Rensselaer

why not change the world?®

What is Electrical, Computer, and Systems Engineering?

Accepted Students Day

4/12/25

Electrical, Computer, and Systems Engineering (ECSE)

What is Electrical, Computer, and Systems Engineering?

Where do Electrical, Computer, and Systems Engineers work?

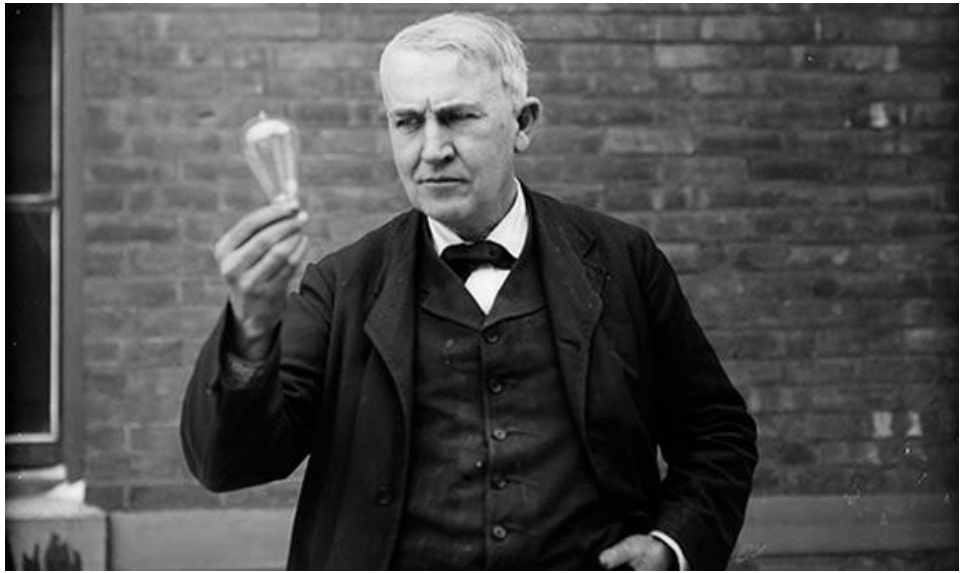
What do Electrical, Computer, and Systems Engineers learn?

ECSE

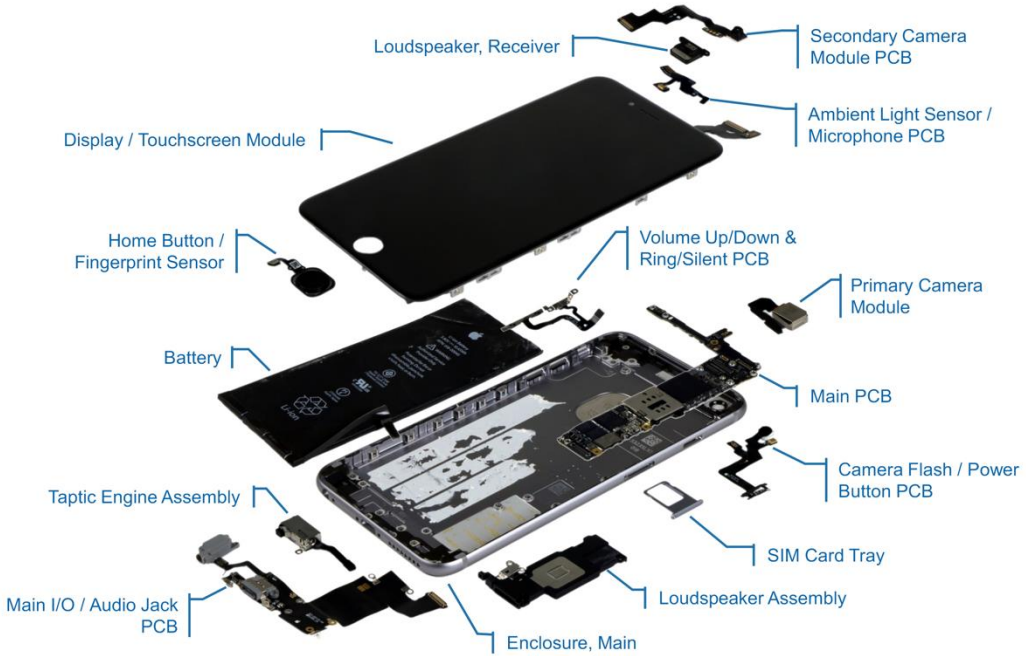
How do you prepare for ECSE?

What would the first year in ECSE be like?

