AREAS

- Analog Circuit Design
- Digital & VLSI Circuits
- MicroElectroMechanical System (MEMS)
- RF and Microwave IC’s
APPLICATIONS

Wireless

Bio-Technologies

MEMS

Si-CMOS front-end

Security

Aerospace & Automotive
Dr. David Allee

- Research: Flexible Electronics
- Courses:
  - EEE 425, 525
    - Digital Circuits & VLSI Design
  - EEE 523, 527
    - Advanced Analog & A/D Design
Flexible Display Center at ASU

http://flexdisplay.asu.edu

Design Flow:

Thin Film Transistor Characterization
- Semiconductor Parameter Analyzer
- Automatic and Manual Probing

Thin Film Transistor Model Parameter Extraction
- Transistor Model Parameters Extracted from Device Data

Improved Thin Film Transistor Models
- Better Modeling of Parasitics
- Incorporation of Threshold Voltage Shift
- Advanced Models Enable Accurate Prediction of Circuit Performance Before Fabrication

Circuit Design & Simulation
- Professional CAD Suite
- Tanner Tools

Circuit Layout & Verification
- FDC Developing Design Rules for High Manufacturing Yield

Designs in Collaboration with UDC, Honeywell, Kent Displays, and E ink.

Fabrication & Test

TFT Model Parameters Extracted From Honeywell Device Data Using AIM

Measured vs. Modeled Data

Drain-source voltage [V]
0.0
0.5
1.0
1.5
2.0
2.5
Drain current [uA]

Measured
Modeled

Y Axis Title [V]

v(10) v(4) v(8)
0.0m 10.0m 20.0m 30.0m

time [sec]
-10.0
0.0
10.0
20.0
30.0
40.0

Proposed Design Rules

Fabrication & Test

Designs in Collaboration with UDC, Honeywell, Kent Displays, and E ink.

Fabrication & Test
Integrated Supply Regulators for RF Applications
RF Frequency Synthesizers
Low Power RF Transceiver Design
Low Power A/D & D/A Converters for RF Applications

Funding
- Semiconductor Research Corporation
- NSF
- Texas Instruments
- BAE
Dr. Bakkaloglu - Courses

- EEE 523
  - Advanced Analog IC Design
- EEE 598
  - Oversampling Data Converter Design
Dr. Hugh Barnaby - Research

- Space Electronics and Radiation Effects
  - Space Electronics Testbed

- Reliability and Radiation Effects Modeling
- Radiation Sensors

- Extreme Environment Effects in Devices and ICs
  - Combined Temperature and Radiation for Moon/Mars
  - Low Dose Rate Effects

NASA Carrier
Dr. Hugh Barnaby - Courses

- EEE 334 (Circuits II)
- EEE 335 (Analog and Digital Circuits)
- EEE 433 (Analog Integrated Circuits)
- EEE 598 Technology Computer Aided Design
Nanoscale Integration and Modeling
- Modeling and design for sub-45nm CMOS
- Reliable design under process variations
- Ultra-low power VLSI design
- Related CAD tools

Funding
- MARCO, SRC, Connection One
Dr. Yu (Kevin) Cao - Courses

- EEE 425
  - Digital circuit design
- EEE 525
  - VLSI system design
- EEE 598
  - Modeling and design for nanometer technology
Bio-MEMS (Micro-Electro-Mechanical-Systems)
- **Cell-on-a-Chip**: Integrating living cells / bacteria on a chip
- Pathological detection, Miniaturized bio-reactor

Bio-Nano-Micro-Interfaces
- Controlling Microdevices by Nanostructures
- Multi-domain Transducers

System Integration using MEMS
- *Hybrid Integration*: A multi-chip module which can accommodate any material / size / shape of chips
- Implantable chipsets, Wireless environment monitoring

Funding
- NSF (National Science Foundation)
- NIH (National Institute of Health)
EEE 334 Electronic Circuits II
EEE 538 Introduction to MEMS
EEE 598 MEMS - Electronic Interfaces
Dr. Jennifer Blain Christen – Research

Life Sciences
- Cellular
- Molecular
- Physiological

Engineering
- Circuits
- Control Systems
- MEMS

Waste

Culture Flask

Incubator
Dr. Jennifer Blain Christen - Courses

- EEE 202
  - Electronic Circuits I
- EEE 435
  - Fundamentals of CMOS and MEMS
- EEE 538
  - Introduction to MEMS
- EEE 598
  - Low Power Bioelectronics
DR. CLARK RESEARCH

- Radiation hardened VLSI circuits
- Low power/high performance microprocessor circuits and architectures
- Ultra low power and harsh environment VLSI systems
- High Security Digital Systems
- Research Opportunities:
  - Radiation hardened, high performance, low power, microprocessor design
  - Security circuits (smart cards, ultra-secure ICs)
  - Low power cache, MMU design
  - Multicore microprocessor circuits and programming

Students hired by: AMD, Intel, Qualcomm, Microchip, FreeScale, MRDC, TI
- EEE 333
  - VHDL and design with FPGAs
- EEE 525
  - VLSI Design
- EEE 625
  - Advanced VLSI Design
Dr. Sayfe Kiaei

- Director of the Connection One Center
- Research: RFIC Design
- Courses
  - EEE 334 / 335 Electronics I, II
  - EEE 433
  - EEE 524 RFIC Design
RF/Microwave Integrated Circuit Design (Satcom/Wireless Comm)
Integration on Gallium Nitride for High-Efficiency and High-Frequency

GaN Circuits/Novel Topologies

- Replace discrete electronics with low-cost transceiver RFIC.

Challenges:
- >>25GHz Circuit Designs
- Low-cost Packaging
- Tx Output Power Requirements

**Taken from Eric Toulouse, Freescale Semiconductor, IWPC Conference, "Systems and Technology Options"**

www.jennifernkitchen.com
Courses

- EEE 433 – Analog Integrated Circuits
- EEE 524 RF Integrated Circuit Design
Passive wireless telemetry sensor system for high energy radiation detection

- Collaborating with wireless engineers, harsh environmental electronics and nuclear scientist
- Wireless telemetry system.
- Passive, micro size, sensitive devices
- 2 patents filed, a few proposals are pending: DTRA, NIH, DoD, NSF
- Applications: space weather, radio-medical, nuclear detection.
Sensor and Sensor System

Micro system on soft substrate (Parylene, PDMS, Polyimide):
- Flexible, stretchable and networked
- 3D surface manufacture
- Biomedical and geology applications

Fluidic parameters measurement:
- Sensors: thermal anemometer, electrodes
- Functions: shear stress, temperature, conductivity, dissolved oxygen.....
- Networked sensor meshes
- Geochemistry and astrobiology applications

Miniature seismometers for harsh environments
- Based on Molecular Electric Transducer with liquid electrolyte, using microfabrication improve size and performance.
- Applications: space exploration, gas or oil detection
- EEE 334 / 335 Electronics I, II
- EEE 538
  - Introduction to MEMS
New Faculty

- Umit Ogras (Digital Design)