



# Rensselaer

why not change the world?®

# Incoming Students Webinar Class of 2024

Class of 2024 Webinar  
7/23/2020

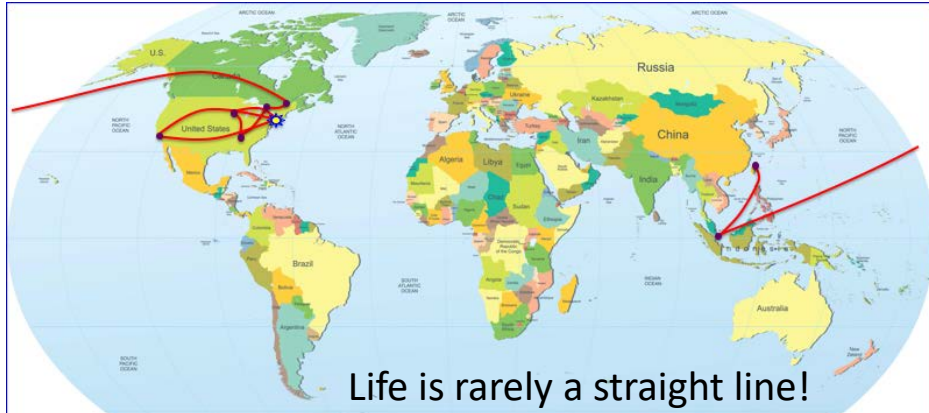
# About ECSE



- 34 faculty members
- ~ 800 undergraduate students in two curricula:
  - Electrical Engineering (EE)
  - Computer & Systems Engr. (CSE)
- Around 150 Graduate Students
- 8 staff members

- ❖ ECSE Department Head: Prof. John Wen
- ❖ First Year
- ❖ Undergraduate Student Coordinator: Rama Hamarneh
- ❖ Faculty Advisers:
  - ❖ Prof. Tianyi Chen
  - ❖ Prof. Derya Malak
  - ❖ Prof. Michael Shur
  - ❖ Prof. Ali Tajer

# Department Head – Prof. John Wen



**B.S. McGill University**

**M.S. University of Illinois**

**Ph.D. Rensselaer Polytechnic Inst.**

Fisher Control, Iowa, 1981-1982

Jet Propulsion Lab, Pasadena, 1985-1988

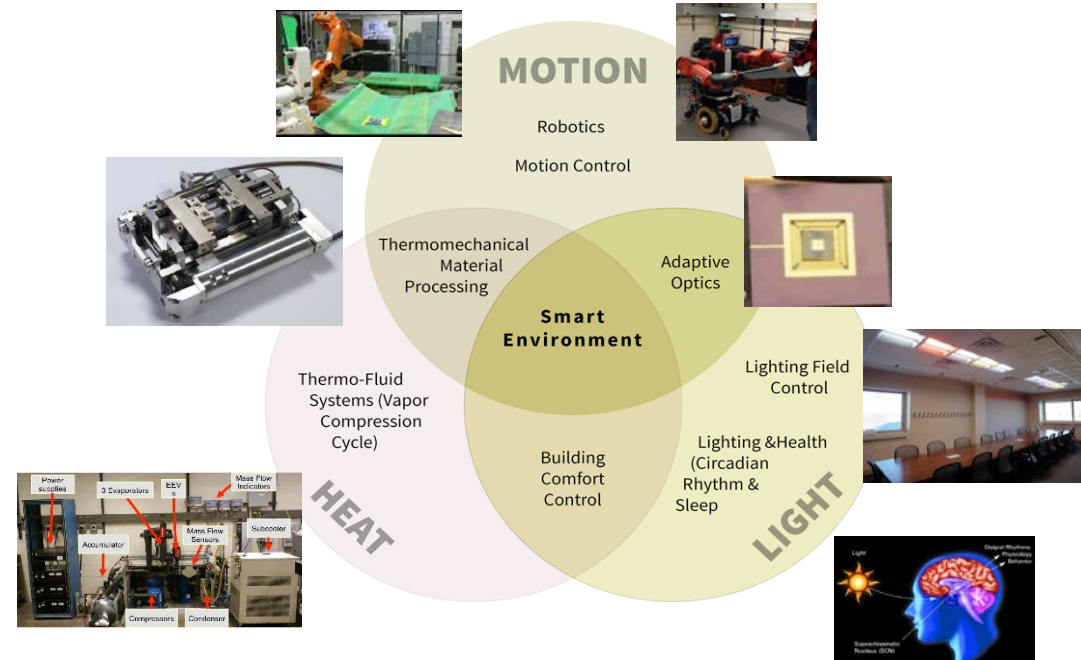
RPI faculty: 1988 - present

CATS Director: 2005 - 2013

ISE Dept Head: 2013 - 2018

ECSE Dept Head: 2018 - now

## Research: Control Theory & Application, Robotics



What I love about RPI – the culture: inquisitive, collaborative, interdisciplinary, intellectual rigor, connection to practice ... ***application of science to the common purposes of life***

Cara Leath

Advises Class of 2024: Electrical, Computer, and Systems, and Materials Engineering

Phone: (518) 276-6669

E-mail: [natalc2@rpi.edu](mailto:natalc2@rpi.edu)

Schedule an appointment:

<https://go.oncehub.com/SoEHub>



# ECSE Undergraduate Student Services

## Dr. Rama Hamarneh Undergraduate Student Coordinator

[hamarr@rpi.edu](mailto:hamarr@rpi.edu)

518-276-8557 or 518-629-5616 (remote)

JEC 6007

To schedule an appointment:

<https://calendly.com/hamarr>



## What I Do:

- Sophomore, Junior and Senior Advising: Major and Degree requirements, graduation progress, class schedule, etc.
- Help with forms
- Declaring a minor
- Undergraduate research
- Registration questions
- Transfer credit
- Study abroad
- Opportunities and events
- General questions!

