Center for Talent DEVELOPMENT®
School of Education & Social Policy

NORTHWESTERN UNIVERSITY

COURSE SYLLABUS

SUMMER PROGRAM 2011

617 Dartmouth Place · Evanston, IL 60208 · 847/491-8257
Summer Office: June 13 – August 11, 2011 · 847/467-2990

Equinox Program

Course Title: Advanced Placement Physics C

Course Description

This advanced course provides students with a detailed study of both classical mechanics and classical electromagnetism. It is designed for students who are interested in majoring in a technical science in college. Students will solve college-level calculus-based physics problems and be prepared for the Advanced Placement Physics C exam.

Essential Questions

- How are quantities of motion, forces, and energy all related? What can we learn by studying their role in mechanics?
- What are the most important relationships between electricity and magnetism? How do Maxwell's Equations describe our knowledge of electromagnetism?
- What is the role of calculus in understanding both mechanics and electricity & magnetism in physics?

Outcomes

Upon successful completion of this course, students will:

- Know basic definitions of physical quantities and the relationships between them
- Understand the basic principles of the following major topics:
    - Kinematics
    - Newton's laws of motion
    - Work, energy, power
    - Systems of particles, linear momentum
    - Circular motion and rotation
    - Oscillations and Gravitation
    - Electrostatics
    - Conductors, Capacitors, Dielectrics
    - Electric Circuits
    - Magnetic fields
    - Electromagnetism
- Apply knowledge of the above topics to various physical situations
- Analyze complex situations involving multiple concepts

Instructional Strategies

Instruction will be differentiated in several forms. Students with advanced math abilities will be challenged with more complex problems, and students with advanced conceptual abilities will be challenged with additional critical thinking tasks. Tiered assignments and flexible grouping will also be utilized. Students will work in groups that will allow them to challenge their own skills as well as contribute to the knowledge level of the class as a whole.

Resources and Materials

- **Books**
  a. Young & Freedman, University Physics, 11e, 978-0805386844.
- **Web sites**
  a. Activ Physics, http://wps.aw.com/aw_young_physics_11/, Source of many useful online lab exercises
  b. Phet, http://phet.colorado.edu/, Interactive physics simulations.
- **Other Media**
  a. Lab Manual – to be provided
- **Materials**
  a. Lab book with quad spaced graph paper (for notes and formal labs)
  b. Graphing calculator (TI-83 or similar)
  c. College rule loose leaf paper (for daily HW assignments)

Student Assessment

- **Pre-Assessment**
  The pre-assessment for this course will be 30 multiple choice problems, similar in difficulty to those found on AP tests.

- **CTD Grading Scale**

A+	100-97%	A	96-93%	A-	92-90%
B+	89-87%	B	86-83%	B-	82-80%
C+	79-77%	C	76-73%	C-	72-70%
D+	69-67%	D	66-63%	D-	62-60%
F	below 60%				

- **Breakdown of Final Grade**
  Daily Homework Assignments: 30% - See the HW Assignments attachment for more detail
  Formal Lab Reports: 10% - We will have an average of 1 formal lab report each week, with several informal labs throughout the course (the informal labs will be graded as Daily HW)
  Daily Quizzes: 40% - Each day there will be a short (20 min) quiz on the previous day's concepts. These quizzes will consist almost entirely of 'retired' AP problems.
  Final Exam: 20% - The final will be similar in structure to the AP Exam, although not as long

- **Post-Assessment**
  The Final Exam will contain problems similar to the AP Physics C exam. These problems will be both multiple choice and free response.

Schedule

(Note – More time is devoted to Ch. 21 thru 29 than 1 thru 13, because E&M is more abstract than Mechanics, but course pacing will be adjusted appropriately to class. It is also expected that in order to stay up to date on material, that students proactively read the following day's chapters. For example, students should read Ch. 1 & 2 prior to Monday's class. But HW Set 1 is due on Tuesday)

Date	Topics	In-class Activities	Assignments/Assessments
Monday	Course Intro; Pre-Assessment; Units, Physical Quantities, and Vectors; Motion Along a Straight Line	Discussion of Ch. 1 & 2; Practice problems/disc Q's; Activ Physics 1.1-1.3	Read Ch. 1 & 2 **prior** to class; HW Set 1 (see attachment)
Tuesday	Motion in Two or Three Dimensions; Newton's Laws of Motion	Discussion of Ch. 3 & 4; Practice problems/disc Q's; Activ Physics 1.12; Projectile Motion Mini-lab	Read Ch. 3 & 4 prior to class; HW Set 2

