The Present, and the Future Perspective of the ECE Department

Andre Manitius
Chair, ECE
ECE numbers in 2004

- 25 full-time faculty members
- 15 part-time faculty members (ECE)
- 13 part-time faculty members (TCOM)
- 4 regular staff members
- 14 graduate teaching assistants
- 16 graduate research assistants
- Several hourly student workers
Total number of alumni: 2528

Number of alumni per degree:
- BS 1518
- ECE PhD 13
- IT PhD 57
- MS EE & CpE 693
- MS TCOM 159
Faculty Expertise

- Communications
- Computer Engineering
- Control
- Electromagnetics
- Microelectronics
- Signal Processing
- System Architectures
Faculty Accomplishments

IEEE Fellows:

Cook       Ephraim     Gertler       Levis       Van Trees

Allnutt         Black          Gaj             Mark             Wage

IEE Fellow  Fmr Dean  Crypto       NSF Career   ONR

E Fellow    Fmr Dean  Crypto  NSF  Career  ONR
Microelectronics Group

- Has established strong reputation in:
  - Silicon on Insulator Technology (SOI)
    - Ioannou and his coworkers and PhD students
  - Ion implantation in wide band gap semiconductors, devices that exploit the unique properties of these semiconductors – Mulpuri
  - Their research students are now employed in such renowned R&D labs as IBM, AMD, GE, Honeywell and NRL.
Adjunct Faculty

Carl Schaefer taught in an imaginative way the Introduction to Engineering, 270 students.

Their project won a first place in the Century Club contest.

Tim Beatty teaches a hands-on course on mobile robotics tapping into students’ enthusiasm for this field.
Department’s Programs
Prior to 1998: BS EE, MS EE

1998: BS in Computer Engineering

1999: MS in Computer Engineering

2000: ECE PhD

2000: MS in Telecommunications
Number of students per program

- MS TCOM: 275
- BS CpE: 163
- MS EE: 141
- BS EE: 244
- PhD ECE: 22
- MS CpE: 67
Courses Offered (S 2004)

- 28 undergraduate ECE courses
- 16 graduate ECE courses
- 13 graduate 3cr TCOM courses
- 3 undergraduate BS IT (9 sections)
- 1 undergraduate ENGR
- N individualized sections
- Thesis advising
Figure 1: Response to question 1: “How much work experience do you have in the field related to your studies?”
Work related to studies? no=blue, yes=red

- Freshman: 20% yes, 80% no
- Sophomore: 33% yes, 67% no
- Junior: 30% yes, 70% no
- Senior: 41% yes, 59% no

Figure 3: Response to question 5: “Is your current job related to your studies?”
Computer Engr Vs Electrical Engr

- Emphasis on digital logic and integration of hardware and software
- VHDL language
- Various software tools
- Capstone course “Single Chip Microprocessors”

- Signals, systems, electromagnetics and microelectronics
- Theory and simulation are emphasized
- MATLAB, and Spice languages
- Senior Design Project
Students Enthused About Robots

ECE 450 Intro to Robotics (Dr. Beatty) teaches students about:

Building a simple moving robot (e.g. LEGO)

Equipping it with sensors (photo diodes, IR pulse sensors, RF-sonar, IR heat sensors) and a NiCa 9V battery

Motorola micro-controller 68HC11

MIT-designed interface board

Simple C programming & multithread programming
Robot Competition
Robot Competition
Computer Engineering: VHDL Language

- Very High Speed Integrated Circuit
- Hardware
- Description
- Language
- A Formal Language for Specifying the Behavior and Structure of a Digital Circuit
- Allows Top-Down Design
- Taught in ECE 331 and subsequent courses
Capstone Course/Project

Emphasis on hands-on and knowledge of industrial tools. This device: DATE-AR
Problems Encountered

