PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE
(50000-60000 LEVEL)

DEPARTMENT: ENGINEERING
EFFECTIVE SESSION: FALL 2011

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

1. New course with supporting documents (complete proposal form)
2. Add existing course offered at another campus
3. Expiration of a course
4. Change in course number
5. Change in course title
6. Change in course credit/type
7. Change in course attributes
8. Change in instructional hours
9. Change in course description
10. Change in course requisites
11. Change in semesters offered
12. Transfer from one department to another

PROPOSED:
Subject Abbreviation: Computer Vision
Course Number: 661
Long Title: Computer Vision
Short Title: Computer Vision

EXISTING:
Subject Abbreviation: ECE
Course Number: 661
Long Title: Computer Vision
Short Title: Computer Vision

TERMS OFFERED:
Check All That Apply:
- Summer
- Fall
- Spring

CAMPUS(ES) INVOLVED:
- Calumet
- N. Central
- Cont Ed
- Tech Statewide
- FL Wayne
- W. Lafayette
- Indianapolis

Abbreviated title will be entered by the Office of the Registrar if omitted.

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hr. (Check One) To Or
   Maximum Cr. Hr.
3. Equivalent Credit: Yes No
4. Thesis Credit: Yes No

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only
2. Satisfactory/Unsatisfactory Only
3. Repeatable
4. Maximum Repeatability Credit: 15
5. Credit by Examination
6. Registration Approval Type: Instructor
7. Variable Title
8. Honors
9. Full Time Privilege
10. Off Campus Experience

Schedule Type
- Lecture
- Recitation
- Presentation
- Laboratory
- Lab Prep
- Studio
- Distance
- Clinic
- Experiential
- Research
- Ind. Study
- Pract/Observ

Minutes Per Mo.
Meetings Per Week
Weeks Offered
% of Credit Allocated

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):
Prerequisites: Graduate Standing. This course deals with how an autonomous or a semi-autonomous system can be endowed with visual perception. The issues discussed include: vision psychophysics, image representation, edge detection, region-based segmentation, camera modeling, stereo vision, pose calculation, object recognition, optical flows, visual tracking, color vision, and beginning concepts of computational geometry. Students are expected to implement vision algorithms through programming assignments.

Calumet Department Head: Donald Muck Date: 3/14/11
Calumet School Dean: Date: 2-09-11
Calumet Undergraduate Curriculum Committee: Date
Fort Wayne Department Head: Date
Fort Wayne School Dean: Date
Fort Wayne Chancellor: Date
Undergraduate Curriculum Committee: Date
Indianapolis Department Head: Date
Indianapolis School Dean: Date
Date Approved by Graduate Council
North Central Faculty Senate Chair: Vice Chancellor for Academic Affairs: Date
West Lafayette Department Head: Date
West Lafayette College/School Dean: Date
Graduate Council Secretary: Date
Graduate Area Committee Convener: Date
Graduate Dean: Date
West Lafayette Registrar: Date
ECE 661 Computer Vision

Credits: 3.

Graduate Area(s):
Computer Engineering

Normally Offered: Fall - even years

Prerequisites: Graduate Standing

Corequisites: None.

Catalog Description: This course deals with how an autonomous or a semi-autonomous system can be endowed with visual perception. The issues discussed include: vision psychophysics, image representation, edge detection, region-based segmentation, camera modeling, stereo vision, pose calculation, object recognition, optical flows, visual tracking, color vision, and beginning concepts of computational geometry. Students are expected to implement vision algorithms through programming assignments.

Required Text(s): None.

Recommended Reference(s): None.

Lecture Outline:

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>1.0</td>
<td>1. Vision Psychophysics A. Vision as an inverse problems B. Assumptions in human visual perception</td>
</tr>
<tr>
<td>0.5</td>
<td>2. Connectivity and Distance Functions</td>
</tr>
<tr>
<td>1.0</td>
<td>3. Image Representation and Data Structure A. Run-length B. Quadtree C. MAT D. Chain-code E. Crack-code F. Skeleton</td>
</tr>
<tr>
<td>0.5</td>
<td>4. Border Following and Thinning</td>
</tr>
<tr>
<td>0.5</td>
<td>5. Component Labeling</td>
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<tr>
<td>0.5</td>
<td>7. Hough Transformation A. Extraction of straight lines B. Extraction of circles</td>
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<tr>
<td>1.0</td>
<td>8. Region-based Segmentation A. Split-and-merge algorithm B. Samef's neighbor finding algorithm</td>
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<tr>
<td>0.5</td>
<td>9. Camera Modeling A. The pin-hole model B. The two-plane model</td>
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<td>2.0</td>
<td>10. Stereo Vision A. Epipolar geometry B. Constraints C. Rectification</td>
</tr>
<tr>
<td>1.0</td>
<td>11. Pose Calculation A. Pose estimation from point correspondences B. Pose estimation using quaternions</td>
</tr>
<tr>
<td>1.0</td>
<td>12. Object Recognition A. Subgraph isomorphism B. Range Data - segmentation of range maps</td>
</tr>
<tr>
<td>1.0</td>
<td>13. Optic Flows and Analysis of Time-varying Imagery</td>
</tr>
<tr>
<td>0.5</td>
<td>14. Visual Tracking</td>
</tr>
<tr>
<td>1.5</td>
<td>15. Color Vision A. The trichromatic theory of color perception B. Color representation by RGB, HIS, and XYZ spaces C. Additive (RGB) and subtractive (CMYK) colors D. Object detection and tracking by color</td>
</tr>
<tr>
<td>1.0</td>
<td>16. Computational Geometry A. Transformation Groups - Affine - Similarity - Equiaffine - Euclidean - Projective - Relationships of the five groups B. Binary and greyscale morphology</td>
</tr>
</tbody>
</table>
Name: Yanfei Liu, Ph.D.