- You might be thinking it’s like this:



- It’s really more like this:

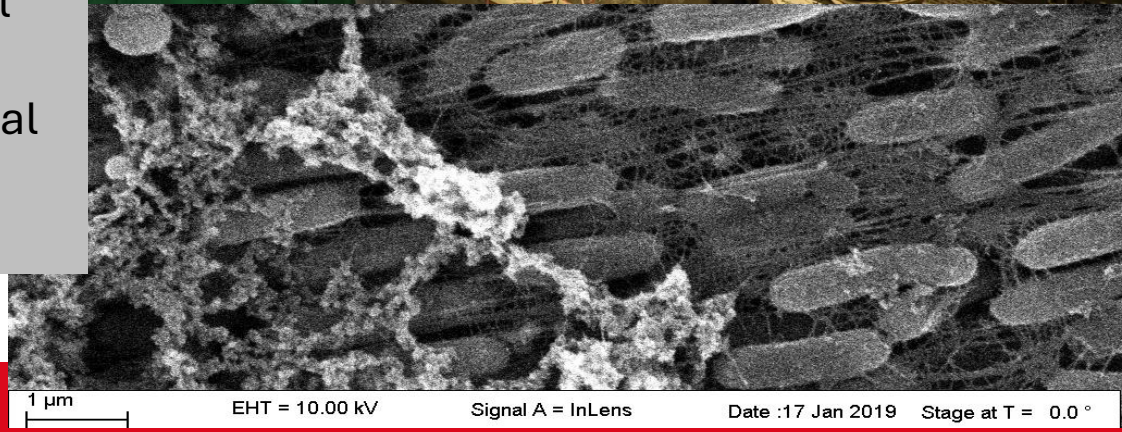


- CPU, user interface (touch screen, keyboard, voice), battery, charging, wireless communication/networking (WiFi, cellular, 5G), camera, storage (SSD), microphone, proximity sensor, touch screen sensor, IMU (motion sensor, acceleration/speed), distance sensor (for focusing), GPS, facial recognition, speech recognition, security, software apps

What is "Electrical and Computer Engineering"?

Or like this:

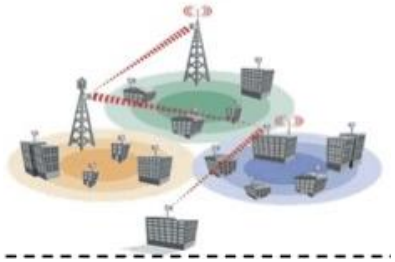
Disinfection (deep UV), detection and diagnostics (sensor and signal processing), medical instrumentation, modeling, medical imaging, robotics (clinical care, delivery, sanitation, socialization)

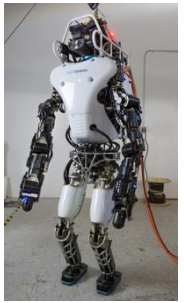


The ECSE Field

Foundation
Electronics, electric power, communication, networking, control, information, imaging, integrated circuits, computer systems, computation

Emerging Applications
Complex interconnected systems, human/automation interaction, multi-disciplinary design, artificial intelligence, machine learning, quantum computing, cybersecurity



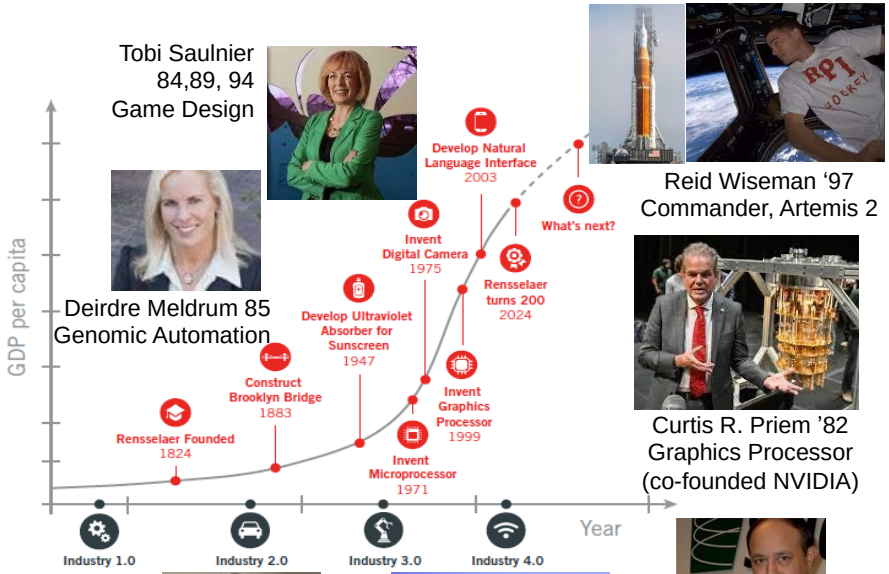


Where do ECSE Students Go and What Do They Do?

- Engineers
- Scientists
- Researchers
- Professors
- Managers
- Developers
- Analysts
- Consultants
- Entrepreneurs
- Directors
- CEOs
- CTOs

BSEE Starting Salary: 60K-100K Average:77.6K BSCSE Starting Salary: 80K-172K Average:103.6K

ECSE Numbers



Founded in 1907 (one of the first 3)

600+ Undergraduate Students:

- Electrical Engineering (EE) > 300
- Computer & Systems Eng (CSE) > 300

~140 Graduate Students

36 faculty members
6 staff members

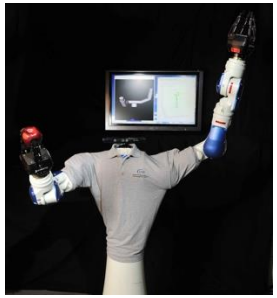
Over 12,000 alumni

Will You Fit Well in ECSE?

You will:

if you want to know **how things work** (generative AI, smartphones, power systems, humanoids, VLSI, photonics, quantum computers, …)

if you want to **make things work**, and work better (robots, smart buildings/city, electric cars/aircraft, renewable energy systems,…)



if you want to **create new things** (circuits, chips, sensors, algorithms, systems, …)

Decisions, Decisions, …

EE or CSE?

