Study and Careers in Computer Science & Electrical Engineering

Presentation to E199 by Brian Woerner, Chair Lane Department of Computer Science & Electrical Engineering
Our world is made up of Complex Systems

When I make a cell phone call, I need …

Electromagnetics

Signal Processing & Microprocessors

Software

Networking

Power

Communications
CSEE brings together many disciplines related to the creation of Information Technology

- Computer Science
  - Computer Engineering
- Electrical Engineering
  - Biometrics Systems

- All these fields share common tools for the creation, processing, and control of complex systems of information
Electrical Engineering

Applying electromagnetics to understand, design, and create useful devices and signals

Key skills: mathematics & physics
Electrical Engineering
Computer Engineering

Designing and building hardware systems to manage information

Key skills: mathematics, systems
Computer Science

Creating computer software and systems to manage information and solve problems

Key skills: mathematics, programming
Biometric Systems

Applying principles and methods from EE/CpE/CS to biological signals and systems

Key skills: mathematics, biology, ability to blaze trails in an discipline
Biometric Systems

Computer Science

Electrical Engineering

Computer Engineering
Nanotechnology
Power Systems

- Economics
  Markets/Risk/Value
- Systems
  Coordination
- Computations
  Software Agents
- Power
  Integration
- Communications
  Measurements
- Electronics
  Sensors/Prototype
- Mathematics
  Modeling/Feasibility
- Controls
  Design

Securing the Energy Grid
Communications and Networking

- Techniques for canceling interference in cell phones
- Methods for sending more data over WLANs

Conventional CDMA vs. After Cancellation

Asynchronous CDMA

Transmit Processing

Receive Processing

Scattering Channel

Transmitter

Receiver
Embedded Systems
Virtual Environments

- Visualizing the workings of the human brain or designing the next video game
Software Reliability
Medical Image Processing
Biometric Systems & Information Assurance

Medical Information Processing

Nanotechnology

Clean, Reliable Power

Virtual Reality for Gaming & Training

Reliable Software Design

Biometric Systems & Information Assurance

Computer Science

Electrical Engineering

Computer Engineering

Computer & Communications Networks

Microprocessors & Embedded Systems

Wireless communications

West Virginia University
Biometric Systems

- Using signal processing to enhance safety and security
<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Foundation Courses</th>
<th>Specialty Courses</th>
<th>Math &amp; Science</th>
<th>Breadth</th>
</tr>
</thead>
<tbody>
<tr>
<td>A common freshmen year across the College of Engineering &amp; Mineral Resources features, chemistry, physics, two semesters of calculus, and two semesters of engineering problem solving. Some deviations are permitted in the Computer Science and Biometric Systems majors</td>
<td>Object-oriented languages: Java, C++</td>
<td>Databases, compilers, software engineering</td>
<td>Discrete mathematics</td>
<td>All disciplines require a well-rounded education with courses in the social sciences and the humanities</td>
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<td>Digital systems, microprocessors, C++</td>
<td>Microprocessors, computer security</td>
<td>Probability, logic</td>
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<td>Circuits, systems, electronics</td>
<td>Power, digital control, communications</td>
<td>Electromagnetic theory</td>
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<td>Systems, electronics, information assurance</td>
<td>Biometric systems, biomedical engineering</td>
<td>Biology</td>
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**Undergraduate Curriculums**

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<tr>
<th>Computer Science</th>
<th>Computer Engineering</th>
<th>Electrical Engineering</th>
<th>Biometric Systems</th>
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<td><strong>Design Experience</strong></td>
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<td>All disciplines feature an integrated 3 year design experience which emphasizes oral and written communication, teamwork, design principles, and professional ethics</td>
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Job Opportunities in CSEE

- CSEE jobs in WV

<table>
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<tr>
<th>Job Title</th>
<th>Positions</th>
<th>Average Salary</th>
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<tbody>
<tr>
<td>Comp&amp;Info Sys. Manager</td>
<td>890</td>
<td>$64.4K</td>
</tr>
<tr>
<td>Engineering Manager</td>
<td>710</td>
<td>$80.5K</td>
</tr>
<tr>
<td>Software Engr., Appl.</td>
<td>570</td>
<td>$59.7K</td>
</tr>
<tr>
<td>Software Engr., Systems</td>
<td>260</td>
<td>$61.2K</td>
</tr>
<tr>
<td>Comp. Engineer</td>
<td>150</td>
<td>$50.4K</td>
</tr>
<tr>
<td>Electrical Engr.</td>
<td>390</td>
<td>$59.7K</td>
</tr>
<tr>
<td>Electronics Engr.</td>
<td>130</td>
<td>$58.4K</td>
</tr>
<tr>
<td>CS Education</td>
<td>200</td>
<td>$50.8K</td>
</tr>
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</table>

- Average Starting Salaries in 2004 for a BS degree (CNN)
  - Computer/Electrical Engineering: $51,297 (2nd on list)
  - Computer Science: $49,036 (3rd on List)

- Projected job growth in CSEE disciplines

<table>
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<tr>
<th>Degree</th>
<th>WV SBEP Projected Annual Growth</th>
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<tr>
<td>CS</td>
<td>10% (2nd out of 429 occupations)</td>
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<tr>
<td>CpE</td>
<td>6% (10th out of 429 occupations)</td>
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<tr>
<td>EE</td>
<td>2%</td>
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</table>
Student Organizations

- Institute of Electrical & Electronic Engineers (IEEE)
- Association of Computing Machinery (ACM)
- Student Society for Advancement of Biometrics (SSAB)
- Eta Kappa Nu (HKN – EE/CpE Honorary)
- Upsilon Pi Epsilon (UPE – CS Honorary)
- Women in Computer Science & Electrical Engineering (WCSEE)
- Formula Lightening Team
- Student advisory council