



*Electrical &
Computer
Engineering*

EE 1322: Intro to Electrical & Computer Engineering

Module 1: Course Intro, Expectations, Syllabus, Grading, and More

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Course instructor: background & interests



- Name pronunciation and spelling: Ahmad Taha
- What should you call me? Whatever you want...titles are meaningless
- Born and raised in Beirut, Lebanon
- Finished my Ph.D. in ECE from Purdue University in August 2015
- Undergraduate education: American University of Beirut — Class of 2011
- Professor, ECE Department @ UTSA since 2015
- **My career objective:**
 - *Understand how infrastructure operate and utilize this knowledge to create tools & algorithms that would be leveraged to solve societal challenges*
 - Essentially, this should improve the quality of life!
 - WTH does that mean anyway, eh?
 - Hobbies: tennis, soccer aka football, politics, philosophy, arguing, cooking

What do professors do?



- What do professors do anyway? What do I do?
- In the US, two types of professors:
 - Lecturers: teaching-oriented faculty
 - Teach 3-5 courses a semester, focus only on teaching classes
 - Professors: research-oriented faculty
 - Teach 1-2 courses a semester
 - Has research labs in a research topic
- What does it mean to do research in ECE/Engineering or any field?
 - Many things actually:
 - Writing scientific papers
 - Designing experiments to test phenomena
 - Coming up with new math
 - New algorithms
 - Examples
 - Write grant proposals to get \$\$ to fund lab work
 - Service
- A tour of my webpage: <http://engineering.utsa.edu/ataha>

1. Why course modules and not lecture?
2. What is ECE?
3. Course objectives (the high-level ones) and description
4. Detailed outline

Part 1:

Why Course Modules—And Lecturing Style

Why course modules—and lecture style



- The course content is organized based on modules, not lectures
- One course module covers one topic
- One course module could be equivalent to 2 or 3 50-minute lectures, or as little as one 50-minute lecture
- Lumping lectures in modules makes it easier for students to learn and focus on topics

Part 2:

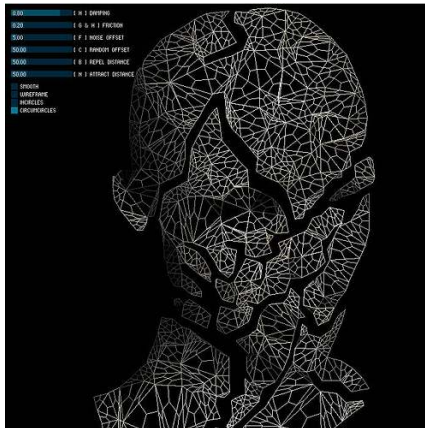
*What is Electrical and Computer Engineering?
What do ECE Grads Do?*

What is ECE?



- Study, development, creation, investigation of pretty much anything that runs on electricity
 - From your lazy dishwasher to the system delivering water to your apartment
 - From GPS on your phone to that ugly Snapchat filter your friend keeps on using
 - From the quark/atom to the supernova
 - From biomedical devices, sensors, engines, circuits, computer programs...
 - **ECE is literally everywhere**
 - ECE has evolved so much in the past 2-3 decades:
 - Traditional ECE was mainly electrical engineering (circuits and what not) + programming
 - The field now is so much broader
 - I am redesigning the course this year to keep up with changes in ECE
- A degree in ECE doesn't teach you everything (duh)
 - It equips you with good background, work ethic, and essential skills to dig deeper in many domains and applications
 - Education is all about learning...no one's gonna force you to learn

What do ECE grads do?



- Electrical Engineering
 - Robotics
 - Communication
 - Digital Signal Processing
 - Electronic Materials and Devices
 - Systems and Controls
 - Electric Power Engineering
 - Machine learning and AI
- Computer Engineering
 - Programming
 - Digital System Design
 - Computer Architecture
 - VLSI Design
 - Engineering Programming Languages
 - Embedded Systems

What do ECE grads do?