The two programs are very close, both providing the fundamentals in electrical engineering, computers, and systems.

EE: more physical devices and systems

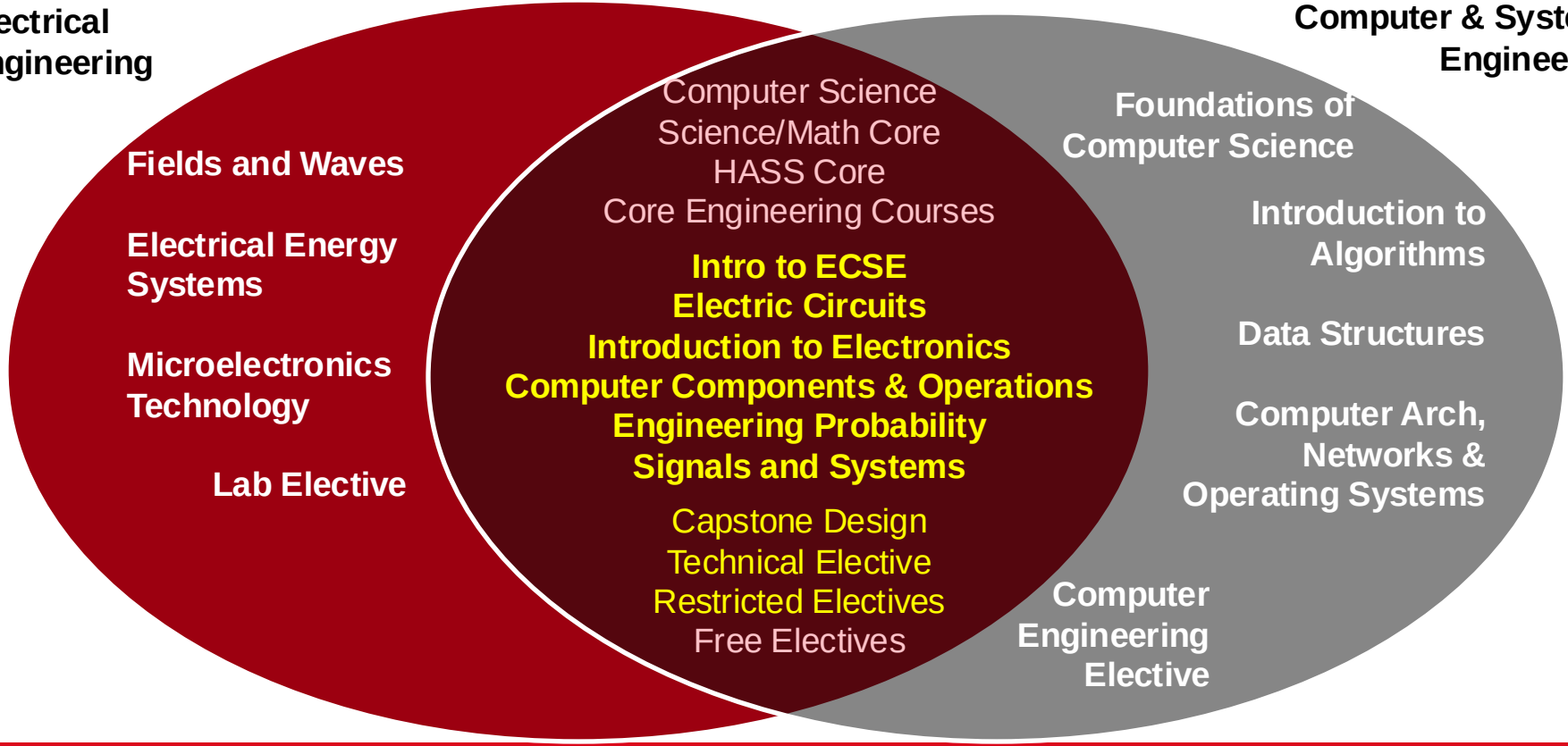
CSE: more algorithm and software engineering

Dual Major?

- You have passion for multiple subject matters (e.g., EE/CSE and … physics, computer science, biomedical engineering, or mechanical engineering)
- You are willing to forgo the free electives
- You are willing to work extra hard to do well in both majors
- You may be ahead of the schedule (e.g., with AP credits)

Minor? Typically 4 courses - Good way to build up background in another field (but difficult to do a dual major), e.g., economics, cognitive science,…

ECSE Curriculum



- # Can I do both?