Date	Topics	In-class Activities	Assignments/Assessments
Wednesday	Applying Newton's Laws; Work & Kinetic Energy	Discussion of Ch. 5 & 6; Practice problems/disc Q's; Work: KE Mini-lab	Read Ch. 5 & 6 prior to class; HW Set 3
Thursday	Potential Energy & Energy Conservation; Momentum, Impulse, & Collisions	Discussion of Ch. 7 & 8; Practice problems/disc Q's; Activ Physics 7.6; Conservation of Energy Mini-lab; Conservation of Momentum Mini-lab	Read Ch. 7 & 8 prior to class; HW Set 4
Friday	Rotation of Rigid Bodies; Dynamics of Rotational Motion	Discussion of Ch. 9 & 10; Practice problems/disc Q's; Activ Physics 4.2, 6.3; Torque and Angular Momentum Mini-lab	Read Ch. 9 & 10 prior to class; **Skim** Ch. 11 prior to class; HW Set 5
Monday	Gravitation; Periodic Motion	Discussion of Ch. 12 & 13; Practice problems/disc Q's; Interactive Physics: Gravity Explorations	Read Ch. 12 & 13 prior to class; HW Set 6
Tuesday	Electric Charge and Electric Field	Discussion of Ch. 21; Practice problems/disc Q's; Activ Physics 11.1, 11.2; Coulomb's Law & Electric Fields Mini-lab	Read Ch. 21 prior to class; HW Set 7
Wednesday	Gauss' Law	Discussion of Ch. 22; Practice problems/disc Q's; Activ Physics 11.7	Read Ch. 22 prior to class; HW Set 8
Thursday	Electric Potential	Discussion of Ch. 23; Practice problems/disc Q's; Equipotential Surfaces Mini-Lab	Read Ch. 23 prior to class; HW Set 9
Friday	Capacitance & Dielectrics	Discussion of Ch. 24; Practice problems/disc Q's;	Read Ch. 24 prior to class; HW Set 10
Monday	Current, Resistance, & EMF; DC Circuits	Discussion of Ch. 25 & 26; Practice problems/disc Q's; RC Circuits Mini-lab; Activ Physics 12.8	Read Ch. 25 & 26 prior to class; HW Set 11
Tuesday	Magnetic Fields & Forces	Discussion of Ch. 27; Practice problems/disc Q's; Activ Physics 13.1-13.3	Read Ch. 27 prior to class; HW Set 12
Wednesday	Sources of Magnetic Field	Discussion of Ch. 28; Practice problems/disc Q's; Activ Physics 13.7	Read Ch. 28 prior to class; HW Set 13
Thursday	Electromagnetic Induction	Discussion of Ch. 29; Practice problems/disc Q's; Activ Physics 13.8	Read Ch. 29 prior to class HW Set 14
Friday	Final Exam & Course Wrap-Up	Final Exam!	Study for the final!

CTD Statement on Third-Party Web Sites

Instructors are required to thoroughly review any third-party web sites they intend to use in their courses for inappropriate content. However, because web content continuously changes, CTD disclaims any responsibility for any of the content contained on third-party web sites used in course materials. If you become aware of anything that may be inappropriate, please notify CTD staff immediately.

AP Physics C Assignment List

All numbers refer to problems except prefaced by "Discussion Question"

*= *EXTRA CREDIT*

Mechanics:

SET 1: Ch. 1 #7, 35, 41, 49, 65, 86, 97;

Ch. 2 #3, 9, 13, 19, 21, 25, 31, 39, 44, 61, 67, 76

SET 2: Ch. 3 #1, 5, 9, 19, 23, 29, 31, 37, 41, 54, 60, 63, 89*

Ch. 4 #3, 5, 7, 15, 17, 19, 33, 39, 45, 49, 55

SET 3: Ch. 5 #3, 8, 11, 13, 19, 23, 31, 35, 39, 43, 46, 49, 62, 73, 89, 115, 127*

Ch. 6 #1, 7, 17, 23, 29, 30, 31, 37, 43, 67, 81, 83

SET 4: Ch. 7 Discussion Questions 1, 8, #1, 5, 9, 13, 17, 24, 33, 37, 42, 43, 46, 63, 65, 74

Ch. 8 Discussion Questions 12, 14, # 1, 4, 7, 9, 13, 17, 23, 27, 34, 35, 39, 45, 59, 64, 70, 93, 99

SET 5: Ch. 9 #1, 5, 11, 13, 21, 23, 31, 37, 41, 45, 65, 85, 86

Ch. 10 Discussion Questions 1, 2, 7, #1, 3, 13, 19, 26, 27, 35, 38, 39, 42, 43, 67, 83, 91

SET 6: Ch. 12 Discussion Questions 7, 15, #5, 6, 13, 15, 23, 27, 29, 45, 46, 50, 61

Ch. 13 Discussion Questions 3, 6, #1, 4, 5, 9, 12, 13, 41, 45, 59, 63

Electricity & Magnetism:

SET 7: Ch. 21 Discussion Questions 15, 17, #1, 7, 11, 19, 25, 29, 31, 45, 71, 75, 94*

SET 8: Ch. 22 Discussion Question 1, #3, 4, 7, 15, 19, 36, 37, 45

SET 9: Ch. 23 #1, 3, 7, 13, 21, 22, 31, 51, 70, 81

SET 10: Ch. 24 #1, 14, 15, 19, 27, 59, 71, 72

SET 11: Ch. 25 #1, 9, 32, 37, 39, 43; Ch. 26 #1, 8, 9, 39, 54

SET 12: Ch. 27 Discussion Questions 1, 6, #1, 3, 11, 15, 20, 30, 31, 35, 59

SET 13: Ch. 28 #5, 11, 17, 31, 32, 35, 54, 61, 62

SET 14: Ch. 29 #6, 9, 16, 18, 20, 25, 27, 54, 61