**You first line of contact for questions in ECSE!**



**Tianyi Chen**  
**Assistant  
Professor**  
JEC 6036

Ph.D., Electrical and Computer  
Engineering, University of Minnesota,  
Twin Cities, 2019

Research Interests: Machine Learning,  
Optimization, Networks, Signal  
Processing

Courses:  
ECSE-6510 Stochastic Signal and  
Systems  
ECSE-4962 Intro. to Machine Learning



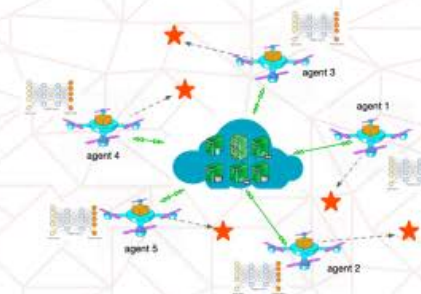
**Key theme:**  
Learning and  
Optimization for  
Networked Systems



Federated learning



Learning from big data



Multi-agent  
reinforcement learning



Mobile edge computing

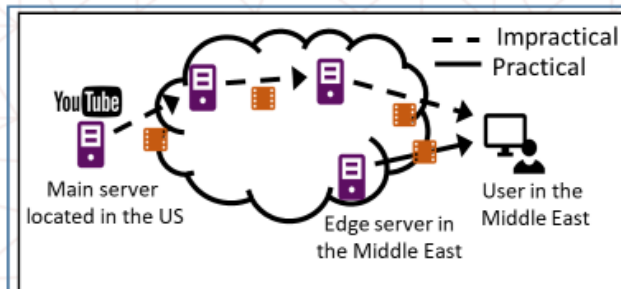


**Derya Malak**  
**Assistant Professor**  
**JEC 6038**

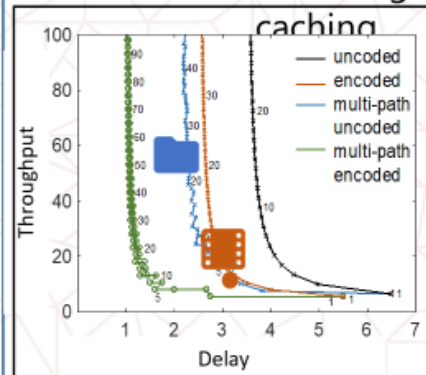
Ph.D., Electrical & Computer Engineering, University of Texas at Austin, 2017

Research Interests: communications, computation and coding in networks.

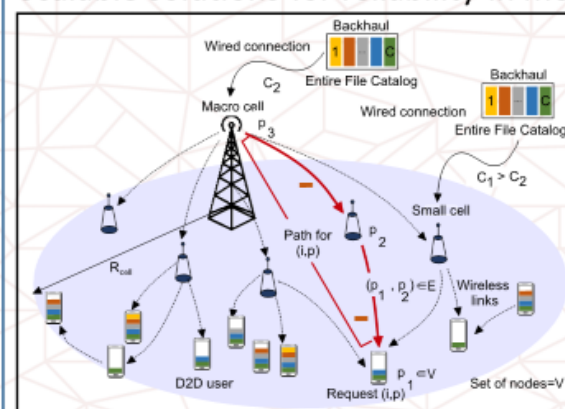
Courses:  
 ECSE-2410, Signals and Systems  
 ECSE-4530, Digital Signal Processing  
 ECSE-6560, Digital Communications



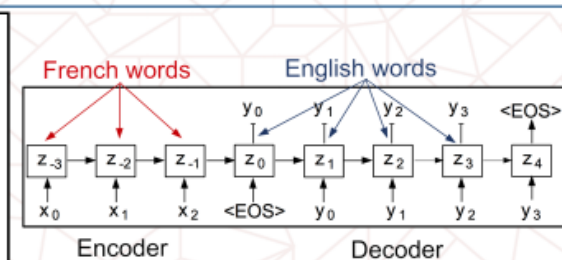
Theoretical limits of geographic



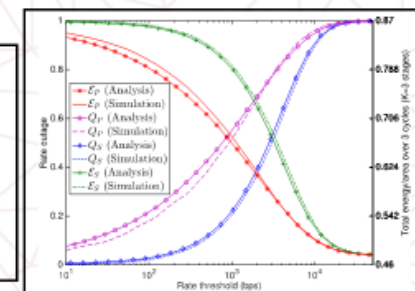
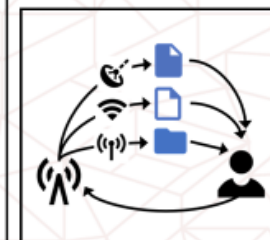
Scalable solutions for reliability in mesh networks



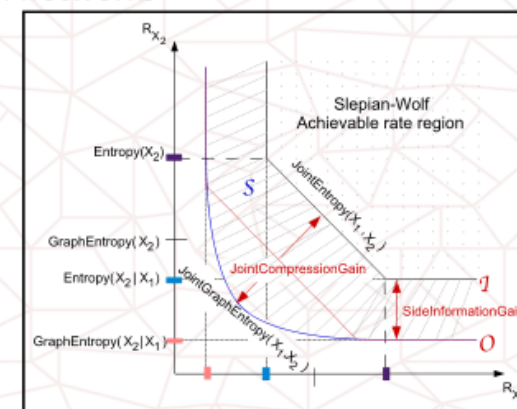
Device-to-device communications



Machine learning to recover the semantic meaning of sentences



Rate-energy tradeoffs in access networks



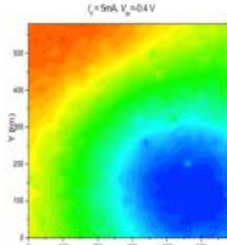
Rate region for functional compression

# Michael Shur

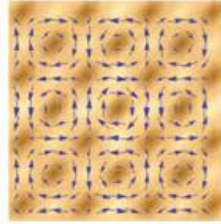
[shurm@rpi.edu](mailto:shurm@rpi.edu)

CII 6023

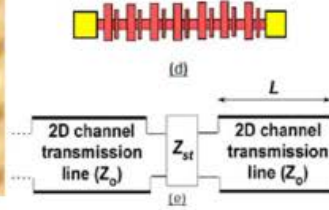
## Michael Shur



THz detection for  
Beyond 5G WIFI

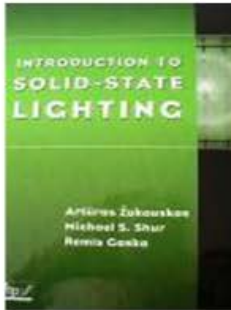


Magnetization  
by THz light

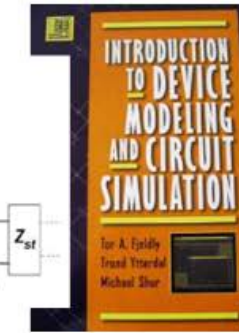


Plasmonic crystal  
For THz sources

## Plasmonics for THz electronics



## Smart lighting Color rendition Engine

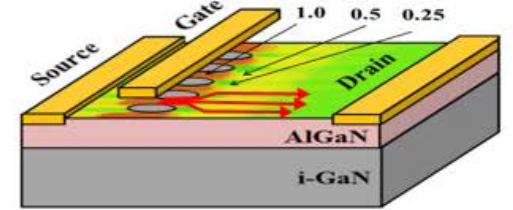


## Advanced VLSI design



Decreasing food waste  
Fighting hospital acquired infections

## Deep UV

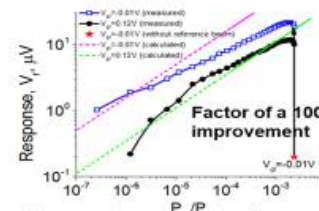
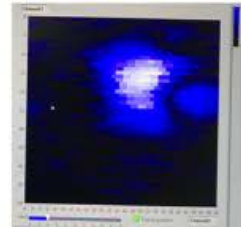


Superior performance due to non-planar  
Electron flow

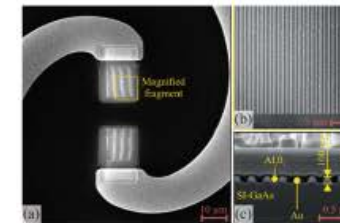
## Power electronics



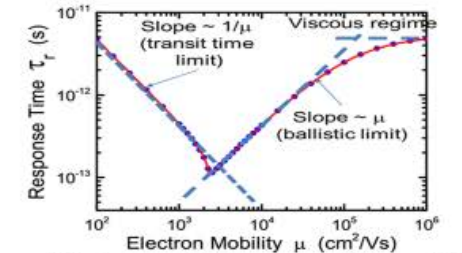
## Hardware cyber security



Homodyne detection-  
Superfast speed  $c$   
controlled by phase



## Nanoparticles enable THz Frequency Performance Superfast Electronics



Higher mobility materials could  
have lower speed

# Information Sciences

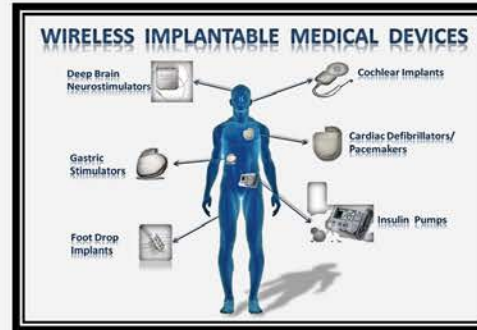
## Machine Learning, Communication, Signal Processing

Ali Tajer, Associate Professor, ECSE

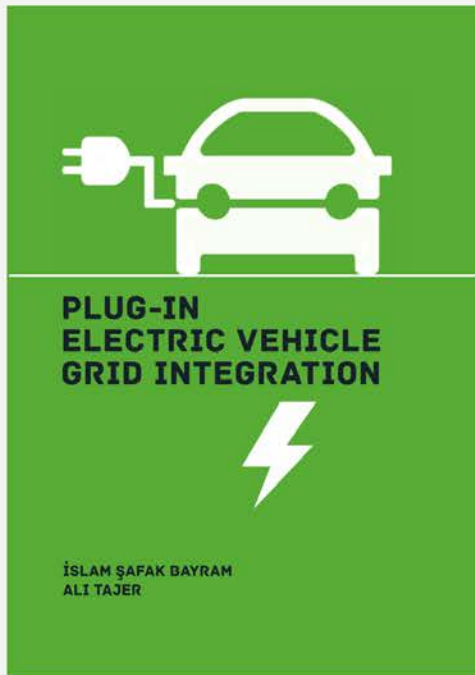
Internet of Things



Wireless Health

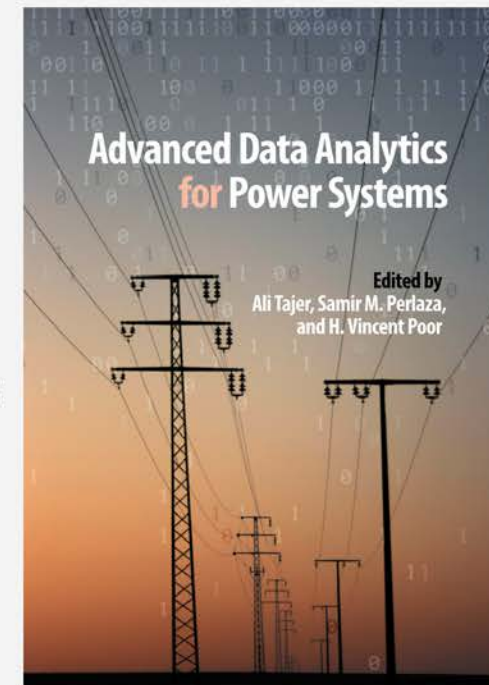


Smart Cities



current research projects:

- inference/learning in networks
- data security/privacy
- large-scale distributed networks
- recommender systems
- brain data analytics



# Your First Year in ECSE/RPI

## Fall 2020

**EE**

<b>ECSE 1010</b>	<b>Intro to ECSE</b>
CSCI 1100	CS 1
MATH 1010	Calculus 1
H&SS Elective	