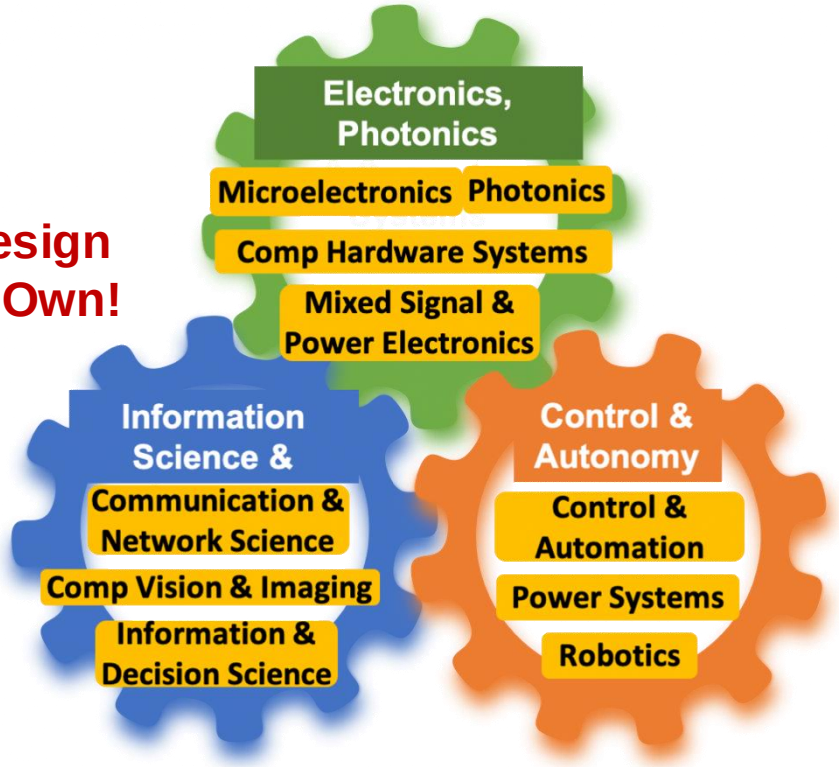
  Yes! Many students comfortably get an EE/CSE dual major where you'll get a broad education in both areas. You'll have a lot of freedom to choose electives in your senior year that focus on what you want to learn more about.

ECSE Concentrations – Depth vs. Breadth

For restricted and technical electives:

- Microelectronics
- Photonics
- Power Electronics
- Computer Hardware Systems
- Communication & Networking
- Computer Vision & Imaging
- AI and Machine Learning
- Power Systems
- Control Systems
- Robotics & Automation

Or Design Your Own!



Undergraduate Research Opportunities

Undergraduate research projects in the ECSE department are arranged based on mutual interests of individual faculty members and students. If you are interested in doing research with a faculty member in their research area, please contact the faculty member directly.

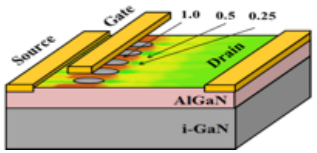
Research can be done for credit, or pay.

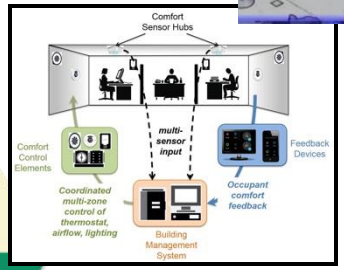
Undergraduate Course Assistant Experience

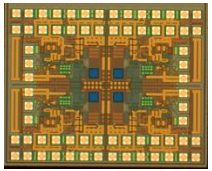
The ECSE Department also offers Undergraduate Student Assistantship (UGSA) to undergraduate students who are interested in and qualified for assisting certain undergraduate courses.

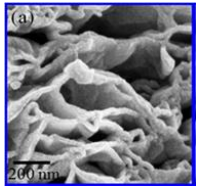
UGSA can be done for credit or pay.

