Introduction to Computer Engineering in ECE

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About Computer Engineering in ECE

- A joint program between ECE and CS
- CE degrees
  - M. S., M. E., Ph.D.
- Group leader:
  - Dr. A.L.N. Reddy
- Information:
  - Carolyn Warzon, 333E WERC
  - http://cegroup.ece.tamu.edu
  - http://ece.tamu.edu
Areas of Research

- VLSI design and CAD
- VLSI synthesis and test
- Computer architecture
- Interconnection networks
- Parallel processing
- Computer networks
- Multimedia systems
- Fault tolerant computing
- Storage and I/O systems
CE Faculty

Prof. A. L. N. Reddy
- CE Group leader

Research
- Computer networks
- Multimedia
- I/O systems
- Computer architecture

Prof. Gwan Choi

Research
- High-Performance and Low-Power VLSI Design
- Wireless Network Circuits and Systems
- Radiation Detection Systems Design
Prof. Jiang Hu

Research
- Physical design automation
- Clock network synthesis
- Design for manufacturability

Prof. Paul Gratz

Research
- On-chip interconnection networks.
- High performance multicore computer architectures.
- Processor memory systems.
CE Faculty

Prof. Sunil Khatri
Research
- VLSI Logic synthesis
- VLSI circuit design
- Low power, resilient circuits
- VLSI Testing

Prof. Peng Li
Research
- VLSI Interconnect modeling, timing
- Signal/power integrity
- Analog/Mixed-signal/RF CAD
- Circuit simulation
Prof. Mi Lu
Research
- Parallel computing
- Distributed processing
- Computer architectures
- Computer networks

Prof. Weiping Shi
Research
- VLSI Logic synthesis
- VLSI circuit design
- Low power, resilient circuits
- VLSI Testing
CE Faculty

Prof. Srinivas Shakkottai
Research
- Communication networks, with an emphasis on the Internet.

Prof. Alexander Sprintson
Research
- Communication networks
- Network algorithms
- Network coding
- Network survivability and robustness
Prof. Xi Zhang

Research

- Wired/Wireless networking
- Communication systems
- Network control and QoS
CE Staff

Carolyn Warzon

- Administrative Coordinator
- 333E WERC
- Phone: 862-1645
- Email: carolyn@ece.tamu.edu
**Computer Engineering Degrees**

- **Master of Science in Computer Engineering (Thesis option)**
  - **32 credit hours**
    - A minimum of 24 classroom hours
      - Excludes 681 (seminar), 684 (internship), 685 (directed studies), & 691 (research).
    - A minimum of 21 classroom hours from
      - College of Engineering
      - College of Science
    - Transfer hours allowed from another institution (6)
    - Max undergraduate hours (9 hours / 3 courses 400 only).
  - **Special problems, seminar, and thesis (681, 685, & 691)**
    - 8 hours maximum of these courses
    - 4 hours minimum of 691
    - 1 hour of seminar is allowed (ECEN 681) but is NOT required
  - **Thesis**
    - At least 2 within Computer Engineering Group of ECEN
    - At least 1 not in the student's department

More information:
http://www.ece.tamu.edu/Graduate/GradDegreeRequirements.php
Master of Engineering (Non-thesis option)

- **30 credit hours**
  - A minimum of 27 classroom hours (Excludes 681, 684, & 685) from
    - College of Engineering
    - College of Science
    - College of Business (at most one course, and only from the INFO Dept.)
  - A minimum of 24 classroom hours from
    - Computer Science
    - Electrical & Computer Engineering
      > >= 13 hours must be in Electrical Engineering for Computer Engineering students in the Electrical & Computer Engineering Department.

More information:
http://www.ece.tamu.edu/Graduate/GradDegreeRequirements.php
Computer Engineering Degrees

- **Master of Engineering (Non-thesis option cont.)**
  - Transfer hours allowed from another institution (6)
  - Max undergraduate hours (9 hours / 3 courses 400 only)
  - One hour of seminar is allowed (ECEN 681) but is NOT required
  - No more than 3 hours of CE/EE 684 and 685.*
  - A report is required in at least one of the EE or CS courses.**
  - Students may petition for exemption from the final oral with the approval of the student's Committee Chair.

- **Composition of committee (at least 3)**
  - At least 2 within Computer Engineering Group of ECEN
  - At least 1 not in the student's department

More information:
http://www.ece.tamu.edu/Graduate/GradDegreeRequirements.php
Computer Engineering Degrees

**Ph.D.**

- **Total number of hours (64 beyond the MS or 96 beyond the BS)**
  - A minimum of 42 classroom hours beyond the BS Degree (Excludes 681, 684, 685, & 691)
  - A maximum of 24 of these hours can be from previous graduate work.
  - Max undergraduate hours (8 hours / 2 courses 400 only).
  - One hour of seminar is allowed (ECEN 681) but is NOT required.

