PHYS 112

Science/Physics

5

COURSE NAME/NUMBER

FACULTY/DEPARTMENT

UFV CREDITS

Electricity and Magnetism

COURSE DESSCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course follows PHYS 111 and is designed for students who are planning to continue their studies in physics or any of the other sciences. Topics include electric fields, Gauss’s law, electric potential, circuits, Kirchhoff’s laws, magnetic fields, magnetic induction, and finally, a study of Maxwell’s equations. The laboratory portion of the course uses experiments to reinforce the theory covered in class.

PREREQUISITES: MATH 111 and one of (PHYS 111, PHYS 105 with a B, or PHYS 101 with a B+).

COREQUISITES: pre or corequisites:

MATH 112

SYNONYMOUS COURSE(S):

(a) Replaces:

(b) Cross-listed with:

(c) Cannot take: for further credit.

TOTAL HOURS PER TERM: 120

TRAINING DAY-BASED INSTRUCTION:

STRUCTURE OF HOURS:

Length of course:

Lectures: 75 Hrs

Seminar: Hrs

Laboratory: 45 Hrs

Field experience: Hrs

Student directed learning: Hrs

Other (specify): Hrs

OTHER:

Maximum enrolment: 36

Expected frequency of course offerings: annually

(please, every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only) ☐ Yes ☐ No

WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department) ☐ Yes ☐ No

TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: ☑ Yes ☐ No

Course designer(s): Tim Cooper

Department Head: Norm Taylor

Supporting area consultation

Curriculum Committee chair: Norm Taylor

Dean/Associate VP: Ora Steyn

Undergraduate Education Committee (UEC) approval

Date approved: April 2011

Date of meeting: April 5, 2011

Date approved: December 16, 2011

Date approved: January 13, 2012

Date of meeting: February 3, 2012
LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to, among other things:

- demonstrate their understanding of the fundamental laws of electricity and magnetism, and learn how to apply the theory to solve related problems in introductory electromagnetism.
- use and investigate fundamental electromagnetism and introductory analog electronics using modern apparatus, and interpret the data obtained.
- demonstrate an understanding for the order of magnitude of physical quantities in real electromagnetic and electronics experiments.
- continue to develop their “error consciousness”, i.e. assigning numerical values for different types of uncertainties in data, and use these numbers to calculate the uncertainties in values in electronics and electromagnetism experiments.
- use calculus in their solutions, up to and including using Maxwell’s equations in integral form.
- understand the meaning of a Gaussian surface, Amperian and Faraday’s loops and be able to use them to solve for the electric and magnetic field in symmetric charge/current distributions.
- understand the connection between flux and field for both electric and magnetic fields.
- use calculus and Kirchhoff’s Rules to solve for quantities in simple R, RC, RL and LC circuits.
- explain the connection between flux and field for both electric and magnetic fields.

METHODS: (Guest lecturers, presentations, online instruction, field trips, etc.)

This course will be presented using lectures and laboratory experiments. Films or other audio-visual aids may be used where appropriate. Problems will be assigned on a regular basis which are to be handed in and marked. Problems that require the use of calculus will be emphasized. Close coordination will be maintained between laboratory and classroom work. Computer-assisted learning programs will be used to increase the understanding of the concepts being studied.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

- Examination(s)
- Portfolio assessment
- Interview(s)
- Other (specify): Evidence of skill equivalent to the lab part of the course

TEXTBOOKS, REFERENCES, MATERIALS: [Textbook selection varies by instructor. Examples for this course might be:]


References:

SUPPLIES / MATERIALS:

STUDENT EVALUATION: [An example of student evaluation for this course might be:]

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm</td>
<td>20%</td>
</tr>
<tr>
<td>Laboratory work</td>
<td>15%</td>
</tr>
<tr>
<td>Final exam</td>
<td>45%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>10%</td>
</tr>
</tbody>
</table>

COURSE CONTENT: [Course content varies by instructor. An example of course content might be:]

1. Coulomb’s Law, electric field, potential, capacitance, Gauss’ Law
2. electric current, electromotive force, Ohm’s Law, Joule’s Law, Kirchhoff’s Laws, RC time constant
3. magnetic field, currents, force on a moving charge
4. sources of magnetic field, Bio Savart Law, Ampere’s Law, and production of B fields
5. magnetic induction, induction, induced emf, Faraday’s Law, Lenz’s Law, mutual inductance, energy in a magnetic field
6. Maxwell’s Equations, E and B waves, energy in E/m waves
7. introduction to time varying electric and magnetic fields and behaviour of AC circuits