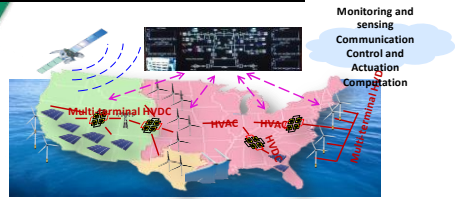
ECSE Research

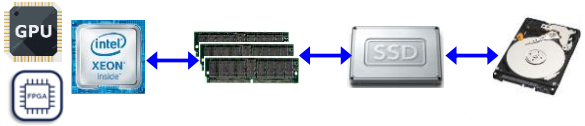


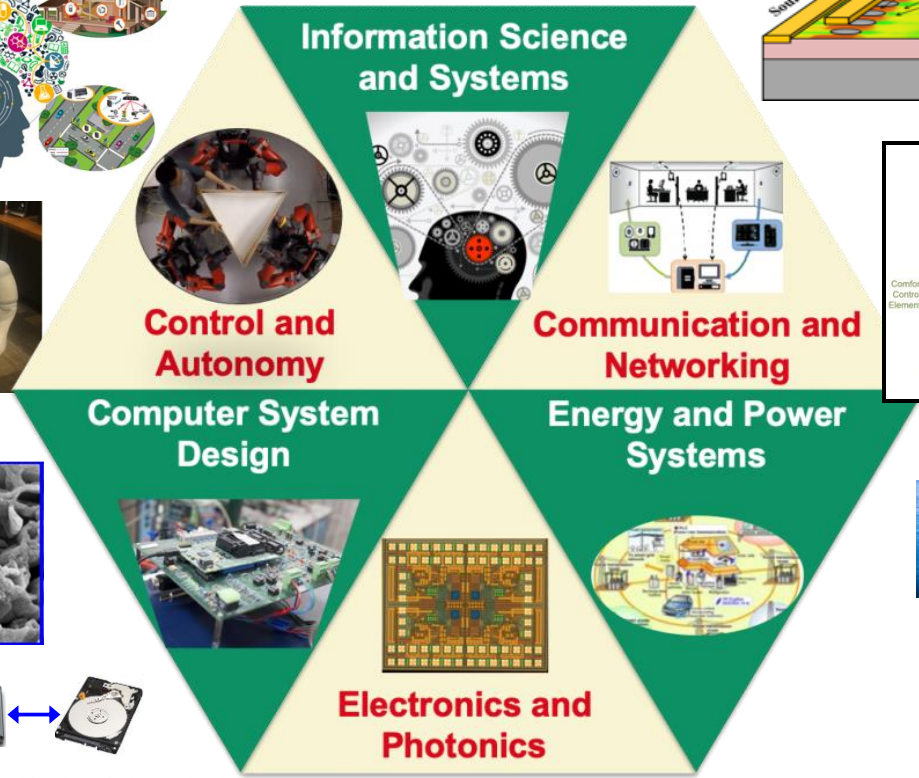












ECSE undergraduate research (Assistive Robot)

US10265227B2
United States

Download PDF Find Prior Art Similar

Inventor: John T. Wen, Jonas Braasch, Utkarsh Sinha, Andrew Cunningham, William H. Keddy-Hector, Daniel C. Kruse, David Whalen, Lu Lu

Conferences > 2014 IEEE International Confe...

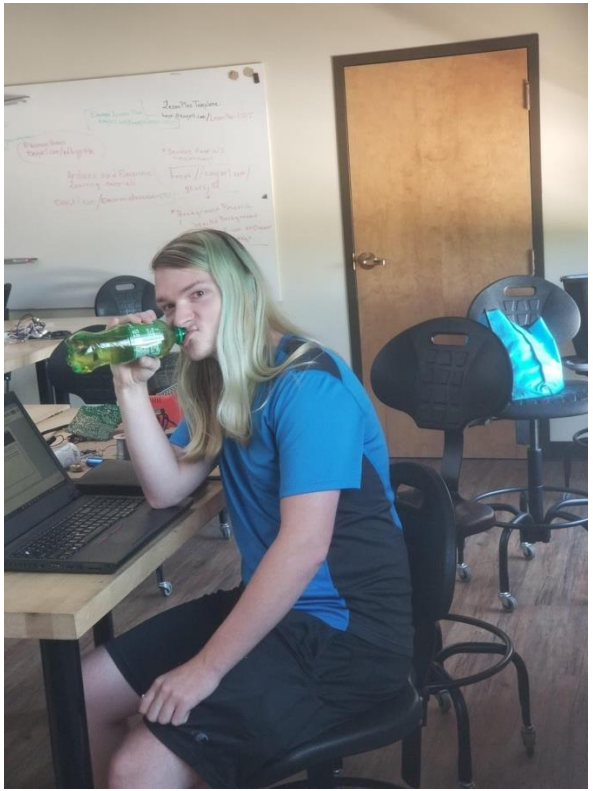
Jamster: A mobile dual-arm assistive robot with Jamboxx control

Publisher: IEEE Cite This PDF

Andrew Cunningham ; William Keddy-Hector ; Utkarsh Sinha ; David Whalen ; Daniel Kruse ; Jonas Braasch All Authors

