

OPEN HOUSE 2017

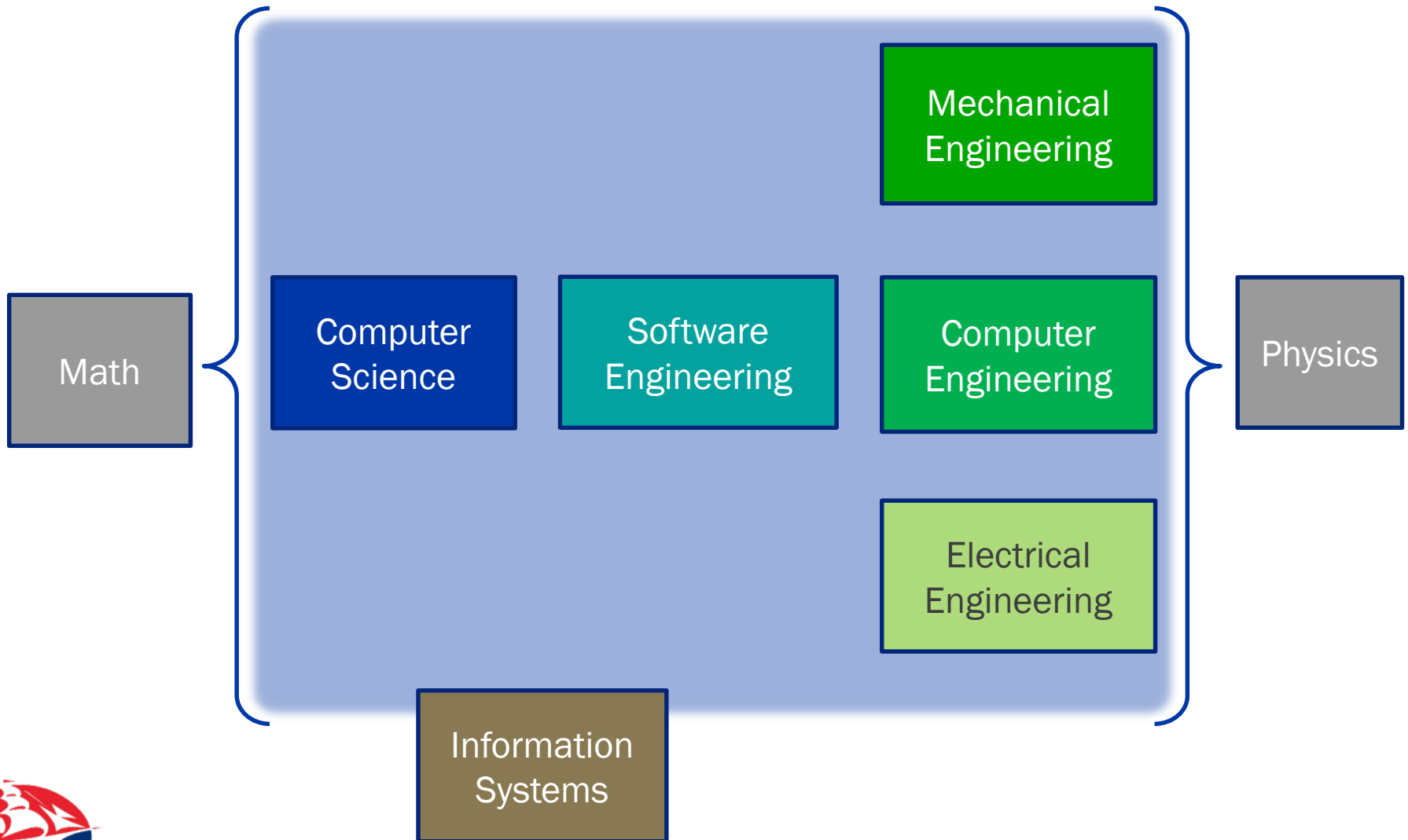
Department of Computer Science & Engineering

Presenters: Drs. Tom Briggs & Dudley Girard



SHIPPENSBURG UNIVERSITY

A Continuum of Programs

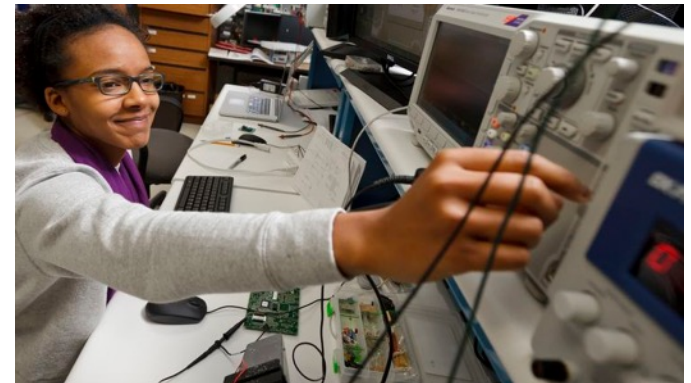


Am I scientist or an engineer?

