Introduction

Our Microsystems and Computer Engineering curriculum offers courses in Computer Systems Design, Integrated Circuits Design, Microfabrication and MEMS, Embedded Systems Design (FPGA), Implementation Sensory Information Processing, Brain-Machine Interfaces, Neurally Integrated Prosthetics and Robotics. These courses span various departments in the Whiting School of Engineering, and can also be taken in other divisions of the University, per the ECE MSE Program guidelines.

General Requirements

Satisfy the following requirements:

1) Completion of eight one-semester graduate courses (400-799 level), and
2) Completion of two additional graduate courses, or a master’s essay, or special research project approved by an ECE faculty member.
3) Six of the courses MUST have a 520.xxx course number. The other four can be from any other department, but of those four, only two can be from the Johns Hopkins Engineering for Professionals (EP) Program.

List of ECE Courses Relevant to the Concentration

Courses in the ECE Department (not all courses are offered every year):

EN.520.407  Introduction to the Physics of Electronic Devices (J. Khurgin)
EN.520.419  Iterative Algorithms (G. Meyer)
EN.520.420  Theory & Design of Iterative Algorithms II (G. Meyer)
EN.520.424  FPGA Synthesis Lab (R. Jenkins)
EN.520.425  FPGA Senior Projects Lab (R. Jenkins)
EN.520.427  Product Design Lab (P. Pouliquen)
EN.520.445  Audio Signal Processing (M. Elhilali)
EN.520.448  Electronics Design Lab (P. Pouliquen)
EN.520.450  Advanced Micro-Processor Lab (R. Glaser)
EN.520.459  Quantum Mechanics for Engineering (T. Schlesinger)
EN.520.481  Microwaves and High Speed Circuits
EN.520.485  Advanced Semiconductor Devices (J. Khurgin)
EN.520.491  CAD Design of Digital VLSI Systems I (R. Etienne-Cummings)
EN.520.492  Mixed-Mode VLSI Systems (P. Pouliquen)
EN.520.495  Microfabrication Laboratory (A. Andreou; J. Wang)
EN.520.515  Processing of Audio and Visual Signals (H. Hermansky)
EN.520.627  Photovoltaics and Energy Devices (S. Thon)
EN.520.680  Speech and Auditory Processing by Humans and Machines (H. Hermansky)
EN.520.735  Sensory Information Processing (A. Andreou)
EN.520.738  Advanced Electronic Lab Design (P. Pouliquen)
EN.520.761  Large Scale Analog Computation (A. Andreou; R. Etienne-Cummings)
EN.520.762  Seminar on Large Scale Analog Computation (A. Andreou; R. Etienne-Cummings)
EN.520.771  Advanced Integrated Circuits (A. Andreou)
EN.520.772  Advanced Integrated Circuits (A. Andreou)
EN.520.773  Advanced Topics in Microsystem Fabrication (A. Andreou)

Relevant Courses in Other Departments
Courses in the Johns Hopkins Engineering for Professionals (EP) Program