https://youtu.be/NIobrxXhmIM?feature=shared

ECSE undergraduate research



- Our students secure opportunities at many great companies including…

Arch Internship/Co-op Employers

- **Electrical Engineering**
  - ABB
  - Advance Testing
  - Advanced Energy
  - Agilent
  - Alcatel-Lucent
  - Alpha
  - Amazon
  - AMD Tronics
  - American Airlines
  - AMS-TAOS
  - Analog Devices
  - Apple
  - Applied Materials
  - Argonne Nat. Lab
  - Arkyd Astronautics
  - Ashcroft, Inc.
  - Autodesk, Inc.
  - BASF
  - Basis Technology
  - Bayer
  - BeijingOrion Energy
  - Boeing
  - Bose
  - Bridgestone
  - Bristol-Myers Squibb
  - Broadcom
  - Cadence Design
  - CDM Smith
  - Cisco Systems, Inc.
  - Collins Aerospace
  - CPI
  - Cummins Inc.
  - Cypress Semicond
  - Daimler Truck NA
  - Draper Lab
  - Dynamic Systems
  - Eaton Corporation
  - Eppendorf
  - ESS
  - Fairmont Mayakoba
  - First Solar
  - Futurewei Tech
  - GE Energy
  - GE Energy (Power)
  - GE Global Research
  - GE Hitachi
  - GE Oil & Gas
  - Gems Sensors
  - General Dynamics
  - GLOBALFOUNDRIES
  - Green Action Studio
  - Halliburton
  - Harman International
  - Hasbro
  - Hermes Microvision
  - Herrick Tech Lab.
  - Honda
  - Horizon
  - IBM
  - Inovance Technology
  - Intel
  - Key Capture Energy
  - Knolls Atomic Power
  - kW Mission Critical
  - Lenovo Group
  - Lockheed Martin
  - Los Alamos Nat Lab
  - Lutron Electronics
  - M/A-COM
  - Mathworks
  - Microsoft
  - MIDI Product Dev
  - MIT Lincoln Laboratory
  - Mitsubishi Motors
  - MixComm
  - Moody's
  - Motorola Solutions
  - Nanolab Technologies
  - NASA
  - National Instruments
  - Nexamp, Inc.
  - NY ISO
  - OATI
  - Palantir Technologies
  - Parrot SA
  - Philips Color
  - Philips Lighting
  - Power Integrations
  - Pratt & Whitney
  - Proterra
  - Qualcomm
  - Raymond Corporation
  - Regeneron
  - RFMD
  - RxAdvance
  - Sanderson MacLeod Inc
  - Schick/Edgewell
  - Sealed Air Corporation
  - Shanghai ChipON
  - Shanghai Science & Tech
  - Siemens Research
  - Snap-On Tools
  - SoundSense
  - SRC, Inc.
  - SRI International
  - Tesla, Inc.
  - Topos Mondial
  - UChicago Argonne, LLC
  - United Imaging
  - Raytheon
  - U of Erlangen-Nuremberg
  - UTC Aerospace
  - VA Medical Center
  - VA Tech Transp Inst
  - Viking Global Investors
  - Vital Vio
  - Western Digital
  - Ximedica
  - XL Group
  - Zoll Medical
- **Computer Systems Engineering**
  - Aerospace Corporation
  - Amazon
  - Analog Devices, Inc.
  - Apple
  - Autodesk, Inc.
  - Barclays
  - Bloomberg
  - Boeing
  - BorgWarner Inc.
  - Buildpay
  - Cisco Systems, Inc.
  - Citigroup
  - CMA
  - Crestron Electronics
  - Danbury Mission Tech
  - Datto
  - Disney Worldwide Serv
  - E La Carte, Inc.
  - EndGame
  - Fluke
  - FM Global
  - Galfar Engineering
  - GE Energy (Power)
  - General Dynamics
  - Google
  - Green Action Studio
  - Harris Corporation
  - Hasbro
  - Health Research Inc.
  - Herrick Technologies
  - Honda
  - IBM
  - Intel
  - James McGuinnes
  - Jiangsu Asian Olympic Tech
  - Applied Physics Laboratory
  - Johnson & Johnson
  - Key Technologies
  - Leidos
  - LifeNets Foundation
  - Lutron Electronics
  - MathWorks
  - Microsoft
  - MIT Lincoln Laboratory
  - MITRE
  - Adaptive Neurotech
  - NYS IT Services
  - Parsons
  - Red Lion Controls
  - Robert Bosch
  - Saab Sensis
  - Sandia National Lab
  - Shengchuang Investment
  - Siemens Corp Research
  - SimpliSafe
  - SK Construction
  - SRC, Inc.
  - SRI International
  - Superior Talent
  - Tesla
  - TG Automotive
  - UPS
  - UTC Aerospace
  - VA Tech Transport Institute
  - Verizon
  - Vital Vio
  - Walt Disney
  - XL Group
  - Yangtze Delta Institute

Arch Away Oppourtunities

- Research at labs and universities
  - Johns Hopkins, RPI, MIT Lincoln Lab, Syracuse, Georgia Tech, Cornell
- Study abroad or at another institution
- Community Service and Outreach, or a Self-Designed Experience

Arch Away and Co-Ops

ELEC '21 Student

Arch Away at **IBM**

"**I have been working for IBM since January 2020 as a product engineering co-op in their mainframe division. My job is to help develop automation tools that improve diagnostic efficiency of high-level mainframe problems. I also mentor other new interns**. "

ELEC and CSYS Dual '22 Student

Internship at **Verizon**

- **Worked for the Technology & Product Development Organization**
- **Developed an application using IoT with Verizon's Digital Signs that could be used for public safety in large campuses**

Clubs and Organizations in ECSE

HKN
Eta Kappa Nu (HKN), the international honor society for electrical and computer engineers, is home to some of the best and brightest students in the field. Rensselaer Polytechnic Institute's Beta Nu chapter of Eta Kappa Nu is among over 200 other chapters across the United States, Europe, and Asia.

IEEE
The RPI Student Branch of the IEEE is an organization dedicated to connecting students, researchers, and industry professionals in order to support the engineering community.

Rensselaer Formula Hybrid
Through participation in the annual SAE Formula Hybrid competition, members build invaluable skills in product-design, team collaboration, and project management, helping to properly prepare them for professional careers in the world of engineering and management.

Embedded Hardware Club
We are a group of students at Rensselaer Polytechnic Institute who share a passion for microcontrollers, electronics, tinkering and programming. As a club, we organize workshops and hands-on projects for both RPI students and EHC members. Whether you're an experienced pro, an amateur electronics enthusiast or just starting out, the Embedded Hardware Club serves as an avenue for electronics development and project collaboration.

And many more in the SoE and beyond (Robotics, Amateur Radio)!

Industry Adviser Program

- Connects current students with alumni for one on one industry advising
- Panels with alumni
- Other engagement with alumni to show you the many possibilities with an ECSE degree!

Graduate/Undergraduate Mentor Program

- For juniors and seniors interested in graduate school
- Pairs you with a graduate ECSE student as you prepare to apply to graduate school
- Mentor to help you navigate your search for the right program for you!

