (Prof. Ender Ayanoglu)
June 3	TBD

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Grading

(1) Attendance – One absence is allowed with no penalty.
Reduction of one letter grade per absence after
the first.

(2) Research Paper – 2000 word essay that discusses
the current state-of-the art in an area of EECS in
which you are interested. Graded for both structure
(grammar, spelling, punctuation) and content. 50%

(3) Plan of Study – Completed 4/5-year plan of study that
would prepare you for the area described in your
research paper. 50%

More details on (2) & (3) later …

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Electrical Engineering Undergrad Program

20 Full-time faculty (2 Asst, 5 Assoc, 13 Full Professors)

ABET Accredited Degree Program

***U.S. News* Rankings: 2006 – 49   2014 – 41**

Students (Fall 2013)
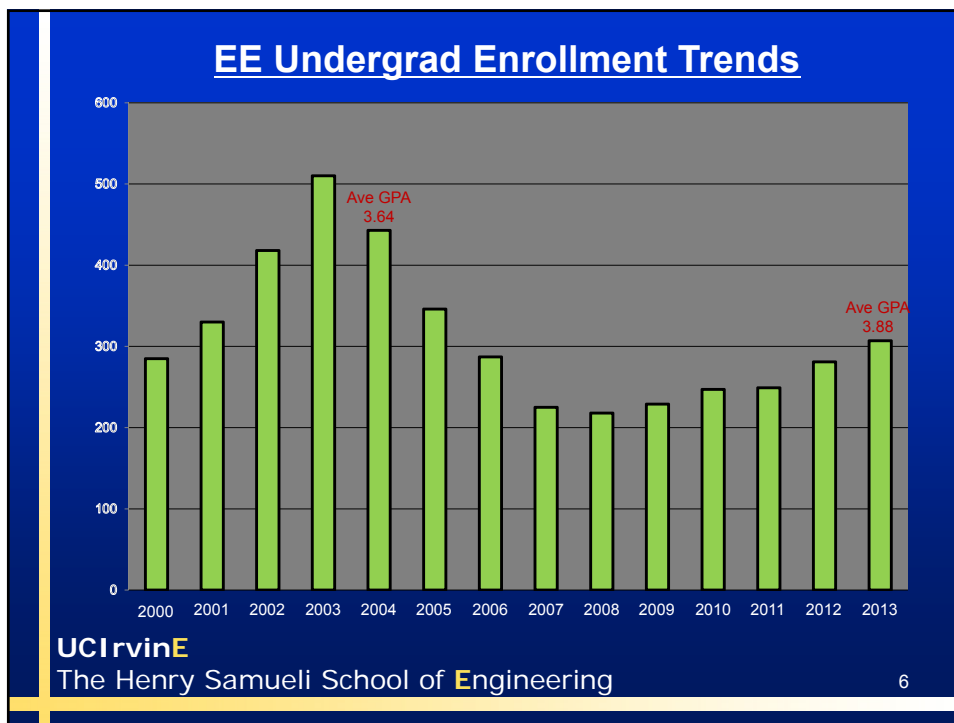 – **307 Undergraduate students**
  – **Enrollment trends (upcoming slide)**

Areas of Emphasis
  – **Analog/RF IC design**
  – **Antennas and Electromagnetics**
  – **Information Theory**
  – **MEMS and BioMEMS**
  – **Nanotechnology**
  – **Photonics**
  – **Power electronics**
  – **Signal and image processing**
  – **Wireless communications and networks**

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EE Undergrad Enrollment Trends

Ave GPA
3.64

Ave GPA
3.88

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

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EE Program Requirements

- EE Core – 116 credit hrs
  - 6 Math courses
  - 4 Physics courses (plus labs)
  - 1 Chemistry course
  - 1 Advanced writing course
  - 17 EECS courses (plus labs)

- EE Specialization – 22-24 credit hrs (varies)
  - All EE students must complete one specialization
  - 2-3 required courses
  - 3-4 additional electives within specialization ("specialized electives")