- **Composition of committee (at least 4)**
  - At least 2 within Computer Engineering Group of ECEN
  - At least 1 not in the student's department and not on the CE faculty
  - At least 1 not in CE Group, but in ECEN department

More information:
http://www.ece.tamu.edu/Graduate/GradDegreeRequirements.php
Computer Engineering Degrees

- Foundation courses, may be taken but will not count toward any of the degrees (MS, Meng, Ph.D.)

- Foundation courses:
  - ECEN 214 Electrical Circuit Theory 4 hrs.
  - ECEN 248 Introduction to Digital Systems Design 4 hrs.
  - ECEN 314 Signals & Systems 3 hrs.
  - ECEN 325 Electronics 4 hrs.
  - CPSC 211 Data Structures & Implementations 4 hrs.
  - CPSC 311 Analysis of Algorithms 3 hrs.
  - CPSC 410 Operating Systems 3 hrs.
  - CPSC 431 Software Engineering 3 hrs.
  - ECEN 350 or CPSC 321 Computer Architecture 3 hrs.
  - ECEN 449 Microprocessor System Design
Computer Engineering Degrees

- STAT 651 and STAT 652 (statistics courses) are for non-science majors and are not allowed.

- Credit for both CPSC 614 (Computer Architecture) and ECEN 651 (Microprogrammed Control of Digital Systems) is not allowed.
  - CPSC 614 is only allowed in special circumstances with the advisor’s approval.
Courses in Fall 2010

- ECEN 449 - Microprocessor System Design (Dr. Gratz)
- ECEN 454 - Digital Integrated Circuit Design (Dr. Li)
- ECEN 489 - 502 Networks and Networking (Dr. Shakkottai)

- ECEN 602 - Computer Communication and Networking (Dr. Reddy)
- ECEN 621 - Mobile Wireless Networking (Dr. Zhang)
- ECEN 651 - Microprogrammed Control of Digital Systems (Dr. Lu)
- ECEN 654 - VLSI Systems Design (Dr. Choi)
- ECEN 681 - CE Seminar (Dr. Li)
- ECEN 689 - 602 Network Coding and Algorithms (Dr. Sprintson)
- ECEN 689 - 604 Algorithmic Foundations of Networking (Dr. Sprintson)
Relevant CS Courses in Fall 2010

- CPSC 614 - Computer Architecture (Dr. Kim)
- CPSC 626 - Parallel Algorithms Design and Analysis (Dr. Amato)
- CPSC 665 - Adv. Networking and Security (Dr. Gu)
- CPSC 689 - 601 - Storage Systems (Dr. Jiang)
- CPSC 689 - 602 - Design Using C++ (Dr. Stroustrup)
ECEN 602: Computer Communication and Networking.

- **Objectives:**
  Computer communication and computer networks; use of the International Standards Organization (ISO) seven-layer Open Systems Interconnection model as basis for systematic approach; operational networks to be included in the study of each layer; homework assignments to make use of a campus computer network.

- **Prerequisite:**
  Statistical probability background.

- **Instructor:**
  Prof. Reddy
ECEN 651 Microprogrammed Control of Digital Systems.

- **Objectives:**
  Hardware and software concepts involved in the design and construction of microprocessor-based digital systems; microprocessor architecture; bussing; interfacing; data input/output; memories; and software development for operation and testing; design projects with microprocessors and related components

- **Prerequisite:**
  ELEN 350 and 449 or approval of instructor.

- **Instructor:**
  Prof. Lu
ECEN 689 - 602: Network Coding and Algorithms

- **Objectives:**
  - Course provides basic and in-depth knowledge of the rapidly evolving areas of network coding and algorithms
  - Study new concepts, theories, and solutions that address some of the most important and urgent design challenges in
    - Wireless networks
    - Peer-to-peer networks
    - Robust networks
  - The course will enable the students to pursue research in the related areas.

- **Prerequisite:**
  Graduate standing or instructor consent.

- **Instructor:**
  Prof. A. Sprintson

- **URL** [http://cegroup.ece.tamu.edu/spalex/netcod](http://cegroup.ece.tamu.edu/spalex/netcod)
# Tentative Full CE Course List

## Hardware/VLSI:
- ECEN 454 Digital Integrated Circuit Design
- ECEN 468 Advanced Logic Design
- ECEN 652 Switching Theory
- ECEN 654 VLSI Systems Design
- ECEN 680 Test and Diagnosis of Digital Systems
- ECEN 687 VLSI Physical Design Automation
- ECEN 689 Special Topics Courses
  - Emerging VLSI CAD Applications and Techniques
  - VLSI Logic Synthesis
  - VLSI Circuit Design
- CSCE 661 Integrated Systems Design Automation

## Computer Architecture:
- ECEN 623 Parallel Geometric Computing
- ECEN 651 Microprogrammed Control of Digital Syst. (not CSCE 614)
- ECEN 653 Computer Arithmetic Unit Design
- ECEN 676 Advanced Computer Architecture
- CSCE 605 Compiler Design