**CSE**

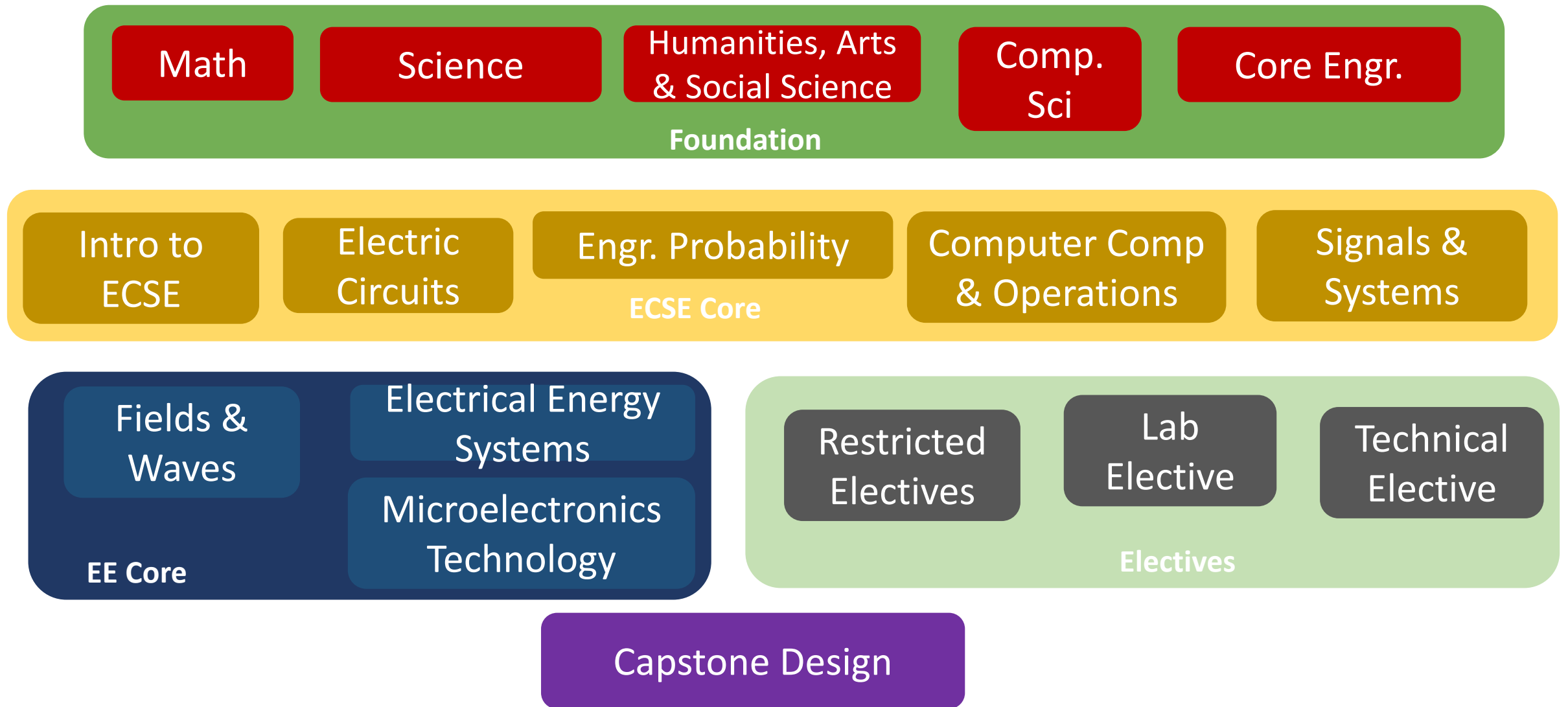
<b>ECSE 1010</b>	<b>Intro to ECSE</b>
CSCI 1100	CS 1
MATH 1010	Calculus 1
H&SS Elective	
ENGR: CAD or Communication	

## Spring 2021

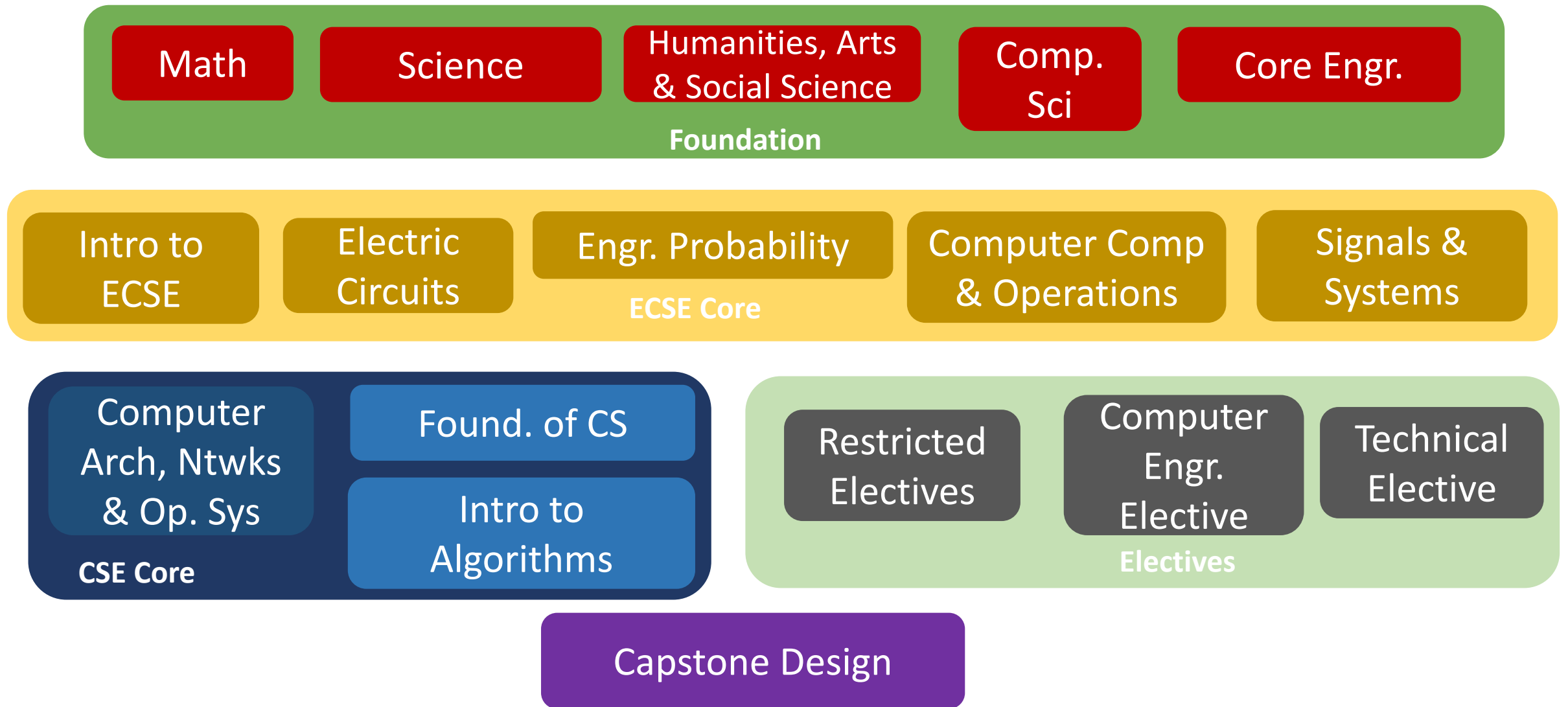
<b>ENGR 2350</b>	<b>Embedded Control</b>
MATH 1020	Calculus 2
PHYS 1100	Physics 1
Science Elective	
ENGR: CAD or Communications	