- Time constraints between other projects and exams
- Intros being buggy while programming
- RC car transmitter and receiver not as reliable as we hoped
- Loose wiring
- Ports on microcontroller not working as expected (port c and port d)
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Microcontroller for a Robot
Obstacle Cleared
Advanced course on digital system design with VHDL
- writing VHDL code for synthesis
- RTL VHDL
- finite state machines
- test benches

Comprehensive introduction to FPGA technology
- hardware:
  Xilinx FPGAs
- software:
  VHDL simulator
  Synthesis tools
  Xilinx ISE

Testing equipment
- oscilloscope
- logic analyzer
XESS Inc. Educational Boards

- Parallel Port
- 9V DC
- PS/2
- VGA
Alumni of EE and CpE

- Kevin Lilly, BS EE and BS CpE 1999
- 160 credit hours
- Embedded software
- Hughes Network Systems, Senior Member of Technical Staff
- All the course work at GMU was immediately applicable to his work
EE Senior Design Projects

Mark Lucero

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Semiconductor Manufacturing Lab

Educating the students about the process of chip manufacturing is challenging, because the whole process of chip manufacturing requires elaborate facilities with clean rooms and expensive equipment.

However, principles of various steps in the manufacturing process can be demonstrated on much simplified lab equipment, without the clean room. Silicon wafers of 80 mm diameter are used.
Semiconductor Manufacturing Lab

[Images of laboratory equipment, including a device labeled "CAUTION: HOT SURFACE" and another labeled "Mask Holder"].

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Lab Development

- 1998: Received $481,000 of VMEC - Virginia Microelectronics Consortium funding for the development of new laboratories in the areas related to semiconductor manufacturing, and began the development of these labs.

- A group of faculty in the ECE Department received $60,000 from NSF for equipment to build a Computer Engineering Laboratory.
Design of the BS IT Degree Program

- Foundation courses:
  - IT 101 Introduction to IT.
  - IT 212 How Computers Work.

Approximately 25% of teaching in BS IT is contributed by the ECE Department.
Students per major in IT 101

- INFT: 56
- UNDE: 27
- DMIS: 15
- ITEU: 13
- SOM: 12
- COM: 12
- FNA N: 11
- MGMT: 10
- ADJ: 9
- ACCT: 8
- AVT: 7
- BIOL: 7
- ECON: 7
- ENGL: 7
- GVIP: 6
- PSYC: 6
- MKTG: 5
- NURS: 4
- HIST: 4
- PUA D: 4
- ANTH: 4
- CPE: 4
- HFRR: 3
- INDV: 3
- ARTH: 3
- CHEM: 2
- ELEN: 2
- ESAS S: 1
- ESBU: 1
- ESIE: 1

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Students in IT 212 "How Computers Work"
MS in Telecommunications

Network, Wireless, Satellite Communications
Networking Lab

Built from “retired” Internet switching equipment donated by Cable & Wireless.

Very popular among BS EE and CpE seniors and MS TCOM students
Advanced Classroom Technologies

Theoretical concepts of electrical engineering such as mathematical algorithms of signal processing are best taught when the theory can be taught hand-in-hand with computation and visualization of the results.

Big screen projection from the computer combined with the availability of computers on students desks is a big step forward.

Student can test algorithms immediately upon their introduction, and explore “what if” questions.
Innovation Hall

Completed in summer 2003

Contains many electronic classrooms
ECE Accomplishments

- Assistant Professor at the EE Department, Southern Methodist U, Dallas, TX.
LAUGH IF YOU WILL, CHILDREN, BUT IT NEVER CRASHED OR HAD HARD DRIVE PROBLEMS. IT NEVER DELETED ANYTHING BY MISTAKE. NEVER GOT VIRUSES. YOU DIDN'T NEED TO DOWNLOAD SOFTWARE. NO POP-UP ADS...
WHICH FIELD WILL HAVE A MAJOR SOCIETAL IMPACT OVER THE NEXT 10 YEARS?