Lecture: TTh 9:30 a.m. to 10:45 p.m., Room 109 Lewis Hall
Instructor: Dr. Ostrovskii, Igor
Office: Room 207 Lewis Hall, Tel: 915-1536; Email: iostrov@phy.olemiss.edu

➢ Office Hours: MWTh 3:00 – 4:00 p.m. (207 Lewis Hall)


➢ Course requirements and course content:

We consider the Physical Principles of both classical and modern physics, formulated as mathematical problems in differential and integral calculus. This course is intended for those who have taken PHYS 213, 214. Prerequisites: MATH 262 and PHYS 212 or modern physics.

➢ The goals: 1) To give main results in the special relativity, quantum mechanics, and atomic and molecular spectroscopy. 2) To show a connection between quantum mechanics and some contemporary tasks in physics. 3) To improve the critical thinking skills of the graduate students.

➢ Grading scale and evaluation:
- Grading Scale: A’s --- 90 – 100%; B’s --- 80 – 89%; C’s ---70 – 79%; Etc.
- Grades will be based on homework, tests, and the final examination:
  Homework ----------- 20%
  Three tests --------- 45% (#1=15%, #2=15%, #3=15%)
  Final exam --------- 35%

- Homework:
  Problems will be assigned after some sections are covered. In solving homework problems, teamwork is possible, but solutions must be handled in independently. Your answers will be graded (counting 20 % for the final grade).
  ➢ Circle the finale answers that you want to be graded.

❖ Tests and Final examination schedule:
  Test 1, Chapters 2, 3, 7, 8 --------------- Thursday, September 16
  Test 2, Chapters 13, 22, 23, 24 --------------- Thursday, October 14
  Test 3, Chs. 31, 32, 33, Fourier Transforms -------- Thursday, Nov. 18

➢ Final examination --------- Thursday, December 6, 2004, 8 a.m.
COURSE SYLLABUS

1. MOTION ALONG A STRAIGHT LINE (Ch. 2) [2 classes]
   • Motion, position, displacement, velocity, acceleration.
   • Graphical integration in motion analysis.

2. VECTORS (Ch. 3) [1 class]
   • Vectors, scalars, unit vector, vector algebra.

3. KINETIC ENERGY AND WORK (Ch. 7) [2 classes]
   • Kinetic energy, Work, work done by different forces.

4. POTENTIAL ENERGY AND CONSERVATION OF ENERGY (Ch. 8) & APPLICATIONS [2 classes]
   • Work and potential energy (PE), path independence of conservative force, conservation of mechanical energy.

   ➢ TEST #1 (class 8), Chapters 2, 3, 7, 8 ➔ Thursday, September 16

5. GRAVITATION (Ch. 13) [2 classes]
   • Newton’s law of gravitation, gravitational field and principle of superposition, gravitational PE, gravitation near and inside Earth, Planets and satellites: Kepler’s Laws.

6. ELECTRIC FIELDS (Ch. 22) [1.5 classes]
   • Electric field lines, electric field due to different systems of electric charges.

7. GAUSS’ LAW (Ch. 23) [1.5 classes]
   • Flux of an Electric field, Gauss’ Law and Coulomb’s Law, Applications.

8. ELECTRIC POTENTIAL (Ch. 24) & APPLICATIONS [2 classes]
   • Electric potential, electric PE, potential due to different systems of electric charges.

   ➢ TEST #2 (class 16), Chapters 13, 22, 23, 24 ➔ Thursday, October 14

9. ELECTROMAGNETIC OSCILLATIONS (Ch. 31) [2 classes]
   • LC Oscillations, Alternating current, Transformers.

10. MAXWELL’S EQUATIONS (Ch. 32) [2 classes]
    • Gauss’ Law for Magnetic field, Displacement current, Maxwell’s Equations.

11. ELECTROMAGNETIC WAVES (Ch.33)&APPLICATIONS: FOURIER TRANSFORMS [5 classes]
    • The traveling electromagnetic wave, energy transport & Pointing vector, radiation pressure, polarization, reflection, refraction.
    • Applications in Physics and Signal Processing: Fourier Transforms.

   ➢ TEST #3 (class 26), Chs. 31, 32, 33, Fourier Transforms ➔ Thursday, November 18

12. RELATIVITY (Ch. 37) [1 class]
    • Postulates, Lorentz transformation and consequences.

13. REVIEW (Last class # 28) [1 class]

   FINAL EXAMINATION: ➔ Thursday, December 6, 2004, 8 a.m.

* - The dates are tentative, and may be changed (but not Final exam!).