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

PROPOSED:

Subject Abbreviation
Course Number
Long Title: Introduction to Robotic Systems
Short Title:

EXISTING:

Subject Abbreviation ECE
Course Number 56900

TERMS OFFERED

Check All That Apply:
☐ Summer ☒ Fall ☒ Spring

CAMPUS(ES) INVOLVED

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

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

CREDIT TYPE

1. Fixed Credit: Cr. Hrs.
   3

2. Variable Credit Range: Minimum Cr. Hrs. (Check One) To Or Yes No
   3

3. Equivalent Credit: Yes No

4. Thesis Credit: Yes No

SCHEDULE TYPE

Lecture Recitation Presentation Laboratory Lab Prep Studio

Schedule Type Minutes Per M 75 Weeks Offered 16 % of Credit Allocated 100

Cross-Listed Courses

COURSE ATTRIBUTES: Check All That Apply

1. Pass/Not Pass Only

2. Satisfactory/Unsatisfactory Only

3. Repeatable: Maximum Repeatable Credit:

4. Credit by Examination

5. Special Fees

6. Registration Approval Type Instrucor

7. Variable Title

8. Honors

9. Full Time Privilege

10. Off Campus Experience

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Prerequisites: ECE 362 or ECE/ME 333. The topics to be covered include: basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematic equations; velocity and force/torque relations; manipulator dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators.

Calumet Department Head Date

Calumet School Dean Date

Calumet Undergrad Curriculum Committee Date

Fort Wayne Department Head Date

Fort Wayne School Dean Date

Fort Wayne Chancellor Date

Undergrad Curriculum Committee Date

Indianapolis Department Head Date

Indianapolis School Dean Date

Data Approved by Graduate Council

North Central Faculty Senate Chair Date

Vice Chancellor for Academic Affairs Date

Graduate Council Secretary Date

West Lafayette Department Head Date

West Lafayette College/School Dean Date

West Lafayette Registrar Date

OFFICE OF THE REGISTRAR
ECE 569 Introduction to Robotic Systems

Lecture Hours: 3. Credits: 3.

Graduate Area(s):
   Automatic Control

Normally Offered: Each Fall

Prerequisites: ECE 382

Prerequisites by Topic: basic knowledge of vector-matrix manipulations

Corequisites: None.

Catalog Description: The topics to be covered include: basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematic equations; velocity and force/torque relations; manipulator dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators.

Required Text(s):

Recommended Reference(s): None.

Lecture Outline:

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1. Introduction A. Uses of robotic manipulators (0.5) B. Components of robotic systems (0.5)</td>
</tr>
<tr>
<td>3</td>
<td>2. Kinematics of Manipulators A. Selection of coordinate frames (0.5) B. Transformation matrices (1.5) C. Calculation of inverse solutions (1.0)</td>
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<td>2</td>
<td>3. Velocities, Forces, Torques in Joint and Base Coordinates A. Differential motion (1) B. Velocity relations (0.5) C. Determination of forces, torques in a manipulator (0.5)</td>
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<td>2</td>
<td>4. Dynamic Modelling A. Lagrange's energy expressions for a manipulator (1) B. Lagrange's equation of motion (1) C. Digital simulation of manipulator model</td>
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<td>2</td>
<td>5. Trajectory Planning A. Joint trajectory (1) B. Cartesian path (1)</td>
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<td>1.5</td>
<td>6. Path Control of Manipulator A. Classical system design (0.5) B. PID-controller design (0.5) C. Force-torque control (0.5)</td>
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<tr>
<td>2</td>
<td>7. Special Topics</td>
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<tr>
<td>2</td>
<td>Exams</td>
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</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)


### PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION
ON REVISION OF A GRADUATE COURSE
(2000-2020 LEVEL)

**DEPARTMENT:**
**ENGINEERING**
**EFFECTIVE SESSION:**
**FALL 2014**

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

1. New course title
2. Title change
3. Title code change
4. Title change in course number
5. Title change in course name
6. Change in instructor
7. Approval of new instructor
8. Approval of new course number
9. Approval of new course title
10. Approval of new course name
11. Approval of new course type
12. Approval of new course title

#### PREREQUISITES

**Existing:**

- Subject: ECE
- Course Number: 63800
- Title: Introduction to Network Systems

#### CREDIT TYPE

- Title: 6 Credit Hours
- Type: Lecture, Laboratory, Field Work, Practicum

#### COURSE ATTRIBUTES

- Offered
- For Credit
- 100 Percent of Credit
- 100 Percent of Grade
- 100 Percent of Lecture
- 100 Percent of Laboratory
- 100 Percent of Field Work
- 100 Percent of Practicum

#### COURSE DESCRIPTION (including required/related/optional)

- Principles and methods used for network systems. The topics to be covered include basic components of network systems, selection of appropriate software, configuration of network systems, initiation of network systems, data communication, network security, network management, network administration, and network protocol design using the network and computer simulation methods and essential components for manipulations.

#### SIGNATURES

- **Department Chair:**
- **Dean:**
- **Undergraduate Committee:**
- **Graduate Committee:**

**OFFICE OF THE REGISTRAR**
### Course Request Form

**Purdue University**

**Request for Addition, Expiration, or Revision of a Graduate Course**

**Form 409 Rev. 12/09**

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

**Subject Abbreviation**: ECE

### Proposed:

- New course with supporting documents (complete proposal form)
- Add existing course offered at another campus
- Change in course description
- Change in course credits/number
- Change in course title
- Change in course type

### Existing:

- Course Number: 58400

#### Course Title:
Introduction to Robotic Systems

### Terms Offered:

- Summer
- Fall
- Spring

#### CAMPUSES INVOLVED:
- Calumet
- Cont Ed
- Tech Statewide
- Ft. Wayne
- Indianapolis
- W. Lafayette

### Credit Type:

- Fixed Credit: 3 Cr. Hrs.
- Variable Credit Range: Minimum Cr. Hrs. (Check One) To Cr. Hrs.
  - Yes
  - No

### Course Attributes:

- Pass/Not Pass Only
- Satisfactory/Unsatisfactory Only
- Repeatable
- Maximum Repeatable Credit
- Credit by Examination
- Special Fees
- Instructor

### Course Description:

Prerequisites: ECE 332 or ECE/ME 333. The topics to be covered include: basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematic equations; velocity and force/torque relations; manipulator dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators.
PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF A GRADUATE COURSE
(60000-60999 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 requirements
11. Change in semesters offered
12. Transfer from one department to another

PROPOSED:

Subject Abbreviation: ECE  Course Number: 56800
Long Title: Introduction to Robotic Systems
Short Title: Robotic Systems

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

CAMPUS(ES) INVOLVED:
- Calumet
- N. Central
- Ft. Wayne
- Ind. State-Wide
- West Lafayette

CREDIT TYPE:
- Fixed Credit: 1.0 hrs.
- Variable Credit Range: Minimum 1.0 hrs
- Maximum O.Hrs:
- Equivalent Credit:
- Thesis Credit:

SCHEDULE TYPE: Minutes: 75
- Lecture
- Recitation
- Presentation
- Laboratory
- Lab Prep
- Studio
- Distance
- Clinic
- Experiential
- Research
- Ind. Study
- Prerequisite:

Course Description (Include Requisites/Restrictions):
Prerequisites: ECE 602 or ECE/ME 333. The topics to be covered include: basic components of robotic systems; selection of coordinating frames; homogeneous transformations, solutions to kinematic equations; velocity and force/torque relations; manipulator dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators.