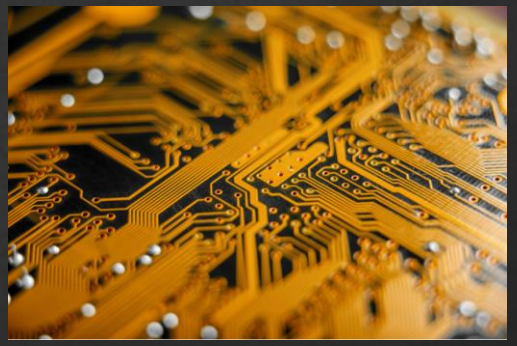
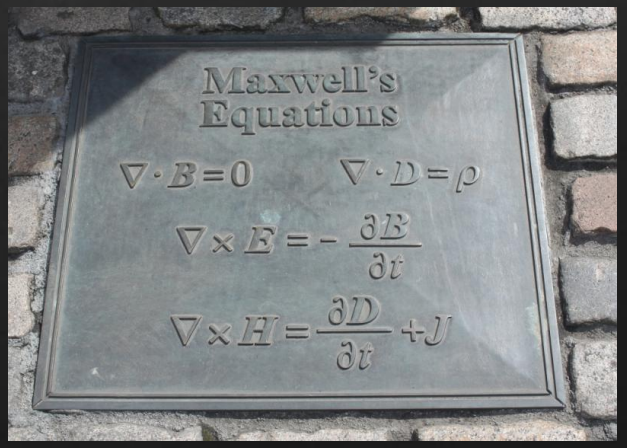
Electromagnetism

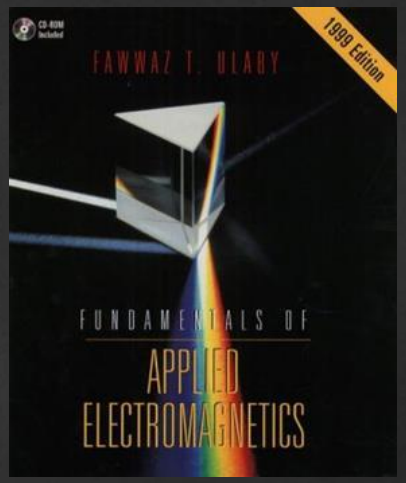
- Understanding optics in order to create useful devices



- This class will cover:
  - Transmission lines
  - Maxwell equations
  - Antennas



Spring 2020 Course info



Instructor: Boubacar Kanté, bkante@berkeley.edu

TA: Zhetao Jia, zhetao@berkeley.edu

Lecture: Online (Zoom), Tu.Th. 9:30am-11am [PST]

Office Hours:

Professor Kanté: Online, Th. 11am-12pm [email me in advance]

Discussion section:

Zhetao Jia: Online, Wed. 11am-12pm

Class Web Page:

https://piazza.com/berkeley/spring2021/ee117/info

Units: 4

Prerequisites: EECS 16B, MATH 53, and MATH 54; PHYSICS 7B or equivalent.

Grading Policy: 10% homework, 40% quizzes, 10% project, 40% final exam

Text: *Fundamentals of Applied Electromagnetics, F. T. Ulaby,* or 5th or 6th edition

Syllabus

- 1 final exam
- 2 quizzes
- 1 group project. Presentation and report
- Weekly homework due on Thursdays, 6pm

Date	Lectures	
01/19	#01	Introduction to electromagnetism
01/21	#02	Traveling waves, phasors, and TLs
01/26	#03	Lossless TLs, standing waves, and input Z
01/28	#04	Z matching and power flow
02/02	#05	Lossy TLs and intro to Smith chart
02/04	#06	Vector analysis review
02/09	#07	Currents, charges, and Maxwell's equations
02/11	#08	Electric potential and Gauss's law
02/16	#09	Electrostatic and Poisson equation
02/18	**Quiz 1**	**Quiz 1**
02/23	#10	Electric properties of materials
02/25	#11	Electric boundary conditions
03/02	#12	Image method
03/04	#13	Magnetic forces and torques
03/09	#14	Bio-Savart's law
03/11	#15	Ampere's law and vector mag. potential
03/16	#16	Mag. materials and boundary conditions
03/18	#17	Inductance and magnetic energy
03/30	#18	Faraday's law, time varying Maxwell's equations, and retarded potentials
04/01	#19	Wave equation and plane waves propagation
04/06	#20	Snell's law, reflection, and transmission
04/08	**Quiz 2**	**Quiz 2**
03/13	#21	Waveguides
04/15	#22	Polarization and Jones Matrix
04/20	#23	Short dipole and antenna characteristics
04/22	#24	Antenna arrays and beam steering
04/27	Projects	Projects presentation (online)
04/29	Projects	Projects presentation (online)
04/30	Projects	Projects report due
05/12	**Final**	**Final exam**

Exams and Homework

Basis for grade

- [20%] Quiz 1: February 18, 2021
- [20%] Quiz 2: April 08, 2021
- [40%] Final exam: May 12, 2021
- [10%] Weekly homework: Due on Thursdays, 6:00pm
- [10%] Project: Presentation on April 27 & 29. Report due on April 30, 2021

Textbook and reference book

Textbook:

F.T. Ulaby, *Fundamentals of Applied Electromagnetics*, Prentice Hall, Fifth Edition, 2006 or Sixth Edition, 2010.

References:

1. M. N. O. Sadiku, *Elements of Electromagnetics*, Oxford University Press, 2001
2. H. H. Skilling, *Fundamentals of Electric Waves*, Wiley, 1948
3. R. Ramo, J.R. Whinnery and T. Van Duzer, *Fields and Waves in Communication Electronics*, Third Edition, Wiley, 1994
4. S. Schwarz, *Electromagnetics for Engineers*, Saunders 1990
5. J.A. Stratton, *Electromagnetic Theory*, Wiley, 2007

Homework

- Problem sets (10% of final grade). Due every week on Thursdays due by 6pm PST [late homework will not be accepted for fairness].

- Collaboration on problem sets is encouraged. However, **you must write your own solutions and understand them**.

- Write down only relevant equations.

- BOX your final answers.

- Simplify your results as much as possible.

Quizzes

- Two quizzes in “virtual” class (40% of final grade).

- One cheat sheet, no collaboration, no computers (low-tech calculators allowed). This is difficult to control online. Tests will be designed accordingly.

Quiz 1: February 18
Quiz 2: April. 08

Final project

- Groups of 3-4 students (will depend on class size).
- Chosen or assigned topic and do theory, simulations or "experiments".
- Give a short (~20min) presentation online.

Code of conduct

- We are here to learn
  - be respectful
  - remember everyone is smart here but has a different background. All questions are welcome!
  - get engaged!

- No cheating
  - but work together
  - help each other on homework

- Give constructive feedback

Warnings

- The class mostly follows the indicated textbook, but you are invited to consult other important references. There are many.
- The class assumes very limited electromagnetic knowledge but will not be easy.
- Some homework are long.
- I am here for your success!