<b>ECSE 2610</b>	<b>Cmptr Comp &amp; Ops</b>
CSCI-1200	Data Structures
MATH 1020	Calculus 2
PHYS 1100	Physics 1

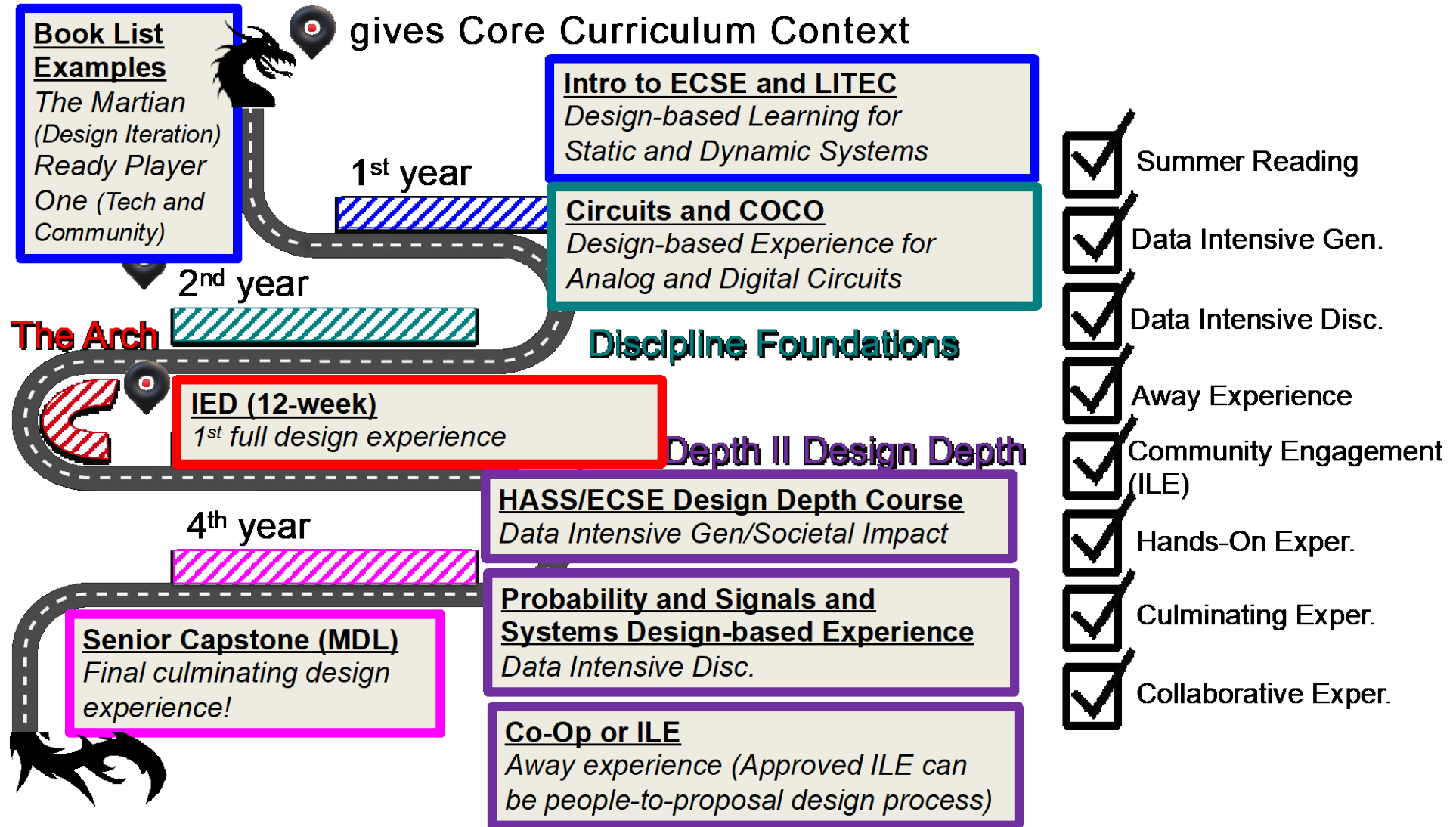
# Electrical Engineering Curriculum



# Computer & Systems Engineering Curriculum



# ECSE Curriculum



## 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?

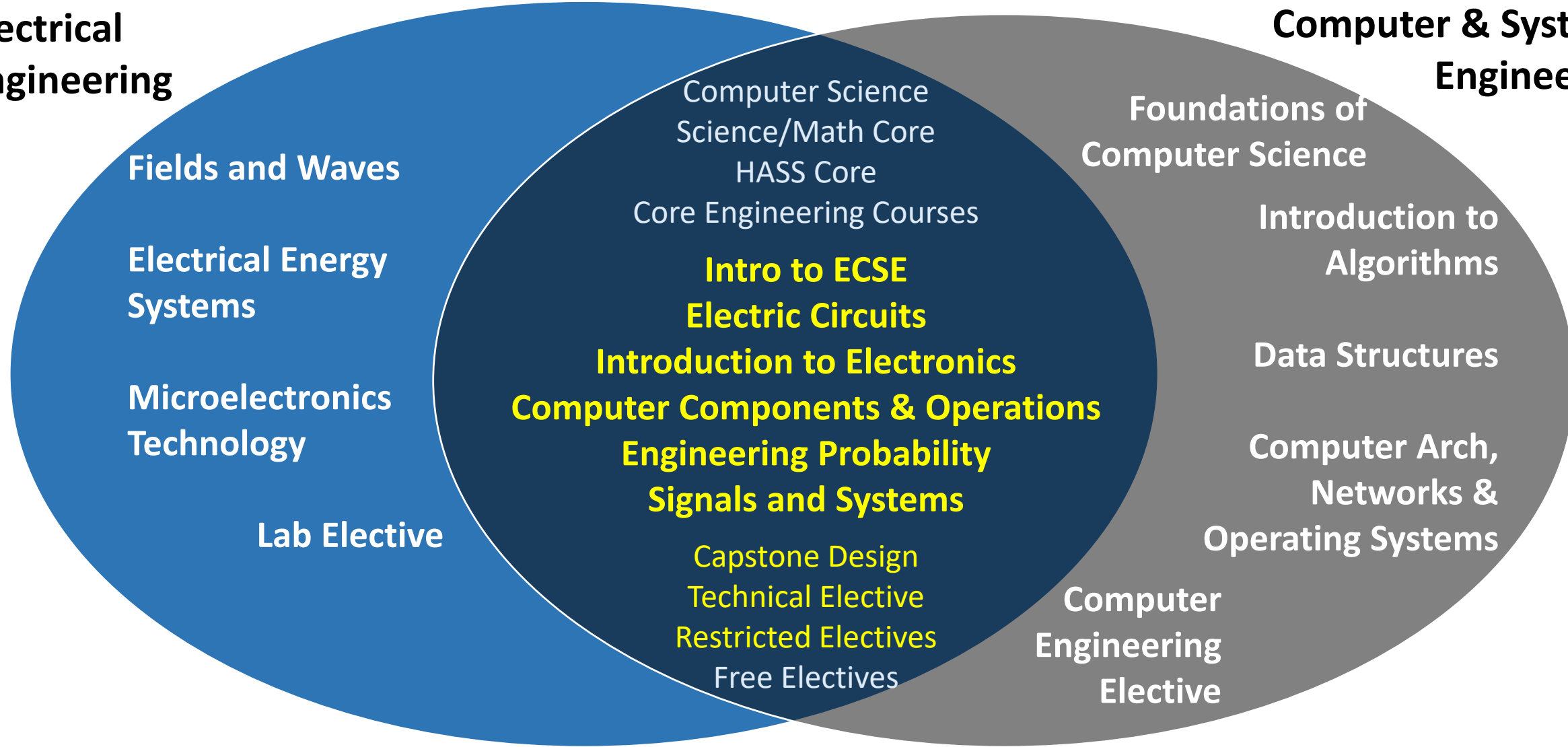
- You have passion for multiple subject matters (e.g., ECSE and ... physics, computer science, biomedical engineering, or mechanical engineering)
- You are willing to forgo the free electives
- You are willing to work extra hard to do well in both majors
- You may be ahead of the schedule (e.g., with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

**Electrical  
Engineering**

**Computer & Systems  
Engineering**



## Program Templates and more details...

More templates for dual majors, as well as more details about the curriculum can be found on our website:



### Dual Major Opportunities:

- Computer Science
- Applied Physics
- Biomedical Eng.
- Mechanical Eng.

<https://ecse.rpi.edu/academics/undergraduate-programs/program-templates>

# ECSE 1010: Introduction to ECSE - Gateway to ECSE

Every new ECSE student will receive an ADALM1000 data acquisition board!

<https://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/adalm1000.html#eb-overview>

- Basic tools and concepts in Electrical, Computer, and Systems Engineering: components, circuits, systems, programming, measurements, data analysis
- Guest lectures on the breadth and range of ECSE research