- Technical Electives – 10 credit hrs (minimum)
  - At least 3 courses
  - At least one from outside specialization
  - Choices: All non-core EECS courses, others with approval

- General Education – As required by UCI

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EE Core

Math 2A	1-D Calculus I	EECS 1	Introduction to EECS
Math 2B	1-D Calculus II	EECS 10	Computational Methods
Math 2D	M-D Calculus I	EECS 31	Digital Systems
Math 2E	M-D Calculus II	EECS 31L	Digital Logic Lab
Math 3A	Linear Algebra	EECS 50	Discrete-Time Systems
Math 3D	Differential Equations	EECS 55	Probability
		EECS 70A/L	Network Analysis I
Physics 7C/L	Force, Energy, Motion	EECS 70B/L	Network Analysis II
Physics 7D/L	Electricity, Magnetism	EECS 145	Adv. EE Mathematics
Physics 7E	Fluids, Waves, Optics	EECS 150	Cont-Time Systems
Physics 51A	Modern Physics	EECS 160A/L	Intro Control Systems
		EECS 170A/L	Electronics I
Chem 1A	General Chemistry	EECS 170B/L	Electronics II
		EECS 170C/L	Electronics III
		EECS 180A	Electromagnetics I
		EECS 159A	Senior Design Project I
		EECS 159B	Senior Design Project II
		EECS 159CW	Senior Design Project III

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EE Specializations

- Electronic Circuit Design

- RF, Antennas, and Microwaves

- Semiconductors and Optoelectronics

- Digital Signal Processing

- Communications

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Electronic Circuit Design

EECS 170D*	IC Design	**EECS 174**	Semiconductor Devices
EECS 170E*	Analog/Comm IC Design	**EECS 176**	Solid State Electronics
EECS 166A	Power Electronics I	**EECS 179**	MEMS
EECS 166B	Power Electronics II	**EECS 182**	MMIC Design
		EECS 188	Optical Electronics

Specialized Electives   4 courses
*Required for Specialization
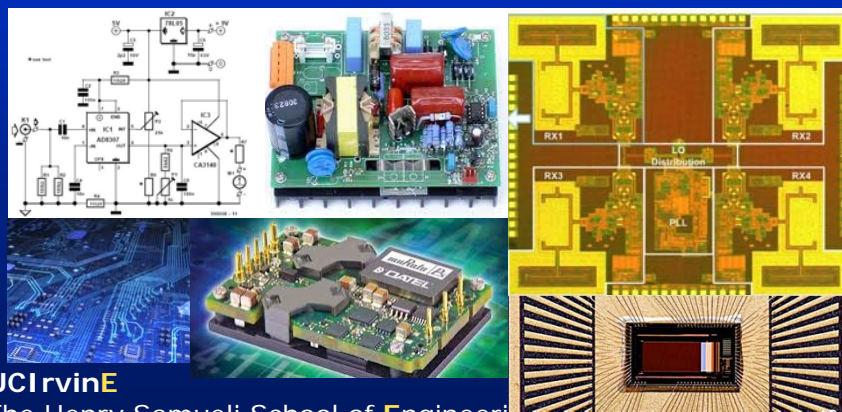
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Electronic Circuit Design

EECS 170D*	IC Design	EECS 174	Semiconductor Devices
EECS 170E*	Analog/Comm IC Design	EECS 176	Solid State Electronics
EECS 166A	Power Electronics I	EECS 179	MEMS
EECS 166B	Power Electronics II	EECS 182	MMIC Design
		EECS 188	Optical Electronics

Specialized Electives   4 courses
*Required for Specialization

Ahmed Eltawil
VLSI Architectures for Wireless

Stuart Kleinfelder
High Speed Digital Cameras, Sensor Systems

Michael Green
Analog IC Design, Nonlinear Circuits

Keyue Smedley
Power Electronics, Energy, Control Systems
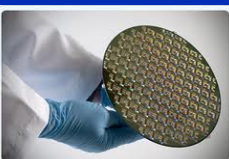
Payam Heydari
High Speed Analog RF/Mixed Signal Circuits