- Let us consider some common devices and services that you might encounter during the day and consider the contributions that electrical and computer engineers may have made to them.

You used the internet to look for a meme?



- Web browser software
- Search code optimization
- Data mining
- Internet technology
- Data center power management
- Data storage
- Cloud management
- <http://www.google.com/about/jobs/teams/>

You used electricity

- Electrical substation design
- Generation station design and operation
- Wireless communications
- Electrical interference mitigation
- Fault protection and system availability
- Coal delivery via railroad
- Green energy: wind and solar

You drove a car

- Hardware and embedded software for passenger electronics
- Hardware and embedded software for realtime control (anti-lock brake software, collision detection, engine controls,...)
- Data collection and telemetry (auto blackbox)
- Wireless communications (GPS, satellite,...)
- Advanced battery technology and electric motors
- And so much more



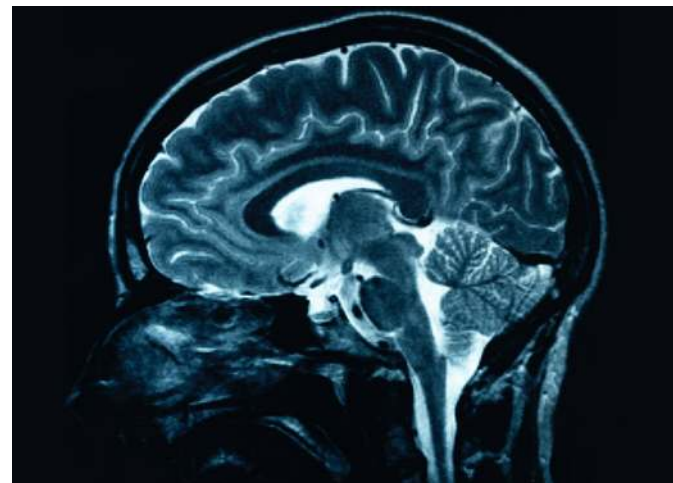
You checked the weather?

- Propulsion and navigation controls in launch vehicle
- Attitude control software in the satellite
- Failsafe/redundant hardware and software design
- Ground station tracking and control software
- Ground station control and data links
- Photovoltaic power design



You Got an x-ray?

- Ultrasound
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Positron Emission Tomography (PET)
- Online medical records storage and transmission



You made a phone call? Posted a picture on ig?

- Microwave communications links
- Fiber optic communications links
- Network switching, routing, and control hardware
- Network switching, routing, and control software/firmware
- Radio-frequency transmitters and receivers



You played a video game?

- Graphics rendering
- Handset hardware
- Virtual reality headset
- Image processing/recognition
- Game engine software



You used a smart watch?

- Sensor interface
- Signal amplification and filtering
- Signal processing and data extraction
- Wireless interface
- Display
- App software



Places UTSA ECEs are working at

- Intel
- Southwest Research
- Raytheon
- General Dynamics
- Microsoft
- Union Pacific
- Schlumberger
- Rackspace
- Dell
- Baker Hughes
- National Instruments
- Lockheed Martin
- Honeywell
- CPS
- Boeing
- Halliburton
- Qualcomm
- Honda
- Fluor
- STMicro-electronics
- Kinetic Concepts
- 3M
- L-3 Communications
- BAE Systems
- Acme Aerospace
- Ericsson
- Oracle
- Tektronix
- AT&T
- Rohde & Schwarz
- Florida Power & Light
- BNSF Railway
- Hewlett-Packard
- Corvalent
- PageSutherlandPage
- Samsung
- DirectTV
- Accenture
- Motorola Solutions
- OneSubSea
- Toyota
- Anheuser-Busch
- USAA
- ExxonMobil
- SRC
- iRobot
- PlusOne Robotics

What it takes to do well in ECE?



