

## PHY 407 – Electricity and Magnetism II Syllabus

### Credit

3 semester hours (3 hours lecture per week)

### Prerequisites

Prerequisite of PHY 406

### Course Description

Fundamental principles of electrodynamics. Topics include Faraday's law, Maxwell's Equations, plane electromagnetic waves, transmission lines, waveguides, and antennas.

### Rationale for Course

Physics is the study of the physical phenomena that we observe in our universe. It is broad ranging and essential to all the sciences. The goal of this course is to further explore the fundamental concepts of physics, focusing on the areas of electrodynamics, and electromagnetic waves. Students will develop problem solving skills, learning how to logically approach and evaluate a variety of physical situations.

### Learning Objectives

After successful completion of this course, students will be able to

- Determine the induced electromotive forces and currents in stationary circuits experiencing a time-varying magnetic flux
- State Maxwell's equations and convert the differential forms to integral forms and vice-versa
- Use Maxwell's Equations to derive a decoupled set of wave equations for electric and magnetic fields in the absence of sources and then modify these equations to describe waves propagating in lossy media
- Describe the behavior of plane electromagnetic waves in media and their behavior at the boundary between two media
- Determine the distributed parameters of TEM waves propagating along parallel plate, two-wire and coaxial transmission lines
- Explain the general characteristics of waves propagating along uniform guiding structures and determine the cutoff frequencies and attenuation constants for TE and TM modes along various waveguides
- Describe the radiation fields and characteristic properties of electric dipoles, current loops, and finite-length thin linear antennas as well as basic properties of simple antenna arrays

### Course Outline

- Time-Varying Fields and Maxwell's Equations
- Plane Electromagnetic Waves
- Transmission Lines
- Waveguides and Cavity Resonators
- Antennas and Radiating Systems

### Academic Integrity

Mississippi College students are expected to be scrupulously honest. Dishonesty, such as cheating or plagiarism, or furnishing false information, including forgery, alteration or misuse of University documents, records or identification, will be regarded as a serious offense subject to severe penalty, including, but not limited to, loss of credit and possible dismissal. See the *Mississippi College Student Handbook* or University

Policy 2.19 for specific information regarding penalties associated with dishonest behavior at Mississippi College. Copies of the *Mississippi College Student Handbook* are available in the Office of the Vice President for Enrollment Management and Student Affairs, Nelson 313. Copies of University policies are available on the Mississippi College web site.

### **Attendance Policy**

Class attendance/participation is an essential part of university education, and students are expected to attend/participate regularly and punctually in all classes and laboratories. The responsibility for any work missed as the result of an absence rests entirely with the student. Cumulative absences/nonparticipation may result in a lowered grade or loss of credit for the course. Tardiness is also subject to penalty, as is any failure to complete required class work on time. A student will receive a grade of F immediately upon accumulating the following number of absences, whether excused or unexcused:

- 12 in semester classes meeting three times per week
- 8 in semester classes meeting two times per week

If a student misses more than the number of class periods specified in university policy and believes that there are reasonable explanations for the absences, he/she may appeal the absences to the Dean of the School of Science and Mathematics.

### **Method of Instruction**

Classes will consist primarily of presenting fundamental topics related to the subject, working example problems, and discussing in-class demonstrations. Key points will be highlighted by the choice of examples, and these points will be discussed in the context of the example.

### **Makeup Tests**

Makeup tests will be given only under the following circumstances:

- Consent of the instructor has been obtained prior to the test.
- An excused absence is obtained from a doctor or the Vice-President for Academic Affairs

### **Dropping the Course**

Refer to the Mississippi College Academic Calendar for the final drop date for the course. Drops after this date will only be permitted for extreme circumstances and will require approval from the course instructor, department chair, Dean of the School of Science and Mathematics, and the Vice-President for Academic Affairs.

### **Instructional Materials**

The required text for the course is Introduction to Electrodynamics, 4<sup>th</sup> Edition by David J. Griffiths. A scientific or graphing calculator is also required, and students must bring it to every lecture and testing period.

### **Methods of Evaluation**

Grading for this course will follow a standard 10-point grading scale:

<u>Letter Grade</u>	<u>Final Numerical Average</u>
A	90–100
B	80–89
C	70–79
D	60–69
F	0–59

The numerical average will be determined as follows: 65% from periodic tests, 15% from homework and other class assignments, and 20% from the final exam. The final exam in this course is comprehensive.

### **Early Alert System**

Mississippi College has adopted the practice of finding students early in the semester who may be exhibiting behaviors that could ultimately have a negative impact on their academic progress. These behaviors are often called “red flag” behaviors and include, but are not limited to, excessive absences, poor test grades, and lack of class participation or evidence of non-engagement. Identifying these behaviors early gives the instructor the opportunity to raise the “red flag” on behalf of a particular student so that the student can take the appropriate action to redirect his/her progress. The system alerts the student, the student’s advisor, and the Office of Student Success.

These messages are intended to help a student recognize an area of concern and to encourage him/her to make some choices to improve the situation. When a student receives an Early Alert message, the student should quickly make an appointment to talk with his/her professor about the situation. Also, students can make full use of the Office of Student Success to set academic goals and connect to campus resources.

### **Students with Disabilities**

In order for a student to receive disability accommodations under Section 504 of the Americans with Disabilities Act, he or she must schedule an individual meeting with the Director of Student Counseling Services immediately upon recognition of their disability (if their disability is known they must come in before the semester begins or make an appointment immediately upon receipt of their syllabi for the new semester). The student must bring with them written documentation from a medical physician and/or licensed clinician that verifies their disability. If the student has received prior accommodations, they must bring written documentation of those accommodations (example Individualized Education Plan from the school system). Documentation must be current (within 3 years).

The student must meet with SCS face-to face and also attend two (2) additional follow up meetings (one mid semester before or after midterm examinations and the last one at the end of the semester). Please note that the student may also schedule additional meetings as needed for support through SCS as they work with their professor throughout the semester. Note: Students must come in each semester to complete their Individualized Accommodation Plan (example: MC student completes fall semester IAP plan and even if student is a continuing student for the spring semester they must come in again to complete their spring semester IAP plan).

Student Counseling Services is located on the 4<sup>th</sup> floor of Alumni Hall) or they may be contacted via email at [mbryant@mc.edu](mailto:mbryant@mc.edu) . You may also reach them by phone at 601-925-7790. Dr. Morgan Bryant is director of MC Student Counseling Services.