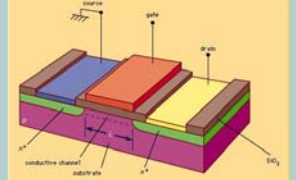**UCIrvinE**
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RF, Antennas, and Microwaves

EECS 144*	Ant. Design for Wireless	EECS 170D	IC Design
EECS 180B*	Electromagnetics II	EECS 170E	Analog/Comm IC Design
EECS 182*	MMIC Design	EECS 180C	Electromagnetics III
Physics 52A	Optics, Lenses, Lasers	EECS 188	Optical Electronics

Specialized Electives   3 courses
*Required for Specialization

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RF, Antennas, and Microwaves

EECS 144*	Ant. Design for Wireless	EECS 170D	IC Design
EECS 180B*	Electromagnetics II	EECS 170E	Analog/Comm IC Design
EECS 182*	MMIC Design	EECS 180C	Electromagnetics III
Physics 52A	Optics, Lenses, Lasers	EECS 188	Optical Electronics

Specialized Electives   3 courses
*Required for Specialization

Filippo Capolino
Metamaterials, Plasmonics, Antennas

Ozdal Boyraz
Integrated Optics, Optical Comm Systems

Franco DeFlaviis
Antennas for Wireless Comm

Chen Tsai
Micro- and Nanophotonics, Magnetics, Metamaterials

Payam Heydari
High Speed Analog RF/Mixed Signal Circuits

Kumar Wickramasinghe
Nanotechnology, Force microscopes

Peter Burke
Quantum Electronics, Nanotechnology

G. P. Li
High Speed Semiconductors, Optoelectronics

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Semiconductors and Optoelectronics

Physics 52A	Optics, Lenses, Lasers	EECS 170D	IC Design
EECS 174	Semiconductor Devices	EECS 176	Solid State Electronics
EECS 188	Optical Electronics	EECS 179	MEMS
Engr 54	Materials Science	EECS 180B	Electromagnetics II
		EECS 180C	Electromagnetics III

Specialized Electives   3 courses
*Required for Specialization

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Semiconductors and Optoelectronics

Physics 52A	Optics, Lenses, Lasers	EECS 170D	IC Design
EECS 174	Semiconductor Devices	EECS 176	Solid State Electronics
EECS 188	Optical Electronics	EECS 179	MEMS
Engr 54	Materials Science	EECS 180B	Electromagnetics II
		EECS 180C	Electromagnetics III

Specialized Electives   3 courses
*Required for Specialization

Peter Burke
Quantum Electronics, Nanotechnology

Ozdal Boyraz
Integrated Optics, Optical Comm Systems

Mark Bachman
MEMS, BioMEMS, Nanotechnology

Chen Tsai
Micro- and Nanophotonics, MEMS Ultrasonics

Chin Lee
Electronic Packaging, Bonding Technolgies

Kumar Wickramasinghe
Nanotechnology, Force microscopes

Stuart Kleinfelder
High Speed Digital Cameras, Sensor Systems

G. P. Li
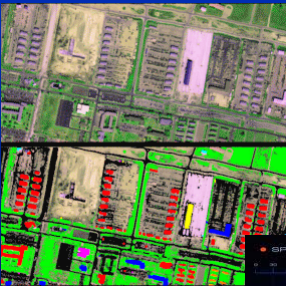High Speed Semiconductors, Optoelectronics

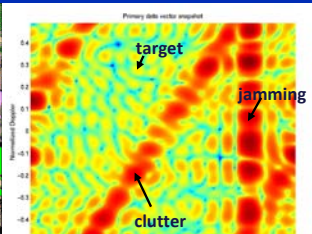**Henry Lee**
Fiber Optics, Compound Semiconductors
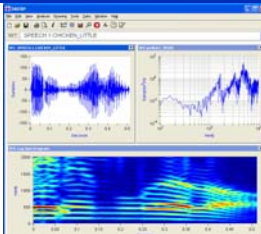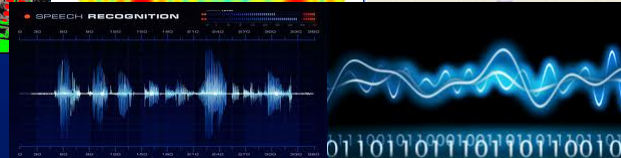
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Digital Signal Processing