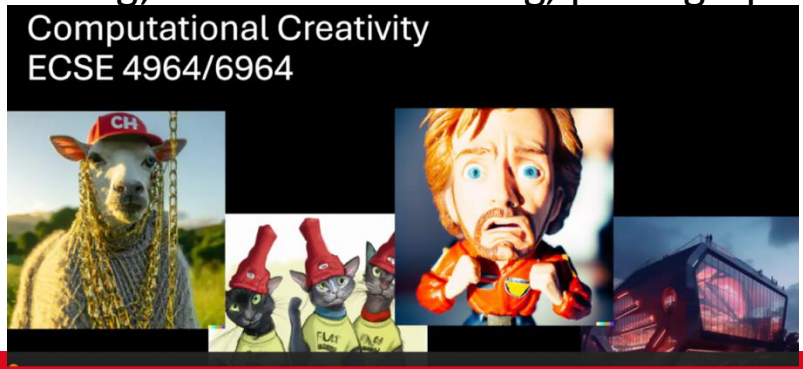
Initiative: Micro/Nano-Electronics, Semiconductor

- Master in Semiconductor Technology (MaST)
- DoD Common: One of five core members of NORDTech $40M first year for facilities (5-year award).
- Strength: Power Electronics, RF, photonics, 3D
- Micron-TEL-NSF Workforce Development
- IBM/Rapidus Workforce Development
- RPI-HVCC Semiconductor Scholar
- GF-RPI Semiconductor Student Award
- Industry-Focused courses
- Albany Nano space (joint seminar series)

Initiative: AI/ML

- IBM-RPI Future of Computing Research Collaboration (FCRC):
  - AI algorithms
  - AI hardware-software co-design
  - Semiconductor technology
  - Application of quantum computing

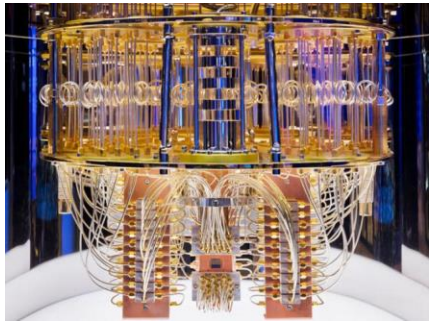
- Future of Computing Institute (FOCI): graduate program in computing (AI/ML)
- AI/ML track: intro to machine learning, deep learning, distributed learning, prob. graph model, reinforcement learning
- Special topic course: computational creativity
  (Rich Radke)

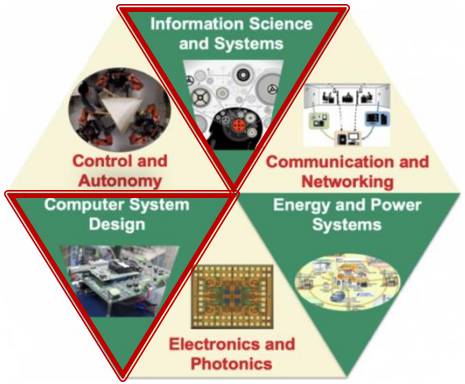


https://youtu.be/cUOOS5aZrfE?list=PLuh62Q4Sv7BX-uwS15xlbi7KUcgKUmWNL

Initiative: Quantum

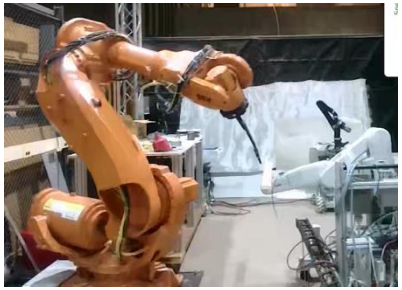
- Quantum System One 127-Qubit machine on campus
- Cloud access of Qiskit. Access to IBM courseware.
- RPI/ECSE courses: quantum programming, quantum electronics, quantum computing (CS, Physics)
- Special topic course: Quantum Electronics Devices (Alex Patterson) Quantum Computing (Zhiding Liang)
- Strong student interest: Quantum Student Club, User Group

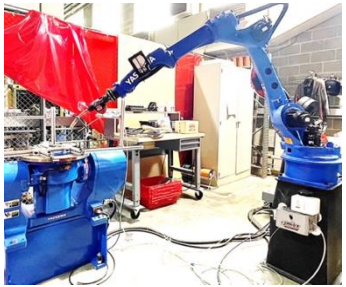


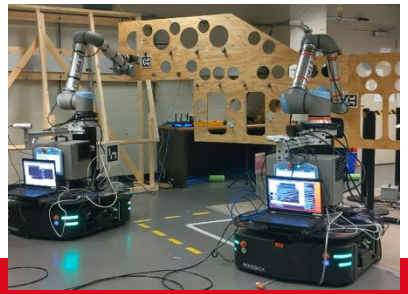


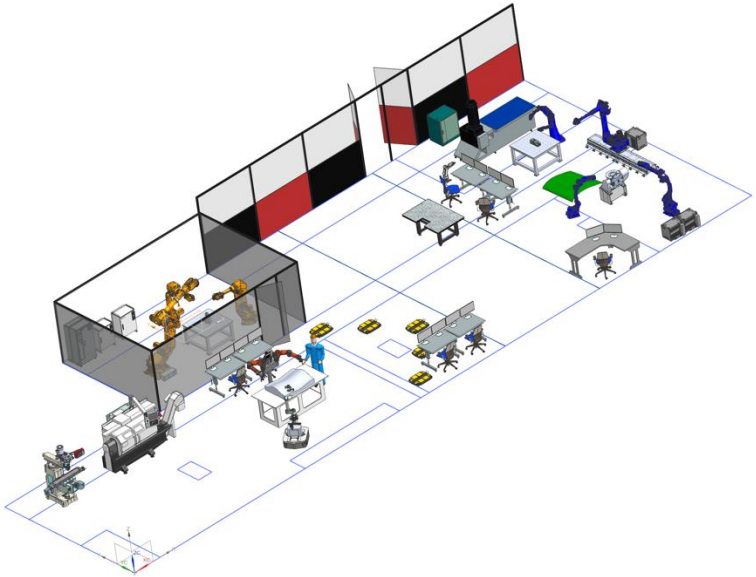
Initiative: Manufacturing and Automation