- A scientist asks, “Why does that cool thing happen?”
 - The goal is the knowledge and the exploration
 - Research
- An engineer asks, “How do I make that happen again?”
 - The goal is the product or process
 - Development

*“A scientist builds to study...
An engineer studies to build”*

- Fred Brooks Jr.



How do these programs fit together?

- The ICON Water Sensor project

- NASA's Wallops Island Launch Facility
- Partnered with our Geography / Earth Sciences department
 - Measure a variety of water conditions
 - upload sensor data, download instructions
 - Record data in a database
 - Allow users to visualize the data
 - Export data to GIS software for modeling and analysis



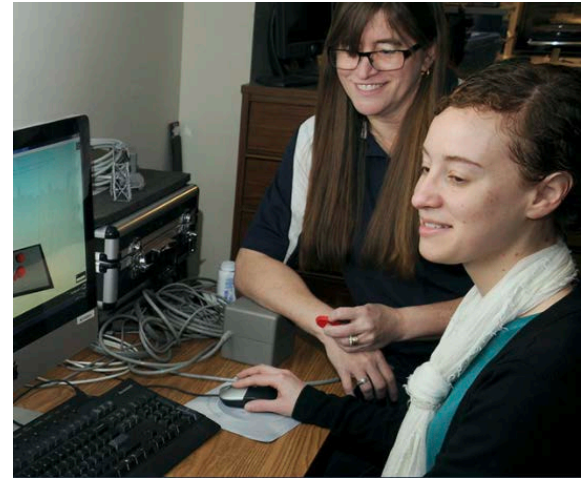
B.S. in Computer Science

- Interdisciplinary Problem Solving
 - **Solving** a wide array of problems using programs
 - **Discovering** the theory of how to solve problems
 - **Searching** for better ways to solve problems
 - **Investigating** problems that don't yet have a solution
- Job titles
 - Developer, Systems Administrator, Data Scientist, Web Developer, Data Base Administrator, Network Administrator, Security Administrator
- Roles in our water sensor project:
 - Determine a way for the sensors to mesh together and connect to Internet
 - Design 3D visualization algorithms of collected sensor data
 - Big Data analysis and machine learning to detect patterns in data



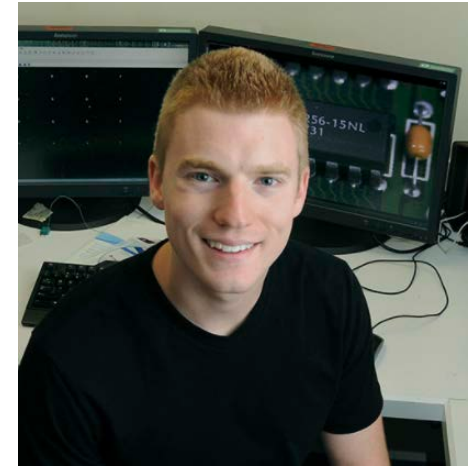
B.S. in Software Engineering

- Engineers that build large, complex **software systems**.
 - **Applying** computational science to build systems
 - **Designing** software systems to meet requirements
 - **Following** a development process
 - **Building** from well-known components
 - **Analyzing** systems
 - **Refining** systems
 - **Managing** teams and large software projects
- Job titles
 - Developer, Software Engineer, Analyst, Web Developer, Quality Assurance, Project Manager
- Roles in our water sensor project:
 - Design and develop a secure, cloud-connected database to store the sensor data and a user portal to access the sensor data.