EECS 152A*	Digital Signal Processing	EECS 101	Machine Vision
EECS 152B*	DSP Lab	EECS 112	Computer Architecture
EECS 22*	Computer Systems & C	EECS 141A	Comm Systems I
EECS 20	Adv. C Programming	EECS 141B	Comm Systems II
		EECS 160B	Digital Control

Specialized Electives   3 courses
*Required for Specialization

target

jamming

clutter

SPEECH RECOGNITION

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Digital Signal Processing

EECS 152A*	Digital Signal Processing	**EECS 101**	Machine Vision
EECS 152B*	DSP Lab	**EECS 112**	Computer Architecture
EECS 22*	Computer Systems & C	**EECS 141A**	Comm Systems I
EECS 20	Adv. C Programming	**EECS 141B**	Comm Systems II
		EECS 160B	Digital Control

Specialized Electives   3 courses
*Required for Specialization

Anima Anandkumar
Machine Learning, Graphical Models

Hamid Jafarkhani
Communication and Coding Theory

Lee Swindlehurst
Wireless, Radar, Sensor Networks

Syed Jafar
Information Theory, Wireless Communications

Glenn Healey
Machine Vision, Image Processing

Ender Ayanoglu
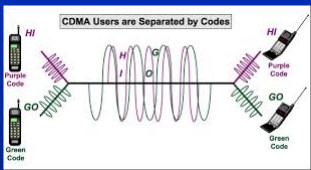Wireless Communications and Networks

UCIrvinE
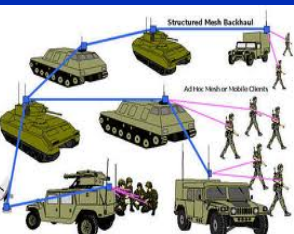The Henry Samueli School of **E**ngineering   17

Communications

EECS 141A*	Comm Systems I	**EECS 144**	Ant. Design for Wireless
EECS 141B*	Comm Systems II	**EECS 148**	Computer Networks
EECS 20	Computer Systems & C	**EECS 152A**	Digital Signal Processing
EECS 22	Adv. C Programming	**EECS 152B**	DSP Lab
		EECS 170E	Analog/Comm IC Design
Specialized Electives 4 courses		**EECS 188**	Optical Electronics
*Required for Specialization			

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Communications

EECS 141A*	Comm Systems I	EECS 144	Ant. Design for Wireless
EECS 141B*	Comm Systems II	EECS 148	Computer Networks
EECS 20	Computer Systems & C	EECS 152A	Digital Signal Processing
EECS 22	Adv. C Programming	EECS 152B	DSP Lab
		EECS 170E	Analog/Comm IC Design
Specialized Electives	4 courses	EECS 188	Optical Electronics
*Required for Specialization			

Anima Anandkumar
Machine Learning, Graphical Models

Hamid Jafarkhani
Communication and Coding Theory

Lee Swindlehurst
Wireless, Radar, Sensor Networks

Syed Jafar
Information Theory, Wireless Communications

Athina Markopoulou
Network Coding and Measurements

Ender Ayanoglu
Wireless Communications and Networks

Ahmed Eltawil
VLSI Architectures for Wireless

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Computer Engineering Undergrad Program

10 Full-time faculty (2 Asst, 3 Assoc, 5 Full Professors)

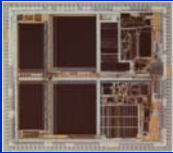**ABET Accredited Degree Program**
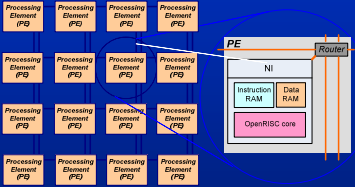
U.S. News **Rankings:** 2007 – 34　　2014 – 31