Degrees:  B.S.E.E. Shandong Jianzhu University, Jinan, China, 1996
          M.S.E.E. Institute of Automation, Chinese Academy of Sciences, Beijing, China, 1999
          Ph.D.  Clemson University, Clemson, SC, 2004

Appointments:
          2005-present    Assistant Professor, Indiana University – Purdue University Fort Wayne

Selected recent publications related to the proposed courses to be taught (ECE 569 & ECE 661)


Prerequisites: Graduate Standing. This course deals with how an autonomous or a semi-autonomous system can be equipped with visual perception. The issues discussed include: vision psychophysiology, image representation, edge detection, region-based segmentation, camera modeling, stereo vision, pose calculation, object recognition, optical flows, visual tracking, color vision, and beginning concepts of computational geometry. Students are expected to implement vision algorithms through programming assignments.
**Purdue University**

**Request For Addition, Expiration, or Revision of a Graduate Course (6000-0000 Level)**

**Department**: Engineering  
**Effective Session**: Fall 2011

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

- 1. New course with supporting documents (complete proposal form)  
- 2. Add existing course offered at another campus  
- 3. Explanation of a course  
- 4. Change in course number  
- 5. Change in course title  
- 6. Change in course credit type  
- 7. Change in course attributes  
- 8. Change in instructional hours  
- 9. Change in course description  
- 10. Change in course credits  
- 11. Change in prerequisites offered  
- 12. Transfer from one department to another

**Proposed**

<table>
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<th>Subject Abbreviation</th>
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<tbody>
<tr>
<td>Course Number</td>
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<tr>
<td>Long Title</td>
<td>Computer Vision</td>
</tr>
<tr>
<td>Short Title</td>
<td>881</td>
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Abbreviated title will be entered by the Office of the Registrar if omitted. Incomplete request not accepted.

**Credit Type**

- 1. Fixed Credit: Cr. Hrs.  
- 2. Variable Credit Range: Minimum or Hrs. (Check One) To:  
- 3. Maximum or Hrs.  
- 4. Equivalent Credit: Yes or No  
- 5. Thesis Credit: Yes or No

**Course Attributes**

- 1. Pass/No Pass Only  
- 2. Satisfactory/Unsatisfactory Only  
- 3. Repeatable  
- 4. Credit by Examination  
- 5. Special Fees  
- 6. Registration Approval Type  
- 7. Variable Title  
- 8. Honors  
- 9. Full Time, Part Time

**Schedule Type**

- Lecture  
- Recitation  
- Presentation  
- Laboratory  
- Lab Prep  
- Studio  
- Distance  
- Clinic  
- Experiential  
- Research  
- Ind. Study  
- Field/Exercise

**Course Description (Include Requisites/Restrictions)**

*Prerequisites: Graduate Standing. This course deals with how an autonomous or semi-autonomous system can be endowed with visual perception. The issues discussed include: vision psychophysics, image representation, object detection, region-based segmentation, camera modeling, stereo vision, pose calculation, object recognition, optical flow, visual tracking, 3D vision, and beginning concepts of computational geometry. Students are expected to implement vision algorithms through programming assignments.*

[Signatures and dates]

**Office of the Registrar**
**PURDUE UNIVERSITY**

**REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE (60000-69999 LEVEL)**

**DEPARTMENT:** ENGINEERING  
**EFFECTIVE SESSION:** FALL 2011

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**CAMPUS(ES) INVOLVED:**

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3. Equivalent Credit: Yes

4. Thesis Credit: Yes

**COURSE ATTRIBUTES:** Check All That Apply

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**SCHEDULE TYPE**

- Lecture
- Recitation
- Presentation
- Laboratory
- Lab Prep
- Studio
- Distance
- Clinic
- Experiential
- Research
- Ind. Study
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**Weekly Meetings:**

<table>
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**Signature:**

- [Signature]
- [Date]

**OFFICE OF THE REGISTRAR**