GPH 530 **Electromagnetic Methods in Geophysics**

Wednesdays, 10:00 – 12:00, Geophysics Dept. classroom

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Course Webpage: http://www.knat.bravehost.com/mysite/EM_methods.htm

The course is designed as a course on electromagnetism (EM) and its application methods in geophysics. Theory of electromagnetism originates from electrostatics and magnetostatics. Electromagnetic induction, Maxwell equations and electromagnetic waves are necessary topics for understanding the EM methods that are used in geophysics. Field procedures for geophysical prospection techniques like Time-domain EM, magnetotellurics, VLF will be introduced.

Course Description:

1. History and Perspective
2. Electrostatics
   1. Coulomb's Law
   2. Electric Fields
   3. Gauss's law
   4. Dirac Delta Function
   5. Electrical Potential
   6. Poisson Equation
3. Magnetostatics
   1. Biot – Savart's Law
   2. Ampere's Law
4. Electromagnetic Induction
   1. EMF
   2. Faraday's Law
   3. Lenz's Law
   4. Eddy Currents
5. Time varying fields, Maxwell's Equations
   1. Maxwell Equation in different Media
   2. Displacement currents

3. Derivation of Wave Equations
4. TE and TM modes

6. Applications of EM methods
    1. Time domain electromagnetic prospecting methods
    2. Very Low Frequency (VLF) methods
    3. Magnetotelluric methods

Text books:

Electromagnetic methods in applied geophysics, SEG (Vol. 1, 2, 3)

Classical Electrodynamics – J.D. Jackson

Problem Solvers Electromagnetics

Electromagnetism – Pollack and Stump

Homeworks:

Matlab applications

Take home exams on theoretical problems