B.S. in Computer Engineering

- Engineers that build **embedded computer systems**
 - **Applying** computational and natural sciences to build systems
 - **Designing** computer systems to meet requirements
 - **Following** a development process
 - **Building** from well-known components
 - **Analyzing** systems
 - **Refining** systems
 - **Managing** teams and embedded systems projects
- Job titles
 - Firmware Engineer, Network Engineer, Analyst, ASIC (Chip) Designer, Hardware Engineer, Network Architect, Project Manager, Operating Systems Engineer
- Roles in our water sensor project:
 - Design and develop firmware and device drivers for the custom sensor board, work with electrical engineers on the custom circuit boards



B.S. in Electrical Engineering

- Engineers that build **electrical, electronic, and communications systems**
 - **Applying** natural and computational sciences to build systems
 - **Designing** electrical components and systems to meet requirements
 - **Following** a development process
 - **Building** systems from well-known components
 - **Analyzing** components and systems
 - **Refining** components and systems
 - **Managing** teams and development projects
- Job titles
 - Electrical Engineer, Circuit Designer, Control Systems Designer, Test Engineer, Radio Engineer, Signal Engineer, Network Engineer
- Roles in our water sensor project:
 - Design circuit board and components to interface to sensor and transmit data wirelessly



B.S. in Mechanical Engineering

- Engineers that build **mechanical systems**
 - **Applying** natural sciences to build systems
 - **Designing** mechanical systems to meet requirements
 - **Following** a development process
 - **Building** from well-known components
 - **Analyzing** systems
 - **Refining** systems
 - **Managing** teams and development projects
- Job Titles
 - Automotive Engineer, Design Engineer, Fluid Mechanics Engineer, Power Mechanics Engineer, Hydraulics Engineer, Mechatronic Engineer, Refrigeration Engineer
- Roles in our water sensor project:
 - Design the housings for the sensors to meet the harsh environmental constraints, determine thermodynamic impacts on the performance of the system



Are you a scientist or an engineer?

- You are if you have:
 - **Curiosity** to explore the world
 - **Perseverance** to overcome challenges
 - **Find** beauty in order
 - Enjoy the satisfaction of **building** something that does something cool
 - You are a **Maker**
 - Not afraid of **math and science**
 - **Thrilled** by learning something new



B.S. in Computer Science Key Features

- Key courses:
 - Algorithms, Theoretical Foundations of CS
 - 120 credit hours
- **Concentrations:**
 - Computer Graphics, Computer Science Applications, and Related Discipline
- Capstone:
 - Independent scientific research project in a topic of your choosing
- Math:
 - Calculus 1, Probability and Statistics, Linear Algebra, and Discrete Math



Computing
Accreditation
Commission

B.S. in Computer Science - Concentrations

- Computer Graphics Concentration
 - Focus: Graphics algorithms and application of these algorithms.
 - **Key Courses:** Computer Graphics and Game Development
- Computer Science Applications Concentration
 - Focus: To give the student experiences across the computer science discipline.
 - **Key Courses:** Artificial Intelligence and Computational Theory
- Related Discipline Concentration
 - Focus: Combining computer science with another field of study.
 - **Key Courses:** <Your Choice Here>



Computing
Accreditation
Commission

Engineering Core Key Features

- Twelve credits taken by all engineers:
 - Engineering Seminar I – Introduction to engineering
 - Engineering Seminar II – Team work and collaboration
 - Engineering Seminar III – Professional communications and ethical behavior
- Programming Sequence:
 - Modeling and Simulations (in MATLAB) – or –
Computer Science I (in Java)
 - Programming for Engineers (C/C++)
- Statistical Process Control – Advanced design and manufacturing process control methods (e.g. ISO9000)



B.S. in Software Engineering Key Features

- Key courses:
 - Design Patterns, Metrics, Large Scale Architectures, Crafting Quality Code
 - 120 credit hours
- Capstone courses:
 - Testing and Extreme Programming – working with a real client to develop a system
- Math:
 - Calculus 1, Probability and Statistics, Linear Algebra, Probability and Statistics for Engineers, Discrete Math



Engineering
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B.S. in Computer Engineering

- Key courses:
 - Computer Organization, Operating Systems, Microcontrollers, Digital and Reconfigurable Computing, Operating System Design and Implementation
 - Physics 1 & 2, Electronics
 - 120 credit hours
- Capstone Course:
 - Work with other computer, electrical, and mechanical engineers to build a product for a real customer.
- Math:
 - Calculus I, II, and III, Differential Equations, Probability and Statistics for Engineers, Discrete Math, and Linear Algebra
 - Computer Engineers automatically earn the *Math Minor*