- Robots for manufacturing, convergent manufacturing
  - CII highbay for manufacturing education and research space, multiple ARM grants
  - New DARPA, ARL grants, Congressional-directed-spending $1M robotics
  - NYSTAR CAT competition 2025









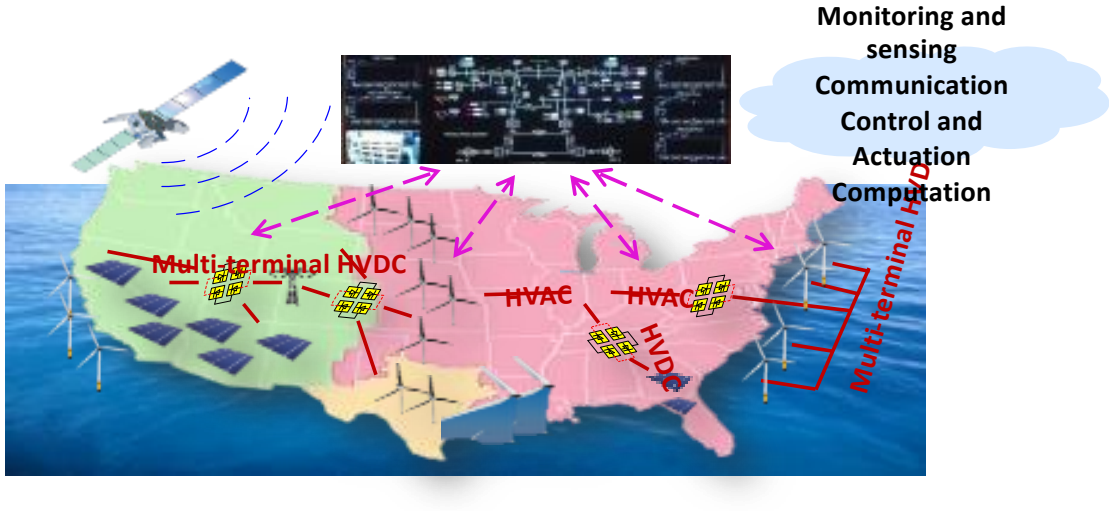
Initiative: Autonomy and Control

- Autonomy and Control: Safe autonomy, hybrid systems, reinforcement learning, multi-agent systems, integrated networking (mmWave)
- Autonomy Research for Exploration (AR-X) Drone/Robotics space (old 87 gym pool)

https://youtu.be/uCg_QqmMhV8?feature=shared

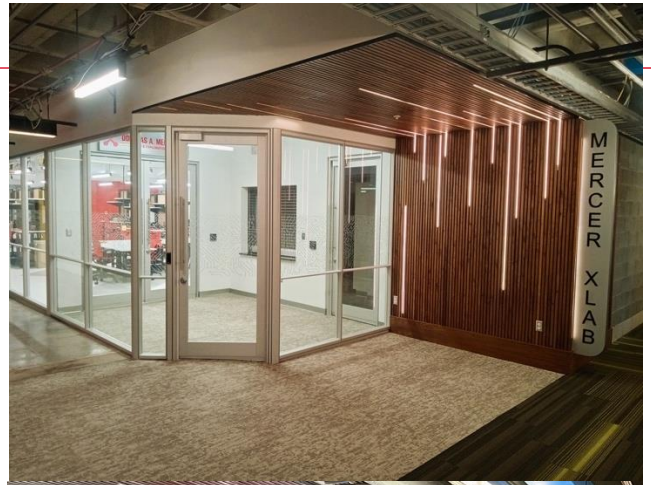
Opportunities: Energy, Power, and Sustainability

- Renewable integration, stability, fault detection, wide bandgap power electronics
  - Center for Future Energy Systems (CFES)
  - Light Enabled Systems and Applications (LESA)
  - NYISO, NYSERDA, NYPA, DOE



Education: Mercer XLab

- Doug Mercer ‘77 Laboratory on Exploration and Innovation (Mercer XLab)
- JEC 6th floor
- Resource for student tinkering, projects, competitions, curriculum (help desk, stockroom, workstations, PCB printer)
- Integration with student clubs (EHC, Robotics, HKN, IEEE, Amateur Radio, Hybrid Motorsport)



https://mercerxlab.rpi.edu

Industry Collaboration/Engagement

- Internship, co-op (Career Fair, CCPD, HandShake)
- Research projects
- Joint proposals
- Industry scholar award (e.g., GlobalFoundries Scholar Award)
- Undergraduate research program (URP)
- Capstone design project
- RCOS (Rensselaer Center for Open Software) project
- Seminars
- Short courses
- Guest speakers

Connect with ECSE

ECSE RPI Students Graduates and Friends

@ECSEDeptRPI

ecse.rpi.edu