Students (Fall 2013)
- **238 Undergraduate students**
- **Enrollment trends (upcoming slide)**

Areas of Emphasis
- **System-on-Chip, Network-on-Chip**
- **Parallel Systems, Computer Architecture**
- **VLSI Synthesis and Design Automation**
- **Embedded Systems**
- **Wireless Sensor Networks**
- **Modeling and Parallel SImulation**
- **Programming Languages and Compilers**
- **Databases and Semantic Computing**
- **Service-Oriented Architectures**
- **Cloud Computing**

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CpE Undergrad Enrollment Trends

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CpE Program Requirements
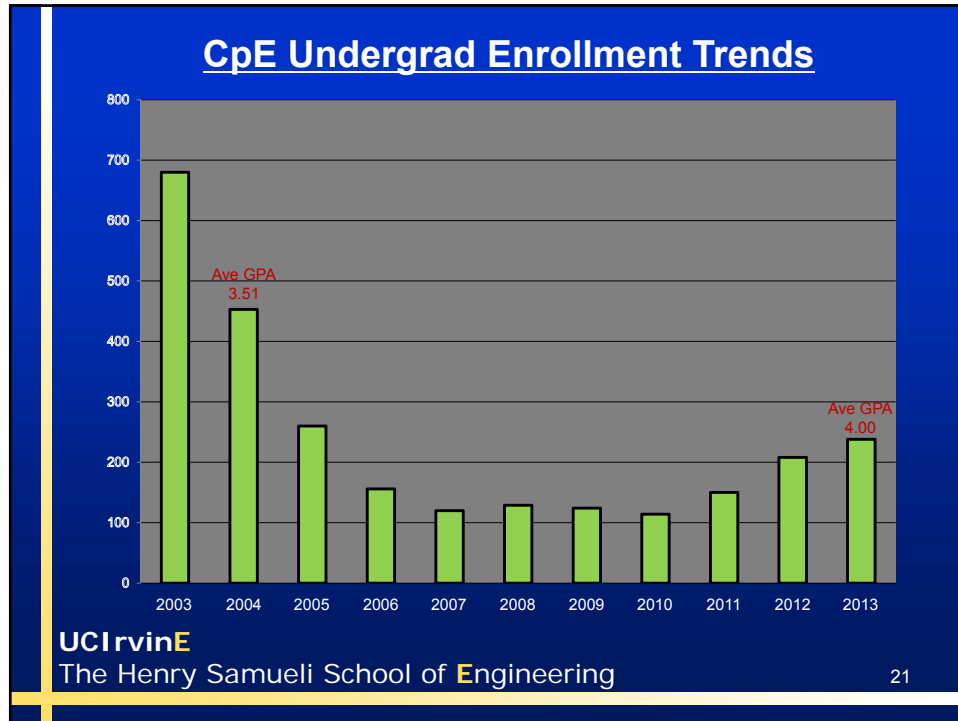
- Mathematics and Basic Science Courses
  - 6 Math courses
  - 2 Physics courses (plus 2 labs)
  - 1 EE Analysis course
  - 1 Advanced writing course

- Engineering Topics Courses
  - 5 Programming courses
  - 5 Software systems courses
  - 4 Hardware systems courses
  - 3 Chip design courses

- Engineering Elective Courses
  - At least 3 courses
  - Choices: Pre-approved EECS courses, others with approval