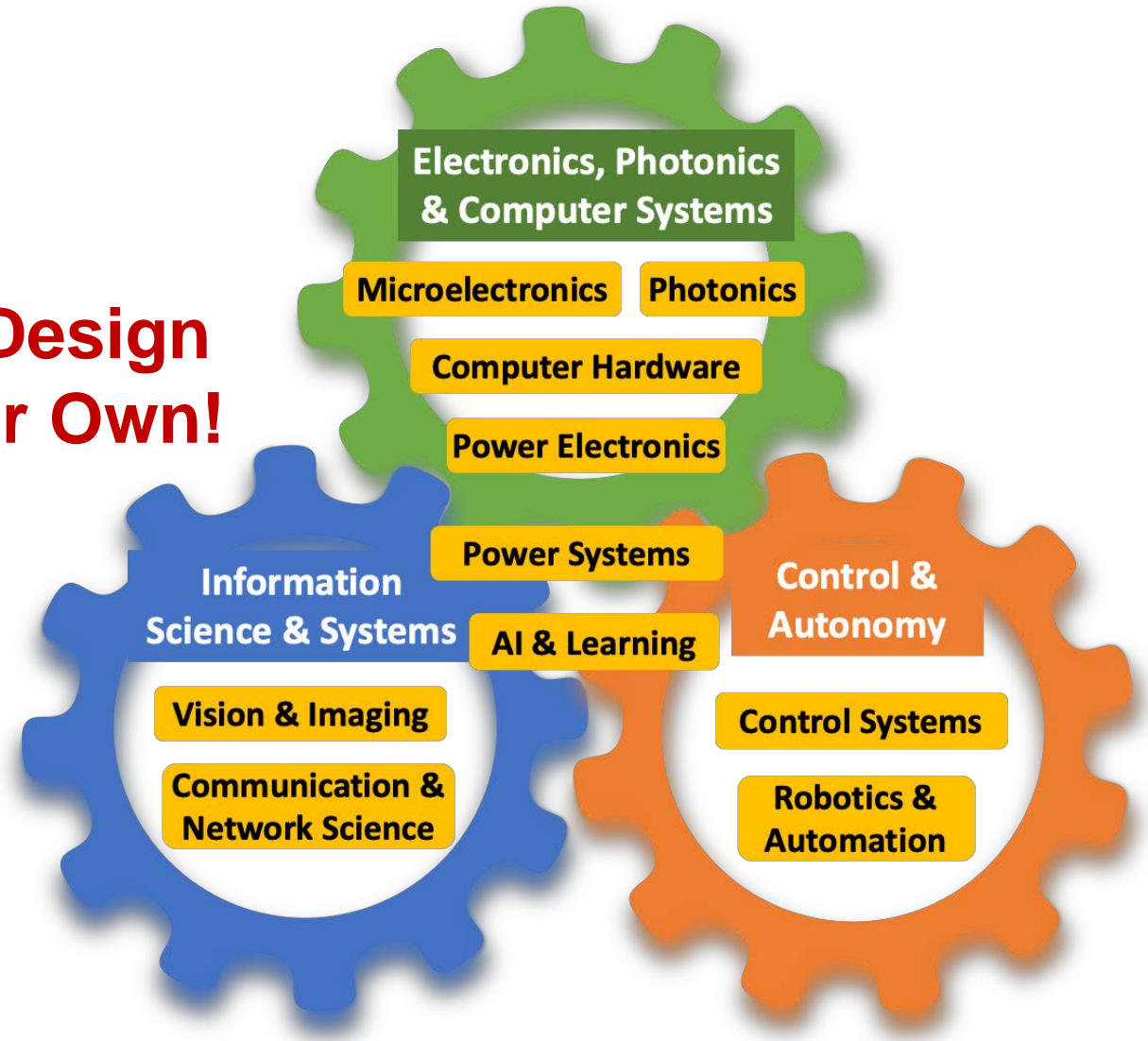


# ECSE Concentrations

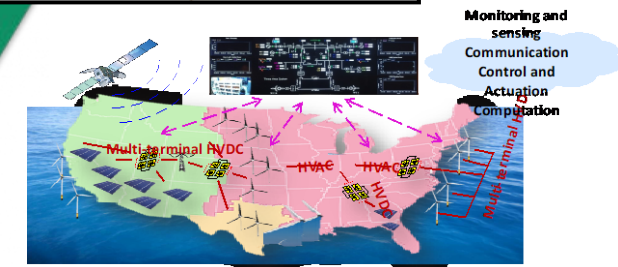
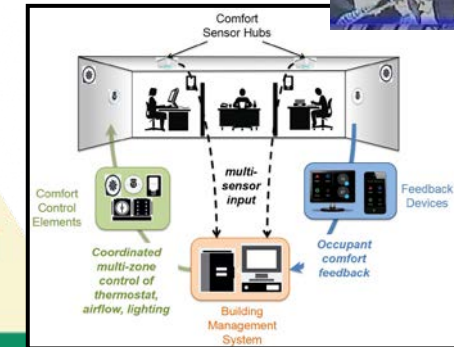
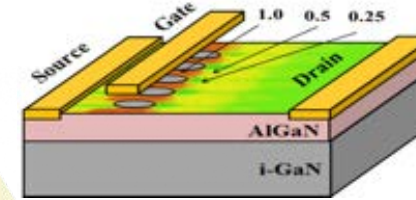
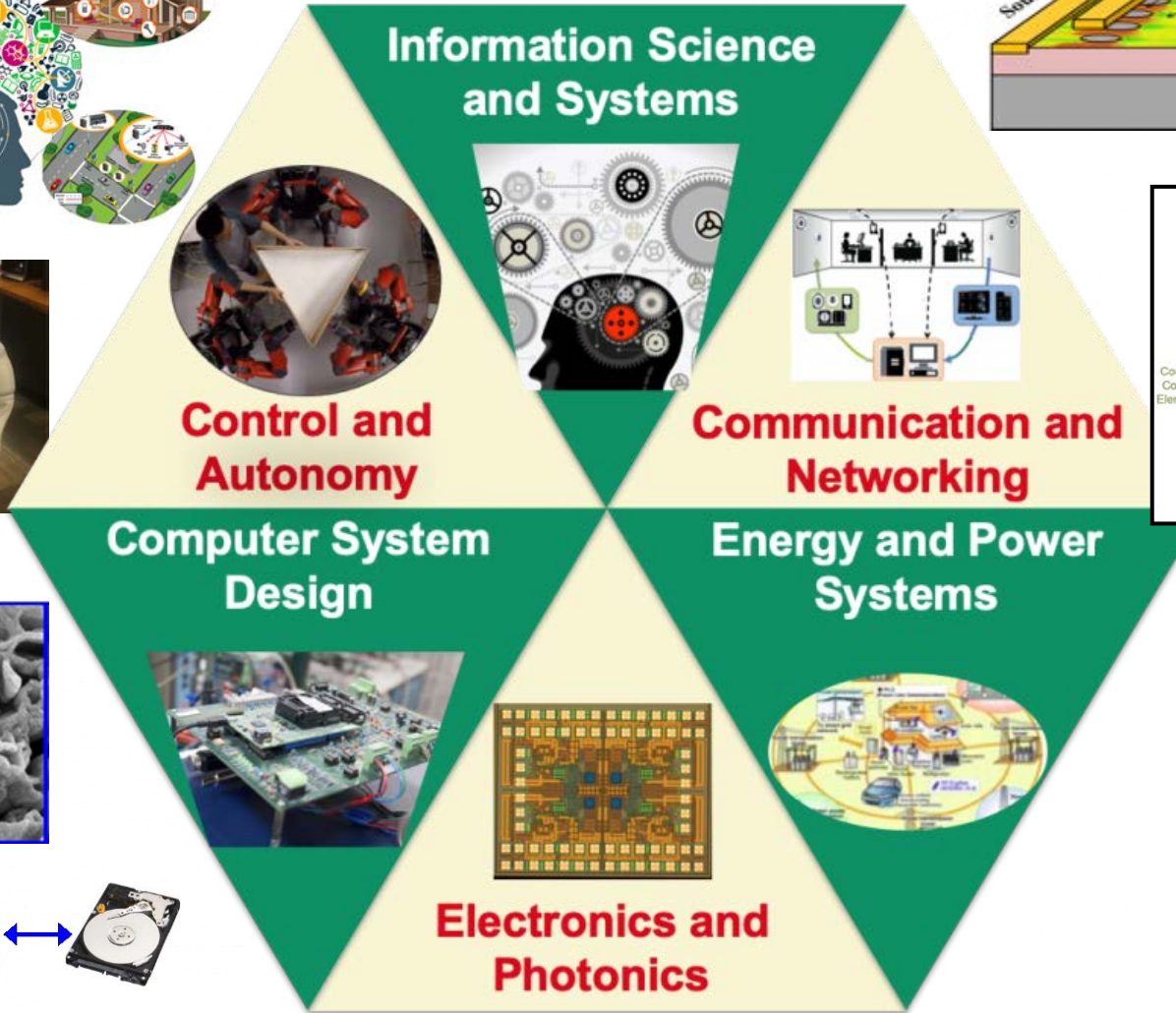
