![Image of a form from Purdue University](image-url)

**Department:** Physics  
**Effective Session:** Spring 2009

**Instructions:** Please check the items below which describe the purpose of this request.

- [X] New course with supporting documents
- [ ] Add existing course offered at another campus
- [ ] Expiration of a course
- [ ] Change in course number
- [ ] Change in course title
- [ ] Change in course credit type
- [ ] Change in course attributes (department head signature only)
- [ ] Change in instructional hours
- [ ] Change in course description
- [ ] Change in course requisites
- [ ] Change in semesters offered (department head signature only)
- [ ] Transfer from one department to another

**Proposed:**

- **Subject Abbreviation:** PHYS
- **Course Number:** 311
- **Long Title:** Intermediate Electricity and Magnetism
- **Short Title:** E&M

**Existing:**

- **Subject Abbreviation:**
- **Course Number:**

**Terms Offered:**

- **Check All That Apply:**
  - [ ] Summer
  - [ ] Fall
  - [X] Spring

**Campus(es) Involved:**

- [ ] Calumet
- [ ] Cont Ed
- [X] Ft. Wayne
- [ ] Tech Statewide
- [ ] W. Lafayette
- [ ] Indianapolis

**Credit Type:**

<table>
<thead>
<tr>
<th>1. Fixed Credit: Cr. Hrs.</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Variable Credit Range:</td>
<td></td>
</tr>
<tr>
<td>Minimum Cr. Hrs. (Check One)</td>
<td>To</td>
</tr>
<tr>
<td>Maximum Cr. Hrs.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Course Attributes:** Check All That Apply

- [ ] Pass/Not Pass Only
- [ ] Satisfactory/ Unsatisfactory Only
- [ ] Repeatable
- [ ] Maximum Repeatable Credit: |
- [ ] Credit by Examination
- [ ] Special Fees

**Schedule Type:**

- **Credit Offered:**
- **% of Credit Allocated:**

**Course Description:**

Vector calculus, electrostatics and magnetostatics, Maxwell's equations, introduction to electromagnetic waves, transmission lines, and radiation from antennas. P: PHYS251, MA363

**Cross-Listed Courses:**

- **Course:** ECE 311
- **Title:** Electric and Magnetic Fields

**Dates and Signatures:**

- Calumet Department Head: [Signature] 10/03/08
- Calumet School Dean: [Signature] 1/27/09
- Fort Wayne Department Head: [Signature] 1/27/09
- Fort Wayne School Dean: [Signature] 1/27/09
- Indianapolis Department Head: [Signature] 1/27/09
- Indianapolis School Dean: [Signature] 1/27/09
- North Central Department Head: [Signature] 1/27/09
- North Central Chancellor: [Signature] 1/27/09
- West Lafayette Department Head: [Signature] 1/27/09
- West Lafayette College/School Dean: [Signature] 1/27/09
- West Lafayette Registrar: [Signature] 1/27/09

**Office of the Registrar**
PHYS 311 - Electric and Magnetic Fields
Tentative Syllabus  
Mark Masters, Ph.D.
Office KT 127
Office phone (260)481-6153
Email: masters@ipfw.edu
Class meeting time M, W 16:30-17:45

Official Office Hours: M: 09:00-11:00, W: 10:00-11:00
I maintain an open door policy, but I reserve the right to close my door when I am busy.
I also accept appointments. If you make an appointment with me, please be there.

Course Description: Continued study of vector calculus, electrostatics, and magnetostatics.
Maxwell’s equations. Introduction to electromagnetic waves, transmission lines, and radiation from antennas

Course Topics:
• Vectors
• Electrostatics
• Magnetostatics
• Maxwell’s equations
• Electromagnetic Waves
• Transmission lines
• Antennas

Course policies: This class will be taught using a method which may be unfamiliar to you. The class will be run as more of a discussion and tutorials with perhaps mini-lectures about certain topics. In order for you to truly understand something, you must work with the ideas involved; you must wrestle with the ideas. There will probably be frustration.
There will be questions and YOU, as a class, must attempt to determine the answers by thinking about what you already know, what you have observed and what you will learn. If you are wrong -- does it matter? NO -- except on tests. Typically, I will NOT give you direct answers to your questions. You will need to talk with your partners and you must DISCUSS and PARTICIPATE in class constructively. It is YOUR class and you must make it work. It is apparent to me that students who actively participate and think about the processes perform better in class overall. To assist in discussions I will give you “tutorials” which lead you in the appropriate direction.

What is participation? Participation means that you apply what you have know and learned to situations presented to you in class. You think about questions at hand. You don’t sit there numbly thinking about what you will do after class, what you had for lunch, etc. You then contribute to the discussion positively, bringing your viewpoint and understanding to everyone’s attention. If a classmate states something that you disagree with or do not understand, question them politely and explain what you think is wrong with what they are saying. Participation is NOT simply asking some random question of
ME. Participation is not simply waiting to be called on to answer some question—generally with an “I don’t know.”

I use this approach because I believe that if I tell you an answer you will not understand the reasoning behind that answer. It is ultimately a fact. However, if you have to work out the reasoning, you are more likely to understand the thinking behind the fact, the process of determining ideas and reasoning. This will serve you well beyond this class, but it is something YOU must learn.