- No secret recipe (no really, no secret recipe...not like pancakes or fried chicken)
- But few things are important to do well in engineering in general, and ECE in specific:
 - The honest will to work hard and put in the effort
 - You can get away with being sloppy for a year or two, but that ain't lasting for so long
 - The ability to enjoy what you're doing...to learn and have a good time
 - Good appreciation and understanding of math
 - I am not accepting the argument "I'm not good at math."
 - No one's born bad at something; we're educated into *badness*
 - Decent programming skills
 - Communication skills
 - Being more than an engineering—caring about the world we inhabit
- And more important, finding an area of ECE you are interested in
- You can make a good, comfortable living + have so much fun
- You will often fail but who doesn't?

Part 3:

Course Syllabus and Description: Grading, Outline, Structure, Expectations

Course webpage & communication



- Course pages: UTSA Blackboard: <http://utsa.blackboard.com>
- Email is the best form of communication! ahmad.taha@utsa.edu
- This course:
 - Two 50-minute lectures/week.
 - One 50-minute recitation/lab session/week (**no lab/recitation for the first 3 weeks**)
- Office Hours:
 - Tuesdays & Thursdays, 9:00 – 10:30am
 - Or by appointment
 - **Via Zoom.** <https://utsa.zoom.us/j/97557156027>
- **Class is online. Videos will be uploaded regularly via Dropbox:**
<https://bit.ly/2Lz23wH>
- Lab sessions are also online. Will be uploaded to above Dropbox folder too:
<https://bit.ly/2Lz23wH>
- **No lab sessions for the first three weeks. I will keep you posted**

Teaching assistants (TA) info



- **Teaching assistant 1: Wasim Dipon**

- Email: wasim.dipon@my.utsa.edu.
- Office hours: Monday 4—6pm; Tuesday 3—5pm, Wednesday 2am—4pm.
- Zoom link: <https://utsa.zoom.us/j/95313160543>

- **Teaching assistant 2: Yuvaraj Munian**

- Email: yuvaraj.munian@my.utsa.edu
- Office hours: Wednesday 4pm—6pm; Thursday 3pm—5pm, Friday 2pm—4pm.
- Zoom link: <https://utsa.zoom.us/j/93922951677>

Course catalog description



An introduction to the electrical and computer engineering profession with emphasis on technical communication, team-based engineering design, professional and ethical responsibilities, contemporary issues, and software tools. One hour of recitation session per week. (Formerly EE 1323. Credit cannot be earned for both EE 1323 and EE 1322.)

Prerequisite: MAT 1073 Algebra for Scientists and Engineers

- No needed textbook. Lecture notes (powerpoints/pdfs will be given)
- Need to install some software:
- **Software tools:**
 - OrCAD/Cadence Demo Software. The department has a multi-user license for the Cadence software which can be run from departmental computers. If you wish to run PSpice software at home, you may download the OrCAD 16.6 or 17.2 Lite Software from Cadence at <http://orcad.com/buy/try-orcad-for-free>. (Caution: It is a large download.) Version 16.6 runs on 32-bit Windows systems and 17.2 runs on 64-bit Windows systems. Either version is OK.
 - Some on-line tutorials for LabVIEW can be found at <http://www.ni.com/academic/students/learn-labview/>.
 - A student version of National Instruments LabVIEW can be purchased at www.studica.com.
 - UTSA now has a university-wide software license for MATLAB that allows students to download a copy onto their laptop or home PC. Log in to ASAP and select the “Software Downloads” tab to find the instructions for getting a copy of MATLAB.
 - Scilab is a free open-source MATLAB-like computational program. It can be found at the link <http://www.scilab.org>. It can be useful after you have left UTSA and can no longer use their MATLAB license.
 - An excellent PSpice reference is the paperback text Analog Design and Simulation Using OrCAD Capture and PSpice, by Dennis Fitzpatrick, Newnes, ISBN 978-0-08-097095.

