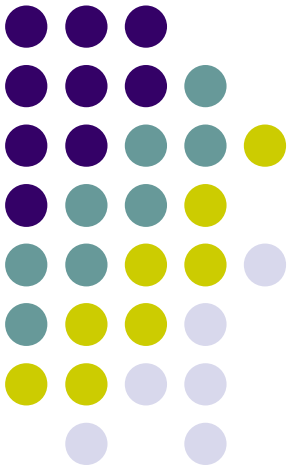
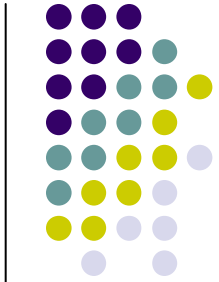
EE 140

Electromagnetic Fields & Waves



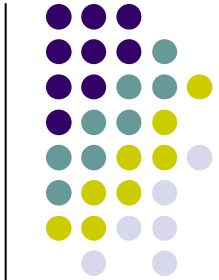
Dr. Ray Kwok

General information



- **Instructor:** Dr. Ray Kwok
- **Lectures:** MW 9:00 – 10:15 Am (Engr 345)
- **Office Hours:** MW 8:30 – 9:00 am, Fri 9:30 – 10:30 am
  or by appt. (email)
- **Office:** Eng 363 / Sci 310 (924-5252)
- **Email:** raymond.kwok@sjsu.edu
- **Website:** www.engr.sjsu.edu/rkwok
  (green sheet and everything else)

Course Description



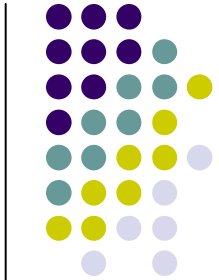
- Continuation of Phys 51….
  Static fields and vector notations
  Maxwell Equations

- Time-varying effect on Electromagnetic Fields
  (change our world!! – motor, generator, telephony…)

- Wave propagation in media & waveguide
  (high frequency applications, telecommunications)

  - Fundamental to all wireless and microwave communication & engineering (e.g. EE172)
  - Even digital designers need working knowledge of RF and microwave – signal integrity.

“Textbook”



- *Electromagnetics for Engineers,*
  Fawwaz T. Ulaby (Prentice Hall)

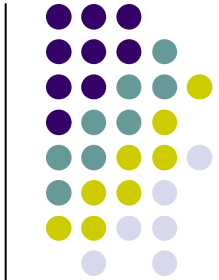
- References:
  - (Similar Level)
  - *Fundamentals of Engineering Electromagnetics*, David K. Cheng (Addison-Wesley)
  - *Introduction to Electrodynamics,* David J. Griffiths (Prentice Hall)
  - *Introduction to Electromagnetic Fields & Waves*, Lorrain & Carson (Freeman)

  - (Elementary Level)
  - *University Physics*, Young & Freedman (Addison -Wesley)
  - *Lectures on Physics*, R. Feynman (Addison-Wesley)

  - (Advance Mathematics)
  - *Calculus & Analytic Geometry*, Thomas & Finney (Addison-Wesley)
  - *Advanced Calculus for Applications*, F.B. Hildebrand (Prentice Hall)
  - *Mathematical Methods for Physicists*, G. Arfken (Academic Press)

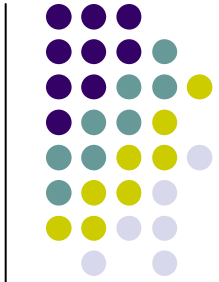
  - Google, YouTube, Khan Academy

Tentative Topics



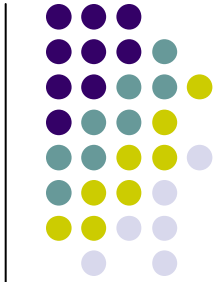
- Static electromagnetic fields
- Magnetic Induction
- Maxwell's Equations
- Electromagnetic Waves
- Propagation in Media
- Wave Reflection and Transmission
- Transmission Lines
- Impedance Matching

What's expected of you?



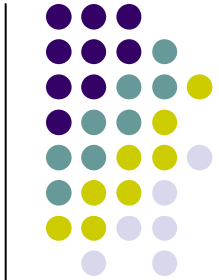
- Come to class
- Schedule at least 8 hours / week to study
- Do your homework
- Learn from your mistakes.
- Active participation in class
- Read your notes after each lecture
- Report any typos. YOU are responsible for correct information.
- Be able to do algebra, calculus, and trigonometry quickly and correctly. Review your calculus and differential equations (if needed)

Homework



- ~Weekly (posted on website)
- Work in groups.
- Check solution online. Understand them.
- 10% of total grade.