Homework: There will be homework assignments. I expect them to be completed on time, thoughtfully, clearly and concisely. I expect your best effort. You should realize that the traditional expectation of homework load is two or three hours of homework for every hour of class. That means that for this class you are expected to spend between six and nine hours on your homework. Schedule it as such. DO NOT leave your homework to just before class; you will ultimately fail if you persist in this approach. When doing homework, you need to remember that the homework is for YOU! You will gain nothing if you copy your homework from a classmate. There is no problem with working with others, but working together requires all parties to do the work: If you attempt to divvy the assignments up or only copy from others you will fail. Come to see me or contact me about questions as soon as possible. My level of sympathy for someone with questions diminishes the closer it is to the due date. Furthermore, if you make an appointment to see me, then you had better show up on time.

How to take notes for this class:
This is perhaps a difficult issue. Because I want you to construct the knowledge rather than have me quote it and you regurgitate it back to me your notes must have a different form than writing everything I put on the board down. What most students are reluctant to do is to write down their thoughts, then write down the corrections to their thoughts. These are perhaps the best way to have the notes. Try to pay attention and note what your classmates are saying. What is your response to their comments? These are the important notes.

To summarize, to succeed in this class you will have to:
- Actively and constructively participate
- Complete the homework assignments on a timely basis, thoughtfully and thoroughly. This means starting them when they are assigned and not procrastinating. DO NOT start doing the homework five minutes before it is due. This is important. The homework will require thought and you grade will depend upon your thoughts and efforts on the homework.
- Think

Grading:
- Class participation 5%
- Homework assignments 25%
- Projects/labs 10%
- 3 Exams 60%
Exam Dates: February 14, March 27, May 6 - 1PM (final)

Attendance: I expect full attendance. Much of the course material in this class is learned through class participation and to my knowledge you are not able to participate if you are not here. It negatively impacts YOU if you miss class because you were too lazy to get out of bed or needed to complete an assignment for another class. You are ALWAYS responsible for EVERYTHING that occurs in class. DO NOT expect ME or your CLASSMATES to make up for unexcused absences. Absence is not an excuse. You are expected to participate and class participation will be taken into account in all grade decisions at the end of the semester. Late homework will not be accepted.

Course Outcomes
A student who successfully fulfills the course requirements will have demonstrated:

1. an ability to perform vector algebra and calculus. (a, e)
2. an understanding of the static electric field and Coulomb’s law, Gauss’ law, and potential field, and capacitors. (a, e)
3. an understanding of the steady magnetic fields and Biot-Savart law, Ampere’s law, and inductors. (a, e)
4. an understanding of Maxwell’s Equations, Faraday’s law and displacement current. (a, e)
5. an understanding of the nature of lossless uniform plane wave propagation. (a, e)
6. an understanding of transmission line and its related engineering problems. (a, c, e)

Disabilities Statement: If you have a disability and need assistance, special arrangements can be made to accommodate most needs. Contact the Director of Services for Students with Disabilities (Walb Union, Room 113, telephone number 481-6658) as soon as possible to work out the details. Once the Director has provided you with a letter attesting to your needs for modification, bring the letter to me. For more information, please visit the web site for SSD at http://www.ipfw.edu/ssd/
<table>
<thead>
<tr>
<th>Week</th>
<th>Days</th>
<th>Activities</th>
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<tbody>
<tr>
<td>1/12</td>
<td>M</td>
<td>Introduction, pre-test</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>Ch 1: EM introductory</td>
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<tr>
<td>1/19</td>
<td>M</td>
<td>MIDK day, no class</td>
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<td></td>
<td>W</td>
<td>Ch 2: Math - vector algebra</td>
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<td>1/26</td>
<td>M</td>
<td>Ch 2: Coordinate systems</td>
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<td></td>
<td>W</td>
<td>Ch 3: gradient operator, divergence operator</td>
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<tr>
<td>2/2</td>
<td>M</td>
<td>Ch 3: curl operator, Laplacian operator</td>
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<tr>
<td></td>
<td>W</td>
<td>Ch 4: Coulomb’s Law</td>
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<td>2/9</td>
<td>M</td>
<td>Ch4: Gauss’s Law</td>
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<td></td>
<td>W</td>
<td>Ch 4: Electric potential, energy</td>
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<td>2/16</td>
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<td>Ch 4: electric materials, Ohm’s Law</td>
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<td>W</td>
<td>Ch 4: boundary conditions, image method</td>
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<tr>
<td>2/23</td>
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<td>Ch4: capacitance</td>
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<td>Ch 5: vector potential, magnetic materials</td>
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<tr>
<td>3/9</td>
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<td>Spring Break</td>
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<tr>
<td>3/16</td>
<td>M</td>
<td>Ch5: Magnetic forces, Biot Savart Law</td>
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<td>3/23</td>
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<td>Ch 6: inductance, Faraday’s law</td>
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<td>Ch 6: displacement current, Maxwell equations</td>
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<td>W</td>
<td>Ch 7: waves, time-harmonic fields</td>
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<td>M</td>
<td>Ch 7: lossless media, wave polarization</td>
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<td></td>
<td>W</td>
<td>Ch 7: lossy media, current in conductors</td>
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<td>4/13</td>
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<td>Ch 7: power density</td>
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<td>Ch 9: wave reflection and transmission</td>
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<tr>
<td>4/27</td>
<td>M</td>
<td>Ch 10: Radiation and antennas</td>
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<td></td>
<td>W</td>
<td>Spillover and review</td>
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<tr>
<td>5/6</td>
<td>W</td>
<td>Final Exam on Wednesday at 4 pm to 6 pm.</td>
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Gang Wang, KT-125