Electrical and Computer Engineering (EP)
EN.525.405  Intermediate Electromagnetics (Thomas; Weiss)
EN.525.406  Electronic Materials (Charles)
EN.525.407  Introduction to Electronic Packaging (Charles)
EN.525.408  Digital Telephony (Blodgett; Carmody)
EN.525.412  Computer Architecture (Cameron)
EN.525.415  Embedded Microprocessor Systems (Stakem)
EN.525.418  Antenna Systems (Weiss)
EN.525.420  Electromagnetic Transmission Systems (Sequeira)
EN.525.421  Introduction to Electronics and the Solid State I (Charles)
EN.525.422  Introduction to Electronics and the Solid State II (Charles)
EN.525.423  Principles of Microwave Circuits (Abita)
EN.525.424  Analog Electronic Circuit Design I (Baisden)
EN.525.428  Introduction to Digital CMOS VLSI (Martin)
EN.525.434  High-Speed Digital Design and Signal Integrity (Eaton)
EN.525.438  Introduction to Wireless Technology (Roddewig)
EN.525.441  Computer and Data Communication Networks I (Hanson)
EN.525.441  Computer and Data Communication Networks I (Nasrabadi)
EN.525.442  FPGA Design Using VHDL (Hourani)
EN.525.442  FPGA Design Using VHDL (Meitzler)
EN.525.442  FPGA Design Using VHDL (Wenstrand; Haber)
EN.525.443  Real-Time Computer Vision (Burlina; Dementhon)
EN.525.445  Modern Navigation Systems (Jablonski)
EN.525.446  DSP Hardware Lab (Wenstrand; Haber)
EN.525.451  Introduction to Electric Power Systems (Alvandi)
EN.525.484  Microwave Systems and Components (Marks, Kaul)
EN.525.712  Advanced Computer Architecture (Cameron)
EN.525.713  Analog Integrated Circuit Design (Martin)
EN.525.723  Computer and Data Communication Networks II (Hanson)
EN.525.725  Power Electronics (Katsis)
EN.525.736  Smart Antennas for Wireless Communications (Roddewig)
EN.525.738  Advanced Antenna Systems (Weiss)
EN.525.742  System-on-a-Chip FPGA Design Lab (Wenstrand; Haber)
EN.525.743  Embedded Systems Development Lab (Houser)
EN.525.754  Wireless Communication Circuits (Houser; Kaul)
EN.525.768  Wireless Networks (Refaei)
EN.525.774  RF and Microwave Circuits I (Penn; Thompson)
EN.525.775  RF and Microwave Circuits II (Penn; Thompson)
EN.525.779  RF Integrated Circuits (Penn; Wilson)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.525.786</td>
<td>Human Robotics Interaction (Lesho; Armiger)</td>
</tr>
<tr>
<td>EN.525.787</td>
<td>Microwave Monolithic Integrated Circuit (MMIC) Design (Penn; Thompson)</td>
</tr>
<tr>
<td>EN.525.788</td>
<td>Power Microwave Monolithic Integrated Circuit (MMIC) Design (Dawson)</td>
</tr>
<tr>
<td>EN.525.796</td>
<td>Introduction to High-Speed Electronics and Optoelectronics (Sova; Vichot)</td>
</tr>
</tbody>
</table>

**Applied Biomedical Engineering (EP)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.585.408</td>
<td>Medical Sensors and Devices (Thakor)</td>
</tr>
<tr>
<td>EN.585.411</td>
<td>Principles of Medical Instrumentation and Devices (Maybhate)</td>
</tr>
<tr>
<td>EN.585.414</td>
<td>Rehabilitation Engineering (Smith)</td>
</tr>
<tr>
<td>EN.585.425</td>
<td>Biomedical Engineering Practice and Innovation (Logsdon; Maybhate)</td>
</tr>
</tbody>
</table>

**Computer Science (EP)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.605.416</td>
<td>Multiprocessor Architecture and Programming (Zheng)</td>
</tr>
<tr>
<td>EN.605.445</td>
<td>Artificial Intelligence (Butcher)</td>
</tr>
<tr>
<td>EN.605.447</td>
<td>Neural Networks (Fleischer)</td>
</tr>
<tr>
<td>EN.605.713</td>
<td>Robotics (Lapin)</td>
</tr>
<tr>
<td>EN.605.728</td>
<td>Quantum Computation (Zaret)</td>
</tr>
<tr>
<td>EN.605.746</td>
<td>Machine Learning (Sheppard)</td>
</tr>
</tbody>
</table>

**Mechanical Engineering (EP)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.535.428</td>
<td>Computer-Integrated Design and Manufacturing (Ivester)</td>
</tr>
</tbody>
</table>

**Courses in Material Science**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.510.611</td>
<td>Solid State Physics (T. Poehler)</td>
</tr>
<tr>
<td>EN.510.612</td>
<td>Solid State Physics (T. Poehler)</td>
</tr>
<tr>
<td>EN.510.618</td>
<td>Electronic and Photonic Processes and Devices (T. Poehler)</td>
</tr>
</tbody>
</table>

