HUNTER COLLEGE OF CUNY
Department of Physics
Physics 121

Fall 2019

General Physics: Introduction to Electricity & Magnetism, Light, and Atomic Physics

Lecturer: Professor Godfrey Gumbs
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Text: The course will follow Halliday, Resnick, and Walker, *Fundamentals of Physics* Volume 2, Tenth Edition, John Wiley)

College rule Re. academic dishonesty: Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The college is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.
Lectures: 121 LC - Monday and Wednesday 10:10 AM -12:00 PM

Recitations: 121RC - Wednesday: 9:10 AM - 10:00 AM

First Mid-Term Exam: Wednesday, October 2 in 1311HN

Second Mid-Term Exam: Wednesday, November 20 in 1311HN

End-Term Exam (*Cumulative*): Time and date to be announced. However, note that the week of finals is December 14 through December 20.

NOTE:

- First day of classes: Wednesday August 28, 2019.
- No classes: Monday September 02: College closed.
- Thursday September 05: Classes follow a Monday schedule.
- Monday September 30: No classes scheduled.
- Wednesday October 09: No classes scheduled.

- No classes: Monday October 14: College closed.
- Wednesday October 16: Classes follow a Monday schedule.
- Last class: Wednesday December 11.
- There will be **NO** make-up exams.

Tentative Outline

1. Electricity: Chapters 21-25.
2. Magnetism: Chapters 26-30.
3. Geometrical Optics: Chapters 31-33.
4. Special Relativity: Chapter 39 (Maybe).

There will be a total of **twenty-eight** lectures. thirteen chapters will be covered.

Grades Computed as Follows

First Midterm:	25%
Second Midterm:	25%
Final Exam:	35%
Laboratory:	15%
TOTAL	100%

NOTE: In weekly recitations, lecture materials will be reviewed and assigned problems will be solved.

Some Useful Results/Formulas

$F_{\text{elec}} = \frac{1}{4\pi\varepsilon}\frac{q_1 q_2}{r^2}$; $\frac{1}{4\pi\varepsilon} = 8.99 \times 10^9 \text{N} \cdot m^2/C^2$; $\mathbf{E} = \mathbf{F}/q$; $c = 2.9979 \times 10^8 m/s$;
$\Phi = \oint \mathbf{E} \cdot d\mathbf{A}$ (flux through a Gaussian surface); $\varepsilon\Phi = q$ (Gauss' law); $\mathbf{E} = -\nabla V$;
$q = CV$; $U = \frac{q^2}{2C} = \frac{1}{2}CV^2$; $i = \int \mathbf{J} \cdot d\mathbf{A}$; $\mathbf{J} = (ne)\mathbf{v}_d$; $R = V/i$; $\mathbf{E} = \rho\mathbf{J}$;
$\sigma = \frac{1}{\rho} = ne^2\tau/m$ (Drude's formula); $P = i^2 R = \frac{V^2}{R}$ (resistive dissipation);
$R_{\text{eq}} = \sum_{n=1}^{N} R_n$ (N resistors in series); $R_{\text{eq}} = \sum_{n=1}^{N} \frac{1}{R_n}$ (N resistors in parallel);
$\omega = 2\pi\nu$ (ν = frequency, ω = angular frequency); $d\mathbf{B} = \left(\frac{\mu_0}{4\pi}\right) \frac{i\ d\mathbf{s} \times \mathbf{r}}{r^3}$ (Biot-Savart law);
$\oint \mathbf{B} \cdot d\mathbf{s} = \mu_0 i$ (Ampere's law); $\oint \mathbf{E} \cdot d\mathbf{s} = -\frac{d\Phi_B}{dt}$ (Faraday's law);
$L = \frac{N\Phi}{i}$ (inductance defined);
$\mathcal{E} = -L\frac{di}{dt}$ (self-induced emf); $u_B = \frac{B^2}{2\mu_0}$ (magnetic energy density);
$\oint \mathbf{B} \cdot d\mathbf{s} = \mu_0\varepsilon_0\frac{d\Phi_E}{dt} + \mu_0 i$ (Ampere-Maxwell law);
$\mathbf{S} = \frac{1}{\mu_0}\mathbf{E} \times \mathbf{B}$ (Poynting vector);
$n_1 \sin\theta_1 = n_2 \sin\theta_2$ (law of refraction);
$\frac{1}{o} + \frac{1}{i} = \frac{1}{f} = (n-1)\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$ (thin lenses);
$\frac{1}{o} + \frac{1}{i} = \frac{1}{f} = \frac{2}{r}$ (spherical mirror)
$\frac{n_1}{o} + \frac{n_2}{i} = \frac{n_2 - n_1}{r}$ (single surface);
$m = -i/o$ (lateral magnification);
$d \sin\theta = m\lambda$ (multiple-slit diffraction);
$2d \sin\theta = m\lambda$ (Bragg's law).