- Education and teaching are all about learning
- There's a reason why infants learn faster than us—they wanna learn
- There are people who want to learn and change...
- And people who do not want to do so
- I'll try my best, but you'll have to do the hard work
- Forget about the grades (y'all will do well I'm sure), focus on learning
- The course is easy, and meant to help you figure out if you like this major
- Challenge yourself, focus on learning, screw the grades
- I don't mind giving everyone an A

Grading policy and cutoffs



- We have to do this unfortunately
- Grade distribution:
 - Homework assignments (25%)
 - Lab assignments (25%)
 - Midterm exam (20%)
 - Final exam (30%)
- Grade cutoffs:
 - A-, A, A+: 85–100
 - B-, B, B+: 70–84
 - C-, C, C+: 55–69
 - D-, D, D+: 40–55
 - F: ≤ 49
- I am confident that y'all will do so well. I feel good about this class

Class policies



- Listening and watching the video lectures
- Active feedback loop
- Emailing me
- Homework and lab assignments
- Exams
- Late submission policy
- Changes to the syllabus

- UTSA wanted faculty to have a unified syllabus with so much text
- Please have a look at the syllabus
- There's a lot of generic stuff that relate to the fact that the class is online
- But you don't need to worry about this
- For the first three weeks, you only have to do the following:
 - a) Watch the video lectures (organized ***based on modules not actual 50-minute lectures***, remember that).
 - I will be telling you how many 50-minute lectures correspond to one module
 - b) Course survey is due in the first week. **Do it now please. Here's the link:**
<https://forms.gle/1NXSojFNwYt6xGaW7>
 - c) Reading material (given soon)
 - d) Homework 1 will be due in 2-3 weeks
 - e) Trying to install MATLAB, PSPICE, and other mentioned software
 - If you have issues installing these tools, the TA will help you

Part 4:

Detailed Course Outline

Course outline: modules (lecture notes)



- Module 1: Course Intro
- Module 2: ECE: Past, Present, and Future
- Module 3: Mathematical Basics
- Module 4: Programming Basics Via Matlab
- Module 5: Circuits Basics
- Module 6: Digital Systems Basics
- Module 7: Power and Energy Systems—And Climate Change
- Module 8: Automatic Control, Robotics, and Cyber-Physical Systems
- Module 9: Communications and Signals Processing
- Module 10: Machine learning and Artificial Intelligence
- Module 11: Computer Engineering and Digital Systems Design
- Module 12: Miscellaneous Topics—Presentation, Soft Skills, Ethics, Change
- *Module 13: Guest Lecturer: Engineering Ethics*
- *Module 14: Guest Lecturer: ACM*
- *Module 15: Guest Lecturer: IEEE*
- *Module 16: Guest Lecturer: Industry engineers*

So much intersection in all of these fields!

Note: The above sequence is not in chronological order. Guest lectures will be given within the above modules.

Course outline (8-9 homework assignments)



- Homework 1: Mathematical Basics (corresponds with Module 3)
- Homework 2: Programming Basics Via Matlab (corresponds with Module 4)
- Homework 3: Circuits Basics (corresponds with Module 5)
- Homework 4: Digital Systems Basics (corresponds with Module 6)
- Homework 5: Power and Energy Systems (corresponds with Module 7)
- Homework 6: Feedback Control Systems (corresponds with Module 8)
- Homework 7: Communications and Signals Processing (corresponds with Module 9)
- Homework 8: Machine learning and Artificial Intelligence (corresponds with Module 10)

These are somewhat tentative, depending on how things go—and whether we stay alive

Course outline (7-8 lab recitations + assignments)



- Lab Recitation 1: Programming Basics 1 in Matlab
 - Basic matrix/vector operations, for/while/cases/if statements, functions, operations, etc...
- Lab Recitation 2: Programming Basics 2 in Matlab
 - Data visualization, advanced functions, etc..
- Lab Recitation 3: Circuits and PSPICE 1
- Lab Recitation 4: Circuits and PSPICE 2
- Lab Recitation 5: Digital System Design Basics
- Lab Recitation 6: Power and Energy Systems
- Lab Recitation 6: Feedback Control Systems
- Lab Recitation 7: Communications + Signals Processing + Intro to LabView
- Lab Recitation 8: Machine learning and Artificial Intelligence

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