Engineering
Accreditation
Commission

B.S. in Electrical Engineering

- Key courses:
 - Electronics, Circuit Analysis, Computer Organization, Signals and Systems, Communications System,
 - Physics I & II, Electricity & Magnetism, Quantum Physics
 - 124 credit hours
- Capstone Course:
 - Work with other computer, electrical, and mechanical engineers to build a product for a real customer.
- Math:
 - Calculus I, II, and III, Differential Equations, Probability and Statistics for Engineers, Discrete Math, and Linear Algebra
 - Electrical Engineers automatically earn the *Math Minor* Capstone



B.S. in Mechanical Engineering

- Key courses:
 - Statics, Dynamics, Fluids, Thermodynamics, Materials & Processes
 - 125 credit hours
- Capstone course:
 - Work with other computer, electrical, and mechanical engineers to build a product for a real customer – OR –
 - Work with other *civil engineers* (anticipated) to complete structural engineering projects
- Math:
 - Calculus I, II, and III, Differential Equations, Probability and Statistics for Engineers, Discrete Math, and Linear Algebra
 - Mechanical Engineers automatically earn the *Math Minor* Capstone



Common Qualities of All Programs

- Emphasis on **practical skills** and preparation for **job skills**
 - Blend between theory and practice
 - Internships
 - Capstone courses
- **Specialized / Individualized Instruction**
 - Independent studies
 - Flexible concentrations
- **Undergraduate Research**
 - Powerful mechanism to bridge classroom and real-world
- **Quality** of instruction and advisement
 - All faculty are tenured or tenure track
 - No teaching assistants are used to teach classes or advise students



Employment Trends

Pennsylvania employment trends and forecasts.

Title	Mean Income ¹	Increase in Employment (through 2025) ²
Computer Systems Manager	\$143,260	17% (1,920)
Systems Software Developer	\$97,980	18% (2,850 new)
Software Developer, Applications	\$95,200	15.1% (2,720 new)
Electronics Engineer	\$94,950	(-0.1%) (0 new)
Computer Hardware Engineer	\$94,480	14.2% (350 new)
Electrical Engineer	\$93,780	3.7% (240 new)
Mechanical Engineer	\$86,270	7.3% (770 new)
Computer Programmer	\$81,120	-0.7% (110 loss)
Web Developers	\$67,360	23.7% (1,090 new)
<i>Mean Pennsylvania</i>	<i>\$40,106</i>	<i>5.7% (39,878 new)³</i>



1. https://www.bls.gov/oes/current/oes_pa.htm#15-0000

2. <http://www.projectionscentral.com/Projections/LongTerm>

3. http://www.workstats.dli.pa.gov/Documents/Projections/Occupational/PA/PA_LTOP.pdf

Companies that hire our students



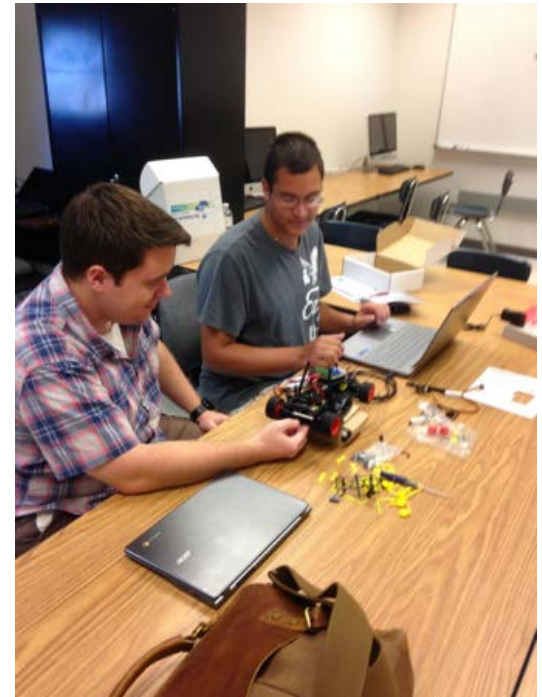
Because we care about your success...