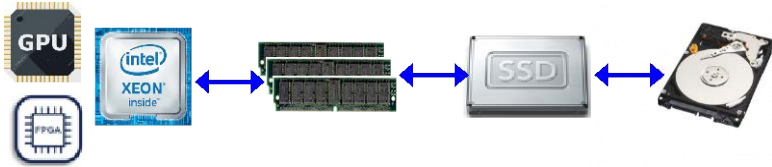
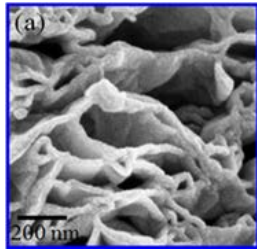
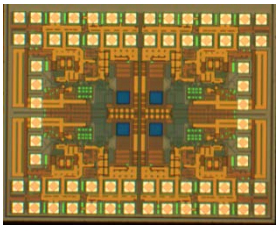
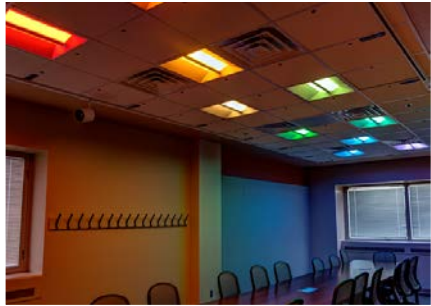
For Restricted, Technical and Lab/Comp. Engr. Electives:

- 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!**



# ECSE Research



## **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.

# Beyond the Classroom



## 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.



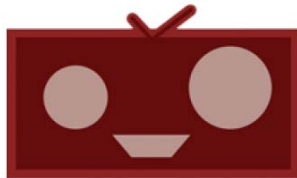
## IEEE

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.

# Resources

- ECSE Website: <https://ecse.rpi.edu/>
- Advising and Learning Assistance Center: <https://info.rpi.edu/advising-learning-assistance/>
- Center for Career and Professional Development: <https://info.rpi.edu/career-development>
- RPI Catalog: <http://catalog.rpi.edu/>
- Grand Challenges – National Academy of Engineering:  
<http://www.engineeringchallenges.org/cms/8996.aspx>
- Institute Directory & Links: <https://info.rpi.edu/>
- International Programs: <https://info.rpi.edu/international-programs>
- Registrar: <https://info.rpi.edu/registrar>
- SIS: <https://sis.rpi.edu>
- Tech Problems? Submit a Ticket: <https://itssc.rpi.edu/hc/en-us>

# Preparing for College – How to Utilize Summer Time!

## - Recommended Reading

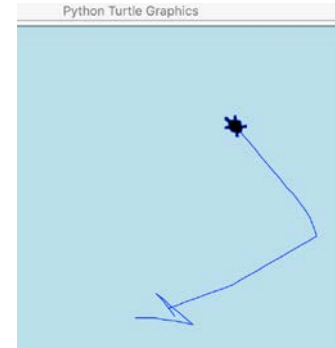
Ready Player One  
The Martian

Empires of Light: Edison, Tesla, Westinghouse, and the Race to Electrify the World  
The Man Who Changed Everything: The Life of James Clerk Maxwell  
The Perfectionists: How Precision Engineers Created the Modern World  
The Idea Factory: Bell Labs and the Great Age of American Innovation  
The Grid: The Fraying Wires Between Americans and Our Energy Future  
Policy, Regulation and Innovation in China's Electricity and Telecom Industries

## - Review/Beef-up Math and Physics

## - Learn Python programming (Python Turtle)

<https://realpython.com/beginners-guide-python-turtle/>



ROS.org  
Documentation

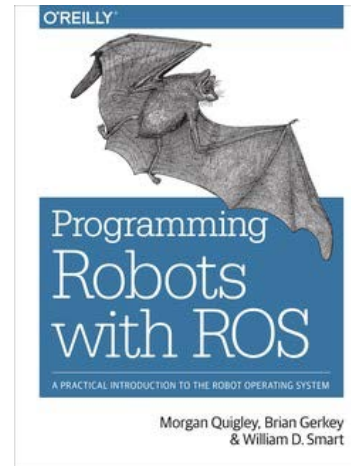
ROS/ Tutorials

ROS Tutorials

## - If you are interested in robotics ... learn ROS, use GitHub

- ROS Tutorial and GitHub <http://wiki.ros.org/ROS/Tutorials>
- ROS books (some may be accessible online)

<https://product.hubspot.com/blog/git-and-github-tutorial-for-beginners>



# Connect with ECSE



@EcseRpi



ECSE RPI Students Graduates and Friends



@ECSEDeptRPI



[ecse.rpi.edu](http://ecse.rpi.edu)

# Questions?

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- ❖ ECSE Department Head: Prof. John Wen
  - ❖ [wenj@rpi.edu](mailto:wenj@rpi.edu)
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  - ❖ [hamarr@rpi.edu](mailto:hamarr@rpi.edu)
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  - ❖ Prof. Michael Shur
  - ❖ Prof. Ali Tajer