**PURDUE UNIVERSITY**
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF AN UNDERGRADUATE COURSE (10000-40000 LEVEL)

**DEPARTMENT**: Physics  
**EFFECTIVE SESSION**: 2015 Fall

**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**: 42300
- **Long Title**: Adaptive and Fourier Optics
- **Short Title**: Fourier Optics

**EXISTING**:

- **Subject Abbreviation**: PHYS
- **Course Number**:  
- **Long Title**: Adaptive and Fourier Optics
- **Short Title**: Fourier Optics

Abbreviated title will be entered by the Office of the Registrar if omitted. (20 CHARACTERS ONLY)

**CREDIT TYPE**

<table>
<thead>
<tr>
<th>Credit Type</th>
<th>1. Fixed Credit: Cr. Hrs.</th>
<th>2. Variable Credit Range: Minimum Cr. Hrs. (Check One)</th>
<th>Maximum Cr. Hrs.</th>
<th>3. Equivalent Credit: Yes</th>
<th>No</th>
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<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
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</tbody>
</table>

**COURSE ATTRIBUTES**

- 1. Pass/Not Pass Only
- 2. Satisfactory/Unsatisfactory Only
- 3. Repeatable
- 4. Credit by Examination
- 5. Fees: [] Coop, [] Lab, [] Rate Request

**COURSE DESCRIPTION**

Modern theories of diffraction and treatment of optical wave propagation using linear system techniques, including Fourier analysis, correlation and convolution and its application in imaging systems, wavefront modulation, optical signal processing and holographic system.

**COURSE LEARNING OUTCOMES**

Understanding the basic scalar diffraction theory and wave optics for imaging system. Using Fourier transform to describe and analyze linear optical systems. Apply the Fresnel and Fraunhofer approximation to calculate the wavefront propagation through optical components. Design and apply the physical principles to optical systems used in astronomy, biology and communication network.

**TERMS OFFERED**

- Fall
- Spring
- Summer

**CAMPUS(ES) INVOLVED**

- Calumet
- Cont Ed
- N. Central
- Fl. Wayne
- Tech Statewide
- Indianapolis
- W. Lafayette

**SCHEDULE TYPE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Minutes Per Mtg</th>
<th>Meetings Per Week</th>
<th>Weeks Offered</th>
<th>% of Credit Allocated</th>
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<tr>
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<td>16</td>
<td>100</td>
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</table>

**Cross-Listed Courses**


**OFFICE OF THE REGISTRAR**

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**Calumet Department Head**
Date: 9/21/14

**Calumet School Dean**
Date: 9/21/14

**Fl. Wayne Department Head**
Date: 9/21/14

**Fl. Wayne School Dean**
Date: 9/21/14

**Indianapolis Department Head**
Date: 9/21/14

**Indianapolis School Dean**
Date: 9/21/14

**North Central Faculty Senate Chair**
Date: 9/21/14

**Vice Chancellor for Academic Affairs**
Date: 9/21/14

**West Lafayette Department Head**
Date: 9/21/14

**West Lafayette College/School Dean**
Date: 9/21/14

**West Lafayette Registrar**
Date: 9/21/14
Adaptive and Fourier Optics

PHYS 42300 Tentative Syllabus

Instructor: Gang Wang
Office: Ketter Hall 125
Phone: 481-6154
Email: wangg@ipfw.edu
Office hours: To be determined.

Course requirements:
Textbook: Introduction to Fourier Optics,
By Joseph Goodman (published by Roberts & Company)
Lectures: Tuesday, Thursday, 3:00 pm – 4:15 pm, KT 133

Grading:

In class quizzes ................................................................. 10%
Homework assignments ............................................. 25%
Comprehensive projects ............................................. 25%
Midterm Exams (6%, 7% and 7%) ...................... 20%
Final Exam ......................................................................... 20%

General Policies:

1. Final grade assignment:
   A+ = 97%-100% (4.0 GP)   A = 93-96.99% (4.0 GP)   A- = 90%-92.99% (3.7 GP)
   B+ = 87%-89.99% (3.3 GP) B = 83-86.99% (3.0 GP)   B- = 80%-82.99% (2.7 GP)
   C+ = 77%-79.99% (2.3 GP) C = 73-76.99% (2.0 GP)   C- = 70%-72.99% (1.7 GP)
   D+ = 67%-69.99% (1.3 GP) D = 63-66.99% (1.0 GP)   D- = 60%-62.99% (0.7 GP)
   F = 0-59.99% (0 GP)

2. Homework assignments are due by 4:30 on the indicated dates. Late submission may be accepted for partial credit. Half of the full score of that assignment will be taken off PER DAY past due.

3. All in class quizzes are "pop-up" quizzes. Absolutely NO make-up quizzes.

Objective of the class:

Students who successfully complete this course will have the working knowledge of the basic scalar diffraction theory and wave optics for imaging system. You are expected to use Fourier transform to describe and analyze linear optical systems, to apply the Fresnel and Fraunhofer approximation to calculate the wavefront propagation through optical components. Common designs and applications in optical systems used in astronomy, biology and communication network will also be discussed in the class. In this class, we will emphasize the understanding of physical concepts and how to related the underlying physical principle to cross-discipline applications. We will have a few comprehensive projects require individual and/or group effort to numerically simulate and/or construct optical systems.
### Physics 42300 Tentative Schedules  
**Fall 2015**

<table>
<thead>
<tr>
<th>Week</th>
<th>Days</th>
<th>Activities</th>
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<tbody>
<tr>
<td>8/24</td>
<td></td>
<td>Introduction to Adaptive Optics</td>
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<tr>
<td>8/31</td>
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<td>Review of classic Electromagnetic theory</td>
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<tr>
<td>9/7</td>
<td></td>
<td>Introduction to Fourier Optics</td>
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<tr>
<td>9/14</td>
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<td>Gaussian beams, ABCD matrix approach</td>
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<td></td>
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<td><strong>Midterm Exam I and Simulation project</strong></td>
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<tr>
<td>9/21</td>
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<td>Fresnel and Fraunhofer diffraction, Fourier Mesh</td>
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<td>9/28</td>
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<td>Siedel and Zernike Polynomial approach, aberrations</td>
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<td>10/5</td>
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<td>Wavefront numerical modeling.</td>
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<td>10/12</td>
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<td>Fall Break</td>
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<td>10/19</td>
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<td>Wavefront sensors and interferometers</td>
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<td>Adaptive optical systems</td>
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<td></td>
<td></td>
<td><strong>Midterm Exam II and group project (Michaelson interferometer)</strong></td>
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<tr>
<td>10/26</td>
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<td>Common adaptive optical applications in Astronomy</td>
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<tr>
<td>11/2</td>
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<td>Adaptive optical applications in optical engineering</td>
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<td>11/9</td>
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<td>Advanced Metric adaptive optics</td>
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<tr>
<td>11/16</td>
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<td>Adaptive optics based device control and correction</td>
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<td></td>
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<td><strong>Midterm Exam III and simulation project</strong></td>
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<tr>
<td>11/23</td>
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<td>Spillover: advanced topics (Image stabilization)</td>
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<td></td>
<td>W-F</td>
<td>Thanksgiving Holiday</td>
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<tr>
<td>11/30</td>
<td></td>
<td>Cross-discipline applications</td>
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| 12/7  |      | Frontier in modern optics (Airy beam, LG, HG modes,)
| 12/14 |      | **Final Exam.** |