- Computer Science & Software Engineering Entrance Requirements
 - SAT 560 or ACT 24 or
 - Ready for college algebra level of higher (math placement level 4) or
 - Complete college algebra at community college
- Computer, Electrical, and Mechanical Engineering
 - SAT 630, ACT 26 or
 - Ready for Calculus I (mat placement level 6) or
 - Complete pre-calculus at community college
- Future Computer Scientists and Engineers
 - Special program to academically support students while they work on their math placement tests
 - Engineering students may not be able to graduate in four years



No Gimmicks

- There are no waiting lists to get into a major
 - – even the Future Engineers program
- All required courses are offered in time for your to graduate on time
- You can complete your entire degree on-campus
 - No on-line courses required, but some are available
- We have flexible transfer policies
 - PATrac.org



Accreditation

- Three of our programs are **ABET** accredited:
 - B.S. in Computer Science since 2004
 - B.S. in Software Engineering since 2014
Only 26 accredited SE programs in the world!
 - B.S. in Computer Engineering since 2014
- Other programs are in the works:
 - Apply after students graduate, takes two years, retroactive to year of application
 - B.S. in Electrical Engineering we plan to apply in 2018
 - B.S. in Mechanical Engineering we plan to apply in 2022



Facilities

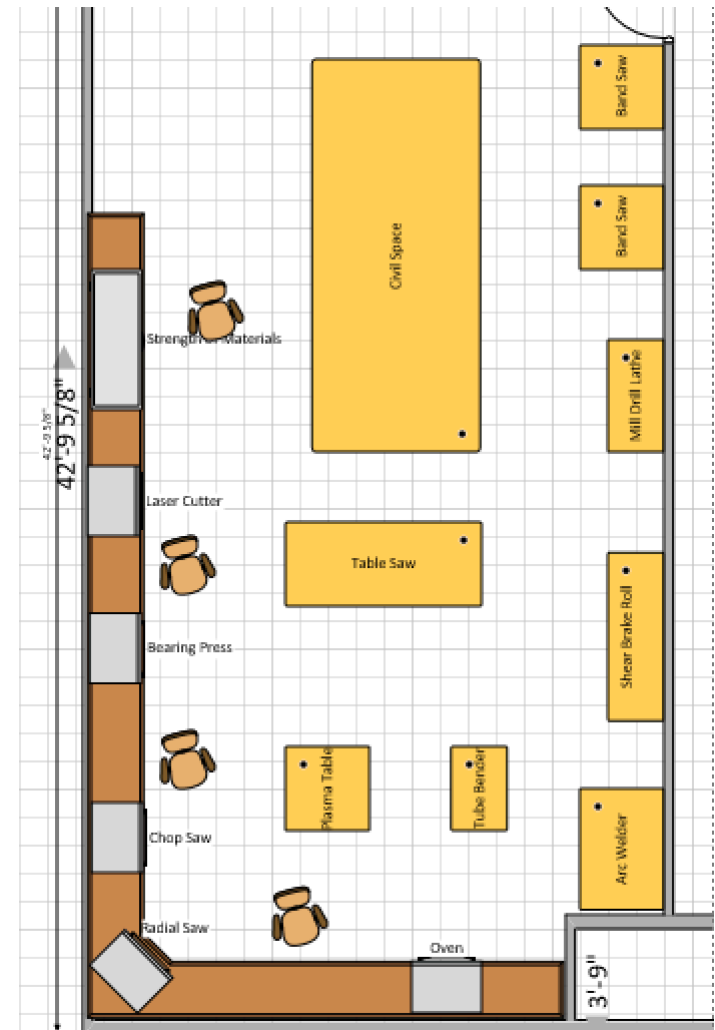
- Classrooms – most are limited to 32 students
- Teaching / Learning labs – all accessible to undergraduates
- State of the Art CE & EE fabrication & rapid prototyping
- Dedicated student lounge and tutors
- Mechanical fabrication labs are being ordered for Fall 2018



New Facilities for Mechanical Engineering

- Machine Shop - \$40,000
- Hydraulic Lab - \$50,000
- MMI / Controls Lab - \$18,000
- Materials Testing Lab - \$38,000
- Thermodynamics Lab - \$15,000
- Fuse 3D printer - \$25,000
- Desktop Metal printer - \$140,000

- Solid Works - \$3,600
- Automation Studio - \$15,000



Extracurricular Activities

- Students create lasting friendships across the disciplines
- Connect with mentors that help with their courses
- Opportunities to travel to competitions and conferences
- Clubs and Activities
 - Women in Computer Science & Engineering (WiCSE)
 - Video Game Development Clubs
 - Programming Team
 - Networking Club
 - Anime Club
 - Crews
 - LLC



Questions for the Faculty?

- Are there any questions for the faculty?



Now, a word from our students...

- Our students are our best advertising
- You can ask our students anything, but maybe they can talk about:
 - How the faculty have helped them
 - A moment where they found support from their friends in the program
 - Life on campus
 - The food in the dining halls

