ECE-UY 1002: Intro to Electrical and Computer Engineering
NYU Tandon School of Engineering
Spring 2024

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1   Course Information

Instructors:	Matthew Campisi *mcampisi@nyu.edu* Ted Rappaport *tsr@nyu.edu*
Lecture Hours:	Once a week lectures (attend the lecture you are assigned): Matthew Campisi: Mon. 2 PM - 3:30 PM 2 Metro Rm. 911; Ted Rappaport: Wed. 2 PM - 3:30 PM 2 Metro Rm. 911
Office Hours:	Matthew Campisi: 370 Jay, Rm. 809, Mon. 1:00 - 2:00pm Ted Rappaport: 370 Jay, Rm. 907, Wed. 3:30 - 5pm
Teaching assistants:	Nathaniel Sehati *nys2021@nyu.edu* Krzysztof Chciuk *kc3977@nyu.edu*
TA office hours:	Tuesday/Thursday 11am - 12:30pm, LC023
Textbook and Materials:	Class notes and materials to be provided on Brightspace
Grading:	Weekly Homework and occasional fun quizzes: 75% Final Presentation: 25%

2   Course Description

This course introduces numerous subject areas in the Electrical and Computer Engineering (ECE) field, including AI/ML, power systems, electronics, computing, networking, security, communications, and signal processing. Each week we will explore a different topic and introduce the history and the core mathematics that enable engineers to model and design real-world products and invent new ones. Some lectures will include a graduate student guest speaker who will share their academic experiences to help you with the journey of becoming an engineer. Most classes will have a homework assignment relevant to the week's topic in order to exercise the mathematics used in all facets of electrical and computer engineering (HW will be due the following week at the beginning of class).

Notice: In this course, each voice in the classroom has something of value to contribute. Please take care to respect the different experiences, beliefs and values expressed by students and staff involved in this course. We support NYU's commitment to diversity and welcome individuals of all ages, backgrounds, citizenships, disabilities, sexes, education levels, ethnicities, family statuses, genders, gender identities, geographical locations, languages, military experiences, political views, races, religions, sexual orientations, socioeconomic statuses and work experiences.

3 Outline

- **Week 1 (Jan. 22 and Jan. 24, 2024):**
  The birth of Electrical and Computer Engineering: Origin, history, facets, branches, technical societies, ethics/professional licensing oath, class introductions – what we do as engineers, and why it is a good and noble profession.
  Guest Speaker: Nikola Janjusevic

- **Week 2 (Jan. 29 and Jan. 31, 2024):**
  Euler Magic, The power of dB, Descartes and Fourier: Why do engineers use imaginary numbers, logarithms (decibels), and multiple dimensions? These are perhaps the most important yet loneliest numbers: $e, j, \pi, 1$

- **Week 3: (Feb. 5 and Feb. 7, 2024):**
  Ohm's Law – the shocking reality of current, voltage and power
  Guest Speaker: NYU Entrepreneurial Institute

- **Week 4: (Feb. 12 and Feb. 14, 2024):**
  Robotics and how Mechanical Engineering foreshadowed electrical engineering using differential equations. Modeling an elevator as a big electrical circuit.

- **Week 5: (Feb. 19 and Feb. 21, 2024 – no class on Feb. 19, ECE scheduling on Feb. 21)**
  Feb. 21 - Meeting with ECE Departmental Advisors Beverlyn Blanco and Richard Toth to review the curricula of the CompE, ECE and EE majors, and to go over future registration procedures including Fall 2024. No class on Feb. 19

- **Week 6: (Feb. 26 and Feb. 28, 2024 – ECE Scheduling on Feb. 26, Guest lecture on Feb. 28)**
  Feb. 26 - Meeting with ECE Departmental Advisors Beverlyn Blanco and Richard Toth to review the curricula of the CompE, ECE and EE majors, and to go over future registration procedures including Fall 2024. Open discussion about ECE Feb. 28.

- **Week 7 (March 4 and March 6, 2024):**
  How the computer was invented and what matters now: Boolean logic, Von Neumann, and Turing.
  Guest Speaker: Ruth Gebremedhin

- **Week 8: (March 11 and March 13, 2024)**
  The transistor and integrated circuit- big things from small devices

  Guest Speaker: Dipankar Shakya (Ted Rappaport's student)

- **Week 9 (March 18 and March 20, 2024): No Class – Spring Break**

- **Week 10: (March 25 and March 27, 2024):**
  Artificial Intelligence, is it both or neither? (propagation equation, gradient descent, neural nets)
  Guest Speaker: Jacky Yuan

- **Week 11: (April 1 and April 3, 2024):**
  Wireless Communications, the convoluted journey of bits in the air (convolution in a linear system, Friis free space radio propagation equation, antennas)
  Guest Speaker: Gaurui Li

- **Week 12: (April 8 and April 10, 2024):**
  Sustainability, the Power Grid, EV, and climate change (power, 3-phased, global power consumption trends.
  Guest Speaker: Ashitosh Srinivasta

- **Week 13 (April 15 and April 17, 2024):**
  How email and the internet were created – probability of error, error control codes, and queuing theory, and a lesson in government funding

- **Week 14 (April 22 and April 24, 2024):**
  Cybersecurity: Safe or not safe?…That is the question.

- **Week 15 (April 29 and May 1, 2024):**
  Group Presentations

  Last day of class (May 6, 2024): ECE Wrap-up

4   Policies

- Please familiarize yourself with, and follow, the university policies on add/drop deadlines, missing classes for religious observance, accommodations for students with disabilities, and other special circumstances.

- More information on the final presentation will be provided in class.

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at <u>212-998-4980</u> or <u>mosescsd@nyu.edu</u>. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at <u>www.nyu.edu/csd</u>. The Moses Center is located at 726 Broadway on the 2nd floor.