**Courses in Computer Science**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.600.420</td>
<td>Parallel Programming (R. Burns)</td>
</tr>
<tr>
<td>EN.600.428</td>
<td>Compilers &amp; Interpreters (P. Froehlich)</td>
</tr>
<tr>
<td>EN.600.433</td>
<td>Computer Systems (P. Froehlich)</td>
</tr>
<tr>
<td>EN.600.436</td>
<td>Algorithms for Sensor-Based Robotics (G. Hager)</td>
</tr>
<tr>
<td>EN.600.437</td>
<td>Distributed Systems (Y. Amir)</td>
</tr>
<tr>
<td>EN.600.450</td>
<td>Network Embedded Systems &amp; Sensor Networks (M. Chang)</td>
</tr>
<tr>
<td>EN.600.475</td>
<td>Introduction to Machine Learning (M. Dredze)</td>
</tr>
<tr>
<td>EN.600.476</td>
<td>Machine Learning in Complex Domains (S. Saria)</td>
</tr>
<tr>
<td>EN.600.615</td>
<td>Big Data, Small Languages, Scalable Systems (Y. Ahmad)</td>
</tr>
<tr>
<td>EN.600.636</td>
<td>Algorithms for Sensor-Based Robotics (G. Hager)</td>
</tr>
<tr>
<td>EN.600.645</td>
<td>Computer Integrated Surgery I (Graduate) (R. Taylor)</td>
</tr>
<tr>
<td>EN.600.646</td>
<td>Computer Integrated Surgery II (Graduate) (R. Taylor)</td>
</tr>
<tr>
<td>EN.600.661</td>
<td>Computer Vision (Graduate) (R. Vidal)</td>
</tr>
<tr>
<td>EN.600.735</td>
<td>Seminar in Machine Learning(J. Sheppard)</td>
</tr>
</tbody>
</table>

**Courses in Mechanical Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN.530.414</td>
<td>Computer-Aided Design (D. Stoianovici)</td>
</tr>
<tr>
<td>EN.530.416</td>
<td>Advanced Mechanical Design (M. Dehghani)</td>
</tr>
<tr>
<td>EN.530.421</td>
<td>Mechatronics (G. Chirikjian)</td>
</tr>
</tbody>
</table>
EN.530.445 Introduction to Biomechanics (S. Belkoff)
EN.530.470 Space Vehicle Dynamics & Control (M. Ozimek; T. McGee)
EN.530.620 Robot Sensors and Actuators (Graduate) (L. Whitcomb)
EN.530.624 Dynamics of Robots and Spacecraft (Graduate) (G. Chirikjian)
EN.530.646 Robot Devices, Kinematics, Dynamics, and Control (N. Cowan)
EN.530.657 Physical Acoustics (A. Prosperetti)
EN.530.672 Biosensing & BioMEMS (J. Wang)
EN.530.676 Locomotion in Mechanical and Biological Systems (N. Cowan)

ECE Activity in Microsystems and Computer Engineering

Core Faculty
- Andreas Andreou
- Ralph Etienne-Cummings
- Mounya Elhilali
- Amy Foster
- Hynek Hermansky
- Jacob Khurgin
- Gerard Meyer
- Philippe Pouliquen

Current Research Activity
- Brain-inspired, Energy-aware Computing Architectures for Big Data
- Active Ultrasound Pattern Injection System (AUSPIS)
- DARPA Unconventional Processing of Signal for Intelligent Data Exploitation (UPSIDE)
- Bidirectional Neuro-prostheses
- Energy Efficient Closed-loop Compressed Sensing Based Neural Recording System
- Proto-object Based Dynamic Visual Saliency Model
- Wireless Biotelemetry Using Ultra-wideband Communications
- Neurmorphic Cognitive Circuits and Systems
- Detect, Identify, Classify and Transmit Information in Speech
- Sensory Information Processing for Robotics Applications
- Probabilistic Computer Systems and Applications

Contact Information
Debbie Race, Academic Program Administrator
The Johns Hopkins University
Dept. of Electrical and Computer Engineering
3400 N. Charles St., Barton Hall 105
Baltimore, MD 21218

Phone: 410-516-4808
Fax: 410-516-5566