## Systems and Software:
- CSCE 410 Operating Systems
- CSCE 606 Software Engineering
- CSCE 629 Analysis of Algorithms
- CSCE 662 Distributed Processing Systems

## Math / Stat:
- MATH 415 Modern Algebra I
- MATH 416 Modern Algebra II
- MATH 446 Principles of Analysis
- MATH 447 Topics in Analysis II
- STAT 601 Statistical Analysis
- MATH 606 Theory of Probability I
- MATH 607 Real Variables I
- MATH 608 Real Variables II
- MATH 651 Optimization I
- MATH 652 Optimization II

## Networks:
- ECEN 602 Computer Comm. and Networking (similar to CSCE 619)
- ECEN 619 Internet Protocols and Modeling
- ECEN 621 Mobile Wireless Networks
- ECEN 627 Multimedia Systems and Networks
- ECEN 663 Data Compression with Applications to Speech and Video
- CSCE 663 Real-time Systems
- CSCE 665 Advanced Networking and Security
- ECEN 689 Special Topics Course
  - Network Coding and Algorithms

## English:
- ENGL 301 Technical Writing (no graduate credit)
ECEN 653: Computer Arithmetic Unit Design

- **Objectives:**
  Design of digit computer arithmetic unit, control and memory. Focusing on microprocessor arithmetic logic unit (ALU) design; high-speed addition, subtraction, multiplication and division algorithms and implementations; design and simulation with integrated circuit components and VLSI circuits.

- **Prerequisite:**
  ECEN 651

- **Instructor:**
  Prof. Lu
ECEN 676: Advanced Computer Architecture

- **Objectives:**
  This course explores design of high-performance computer architectures and their quantitative analysis. Microarchitectural details of modern superscalar processors. Emphasis on fine-grain and coarse-grain parallelism; interconnection networks; shared memory and message passing architectures; multi-threaded architectures.

- **Prerequisite:**
  ECEN 651 or CPSC 614 or approval of instructor.

- **Instructor:**
  Prof. Paul Gratz
ECEN 689: Computer Security

**Objectives:**
Attacks, services and mechanisms
- Security attacks
- Security services
- Methods of Defense
- A model for Internetwork Security
- DOS Attack mechanisms

**Prerequisite:**
ECEN 602

**Instructor:**
Prof. Reddy
ECEN 689 - 608: Advances in VLSI Circuit Design

- **Objectives:**
  The class covers design techniques applicable in a custom VLSI design setting. We cover various CMOS circuit design styles, design and simulation techniques including 3-D parasitic extraction, leakage power reduction and exploitation, dynamic compensation of circuit behavior, design of semiconductor memories, packaging issues and transmission line analysis.

- **Prerequisite:**
  Graduate standing, or instructor consent.

- **Instructor:**
  Prof. Khatri

- **URL**
  http://www.ece.tamu.edu/~sunil/courses/ee689-circuit
ECEN 689 - 605: Algorithms and Methodologies for VLSI

- **Objectives:**
  This course will provide a top-down perspective of VLSI design flow with focus on architectural transformations and physical design. The architectural transformations will be illustrated through DSP circuits. The physical design part includes algorithms on floorplanning, cell placement, routing and circuit sizing. In addition, this course will cover other important aspects of VLSI design, such as functional verification, clocking, heat removal, signal integrity and package design.

- **Prerequisite:**
  Basic knowledge on digital design, circuit theory, algorithms and C/C++ programming, or consent of the instructor.

- **Instructor:**
  Prof. Hu

- **URL**
  http://dropzone.tamu.edu/~jhu/teaching/ecen689Fall08/index.html
ECEN 689 – 604: Algorithmic Foundations of Networking

- **Objectives:**
  The course will provide fundamental and in-depth knowledge of the rapidly evolving area of network algorithms. We will study the theoretical foundations as well as efficient methods for algorithm design that apply to various areas of networking. We will discuss unique properties of networking algorithms and show specific examples of algorithm design. The course will provide the students with powerful algorithmic tools and enable them to pursue research in the related areas.

- **Prerequisite:**
  Graduate standing or instructor consent.

- **Instructor:**
  Prof. Sprintson

- **URL** http://cegroup.ece.tamu.edu/spalex/algfound/
CE Scholarship Program

- A limited number of CE scholarships will be available in the Fall 2010.
  - CEEN scholarship is intended for M.S. and Ph.D. students working or interested to work with the faculty members of the Computer Engineering Group in the Department of Electrical and Computer Engineering.
  - You are encouraged to contact faculty members you would like to work with before submitting the application.
  - You may attach a recommendation letter from a faculty member to your application (optional).

- To apply please fill out the electronic form found at http://cegoup.ece.tamu.edu/

- Please forward (by email) the completed form along with your resume to Mrs. Carolyn Warzon.

- Application must be received by Sept. 3rd, 2010, 5pm.
Thank you

Welcome to ECE!

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