Grades



- Homework/Classwork 10%
- 2 mid-term 25%
- Final 40%
- letter grade:

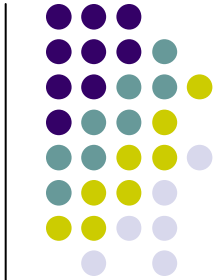
  80 – 100% = “A”

  65 – 80% = “B”

  50 – 65% = “C”

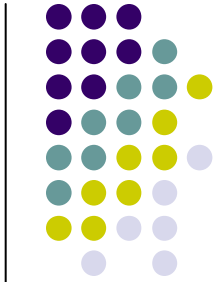
  35 – 50% = “D”
- No curve

Calendar



- 2/3 Last day to drop
- 3/18 Mid-term 1
- 3/23 - 27 Spring break
- 3/31 Cesar Chavez Day
- 4/23 Last day to withdraw
- 4/27 Mid-term 2
- 5/13 Last day of instruction
- 5/15 Tue Final Exam 7:15 - 9:30 am

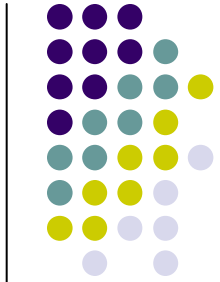
Others



- Missed lecture

  (Introduce yourself to 2+ people & get their emails!!!)
- No late homework
- Missed exam (0)
- No cheating (photo ID, no electronics other than calculators, no restroom break)
- Slow me down, ask questions

Q & A



- **Email:** Raymond.Kwok@sjsu.edu
- **Website:** www.engr.sjsu.edu/rkwok
  (green sheet and everything else)
- **Online discussion:** **www.**piazza.com/sjsu/fall2014/EE140

Exercise - 1

$$\vec{A} = \hat{x} - 4\hat{z}$$

$$\vec{B} = 2\hat{x} + \hat{y} + \hat{z}$$

Find:

(a) $\vec{A} + \vec{B}$

(b) $\vec{B} - 2\vec{A}$

(c) $\vec{A} \cdot \vec{B}$

(d) $\vec{A} \times \vec{B}$

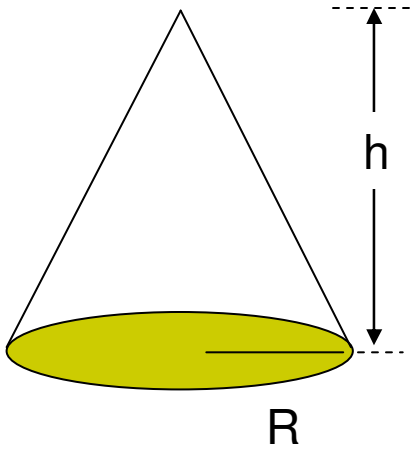
(e) $\vec{A} \times \vec{A}$

(f) $\vec{B} \cdot \vec{B}$

(g) Angle between A and B

(h) Find a vector that is perpendicular to A and B ?

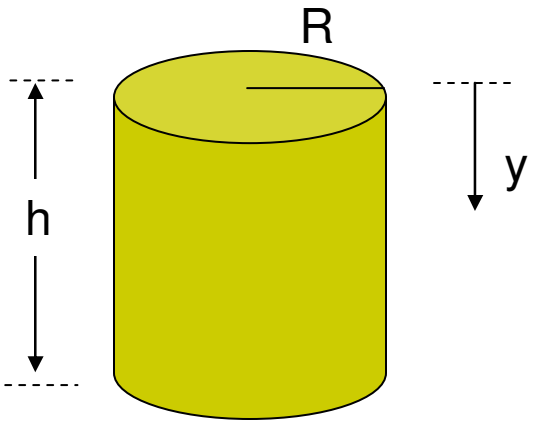
Exercise - 2



A regular symmetrical cone with circular base of radius R has a volume of $(1/3)\pi R^2 h$.

Derive this formula using elementary calculus.

Exercise - 3



A cylinder with radius R and
a non-uniform mass density $\rho(y) = 4 + 3y$.
(All quantities are in SI units).

If R = 1 m & h = 5 m,
what is the total mass of the cylinder?