- General Education – As required by UCI

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CpE Core

Math 2A	1-D Calculus I	**EECS 1**	Introduction to EECS
Math 2B	1-D Calculus II	**EECS 12**	Intro Programming
Math 2D	M-D Calculus I	**EECS 20**	C Programming
Math 3A	Linear Algebra	**EECS 22**	Advanced C Progr.
Math 3D	Differential Equations	**EECS 22L**	Advanced C Progr. Lab
ICS 6D	Discrete Math for CS	**EECS 31**	Digital Systems
		EECS 31L	Digital Logic Lab
Physics 7C/L	Force, Energy, Motion	**EECS 40**	Object Oriented Systems
Physics 7D/L	Electricity, Magnetism	**EECS 111**	System Software
Physics 7E	Fluids, Waves, Optics	**EECS 112**	Org. of Dig. Computers
		EECS 112L	Org. of Dig. Comp. Lab
		EECS 113	Micro Comp. Interface
		EECS 114	Engr. Data Struct. + Alg.
		EECS 116	Intro Data Management
		EECS 117	Parallel Comp. Systems
		EECS 118	Intro KMSE
		EECS 119	VLSI
		EECS 123	Intro Real-Time Dist. Prg.
		EECS 159A	Senior Design Project I
		EECS 159B	Senior Design Project II
		EECS 159CW	Senior Design Project III

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Computer Engineering Research

Embedded Systems

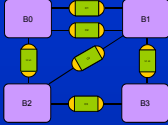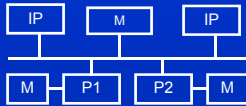**Hardware**

Bagherzadeh
Gaudiot
Kurdahi

Al Faruque
Chou
Doemer

Software

Chandramowlishwaran
Demsky
Lin
Sheu

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Embedded Systems

Mohammad Al Faruque
Cyber-Physical Systems

Cyber-physical Systems
Wireless sensor platforms
Low-power design
Resource-constrained software architecture

Pai Chou
Wireless Sensor Networks

Models of computation
Specification and model refinement
Computer-Aided Design and Synthesis
System synthesis tools

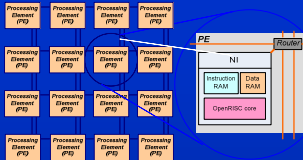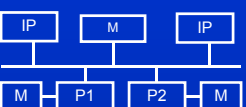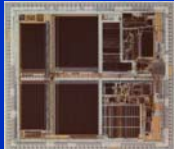**Rainer Doemer**
Modeling, Simulation, Synthesis

Applications
Energy (green computing)
Medical

Fadi Kurdahi
Modeling, Simulation, Synthesis

Transportation
Mechanical
Communication
Aerospace

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Hardware Systems

Nader Bagherzadeh
Cyber-Physical Systems

Computer Architecture
Parallel Systems
Network-on-Chip (NoC) Design
System-on-Chip (SoC) Design
Wireless Sensor Networks

Jean-Luc Gaudiot
Computer Architecture, Parallel Systems, Network Processors

Programmability
Multi- and Many-Core Processors
Network processors
Heterogenous chip design
VLSI Synthesis

Fadi Kurdahi
Modeling, Simulation, Synthesis
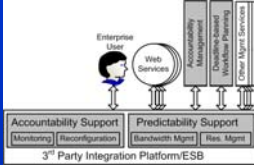
Design Automation
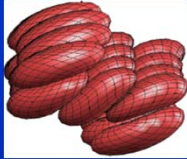
Goals
Efficient, low-power
Cross-layer
Robust, reliable, reconfigurable

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Software Systems

Aparna Chandramowlishwaran
Parallel algorithms, HPC

Brian Demsky
Programming Languages, Compilers

K-J Lin
Distributed Computing, Cloud Computing

Phillip Sheu
Databases, Semantic Computing

Programming Languages
Interpreters and compilers
Parallel execution
High-Performance Computing
Security
Robust software systems
Service Oriented Architecture
Internet
Service Provider Work Flows
Middleware Architecture
Fault-detection and prevention
Management
Natural Language Driven Computing
Semantic Web Services
Semantic Software Engineering

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Where Can I Go for More Info?

Catalogue
catalogue.uci.edu/thehenrysamuelischoolofengineering/departmentofelectricalengineeringandcomputerscience/

Department Website
www.eng.uci.edu/dept/eecs

Course Outlines
plaza.eng.uci.edu/course/outline/eecs/2014-2015

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