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EE 5337

Computational Electromagnetics (CEM)

Lecture #0

Rules and Procedures

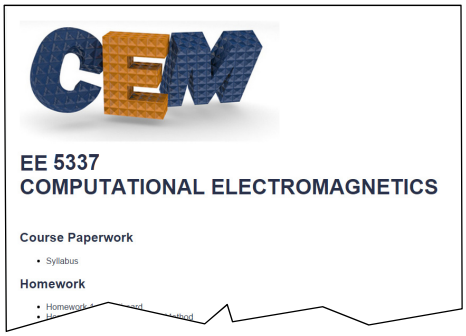
Outline

- The Textbook
- Grading
- Homework
- Exams
- MATLAB Codes
- Final Project

The Textbook

There is no official textbook for the class because no such textbook exists.

The "textbook" is therefore the course website.



http://emlab.utep.edu/ee5390cem.htm

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Grading

Homework 40%	90% – 100% → **A**
Midterm Exam #1 ..... 15%	80% – 89% → **B**
Midterm Exam #2 ..... 15%	70% – 79% → **C**
Final Project 20%	60% – 69% → **D**
Participation 10%	0% – 59% → **F**

HOMEWORK IS 40%
OF YOUR FINAL GRADE!!!!!!!

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Homework Rules

- Assigned on a weekly basis.
- Homework is very cumulative. It is not an option to miss a homework.
- Late Homework
  - -10% every day late.
  - Grade of zero after three days.
  - I need to distribute solutions as soon as possible.
- Homework is 40% of your final grade. The homework **IS** this class.
- Do your own work. Do not copy from other students.

Homework Format

- Must have a cover page.
  - Name, course information, assignment #, date, etc.
- Put problems in the proper order.
- Be neat and well organized.
- Providing computer codes is optional.
- ***ALL CODES MUST GO INTO AN APPENDIX!***
- Construct homework as if you will need to relearn the material 10 years from now and have only your notes and homework.
- Stapled at upper-left corner with no additional binding.

Exams

- All exams are take-home.
- Exams follow the exact same format and rules as the homework.
- Cannot provide help on an exam.

Extra Credit?

No additional assignments will be given in this class for extra credit.

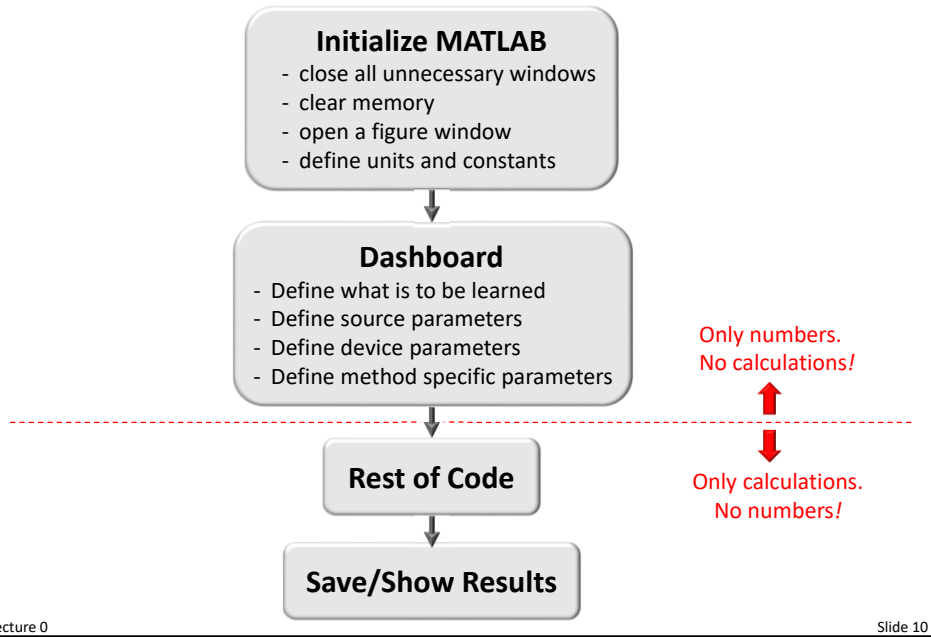
Extra credit is given in the following circumstances:

- You catch a mistake in the course materials.
- Your assignments go above and beyond what is asked.

Rules For Your MATLAB Codes

- You must use MATLAB for all homework and exams.
- Programs must follow the block diagrams in the class exactly.
- Codes must be neat, well organized, and well commented.
- Unless otherwise instructed, code must be a single program and NOT broken into separate functions.
- Try to use the same variable names as the notes and the instructor.
- Need help? If you are stuck and your codes follow ALL of the above rules, e-mail me your MATLAB code.
  - `rcrumpf@utep.edu`
  - Cannot provide help on exams.

Structure of the Ideal Code



The Final Project

- Purpose – to learn, practice, and share a topic outside of what was taught in class.
- Project should be summarized in Power Point.
  - Must be complete enough that another student from the class can reproduce your work if needed.
- Final Project = Final Exam
- Projects presented during the final exam period.
- May work alone or in teams, but teams must do proportionally more work.
- Must submit all electronic files to course instructor.
- No late projects will be accepted.
- Get started early*!!*

Project Ideas

- Study a new device
  - Photonic crystals
  - Bragg gratings
  - Guided-mode resonance filters
  - Negative index metamaterials
  - Find band extreme away from key points of symmetry
  - Solve Shrödinger's equation
  - Angle of reflection not equal to angle of incidence
- Implement a new method
  - Method of moments
  - Solve another differential equation (i.e. heat equation, etc.)
  - Finite element method
  - Waveguide analysis
  - Beam propagation method
  - Method of lines
  - Fourier-Space FDFD
  - Compare various methods on same device
  - Hybridize RCWA and MOL
- Add a feature to a method
  - FDFD for oblique coordinate system
  - Fix Gibb's phenomenon
  - Dielectric smoothing
  - Fast Fourier factorization
  - Incorporate model into optimization
  - Smart parameter sweep
  - Iterative solver (w/ fast seeded sweep)
  - Nonuniform or unstructured grid
  - Different language (Python, C, Fortran, etc.)
  - R/H/ETM matrices
  - SC-PML
  - Iterative FDFD
  - Parallelize a method
  - Optimize PML parameters
  - Higher-order accurate derivatives
  - Other boundary conditions
  - Analog layers in semi-analytical methods
  - Handle fully anisotropic materials
  - Calculate isofrequency contours
  - More efficient `convmat()`
  - Efficient `convmat()` for non-orthorhombic symmetries
  - Model a two-period device