TO: The Faculty of the College of Engineering

FROM: The Faculty of the School of Industrial Engineering

RE: Change to Graduate-Level Course IE 67400 Title and Description

The Faculty of the School of Industrial Engineering has approved the following prerequisite and course description changes.

From: IE 67400 – Computer and Communication Methods for Production Control
Term Offered: Spring, Lecture 3, Cr. 3

Prerequisites: IE 57400 or IE 57500 or IE 57900;
Description: The study of the theoretical foundation and relevance of advanced computer and communication methods in the planning and control of intelligent production operations; manufacturing operating systems; synchronization in decentralized systems; recovery in decentralized systems; parallel processing; distributed databases; factory networks; reasoning and logic for production control.

To: IE 67400 – Cyber Methods for Advanced Production Control
Term Offered: Spring, Lecture 3, Cr. 3

Prerequisites: IE 57400 or IE 57500 or IE 57900;
Description: The study of the theoretical foundation and relevance of advanced cyber methods in the planning and control of intelligent production operations; manufacturing operating systems; synchronization in decentralized systems; recovery in decentralized systems; parallel processing; distributed databases; factory networks; reasoning and logic for production control.

Reason: The course contents has been updated to include research on methods of computing, communication, real-time control, and brain models, all comprising what cyber is, with a focus on th production control context.

Abhi Deshmukh 10/3/16

Abhijit Deshmukh
Professor and Head
School of Industrial Engineering

Office of the Registrar
FORM 40G REV. 8/16

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

DEPARTMENT: Industrial Engineering | EFFECTIVE SESSION: Spring 2017

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
- [x] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes
- [ ] 8. Change in instructional hours
- [x] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	IE	Subject Abbreviation	IE
Course Number	67400	Course Number	67400

Long Title: Cyber Methods for Advanced Production Control

Short Title: Cyber Methods Adv Prod Control

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

TERMS OFFERED (Check All That Apply)

- [ ] Fall
- [x] Spring
- [ ] Summer

CAMPUS(ES) INVOLVED

- [ ] Calumet
- [x] Cont Ed
- [ ] Ft. Wayne
- [ ] Indianapolis
- [ ] N. Central
- [ ] Tech Statewide
- [x] W. Lafayette

CREDIT TYPE

1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range:
   Minimum Cr. Hrs
   (Check One) To [ ] Or [ ]
   Maximum Cr. Hrs
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 [ ]
   Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees [ ] Coop [ ] Lab [ ] Rate Request
   Include comment to explain fee
6. Registration Approval Type
   Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	50	3	15	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS): (Note: If description will not fit in space provided, please create a separate document and attach it to this form.)

The study of the theoretical foundation and relevance of advanced cyber methods in the planning and control of intelligent production operations; manufacturing operating systems; synchronization in decentralized systems; recovery in decentralized systems; parallel processing; distributed databases; factory networks; reasoning and logic for production control. Prerequisites: IE 57400 or IE 57500 or IE 57900.

*COURSE LEARNING OUTCOMES: (Note: If course learning outcomes will not fit in space provided, please create a separate document and attach it to this form.)

Be able to… 1. identify and use e-Collaborative algorithms and protocols; 2. understand and differentiate between the top five levels of automation; 3. apply cyber methods to various production control scenarios;

Calumet Department Head	Date	Calumet School Dean	Date	Calumet Director of Graduate Studies	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date	Fort Wayne Director of Graduate Studies	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date	IUPUI Associate Dean for Graduate Education	Date
North Central Department Head	Date	North Central School Dean	Date	North Central Director of Graduate Studies	Date
West Lafayette Department Head	11/3/16	West Lafayette College/School Dean	Date	Date Approved by Graduate Council	Date
Graduate Area Committee Convener	Date	Graduate Dean	Date	Graduate Council Secretary	Date
				West Lafayette Registrar	Date

OFFICE OF THE REGISTRAR

Grad Form 40G must include the Graduate Council's supporting document, which is available at http://www.purdue.edu/registrar/forms/form_40_Intro.html

School of Industrial Engineering, Purdue University **Spring 2017**

IE 674 Cyber Methods for Production Control

M, W, F, 3:30-4:20 PM GRIS 134

Instructor: Professor S.Y. Nof nof@purdue.edu

Prerequisite: Graduate student, background in computing, programming not required

Reading: Required reading list and handouts – Posted on BB

Course Objectives -- What we will learn:

- The theoretical foundation and relevance of advanced cyber, real-time control, computing, communication, and brain models for (1) robotics and (2) automation of planning and decisions in distributed production and supply installations, global supply, logistics, and service systems/networks.
- Current and emerging functions, algorithms, protocols, and models; how to apply them in research projects and presentations, and in the field. Focus will be on the five top levels of automation (Nof, Ch. 3, *Springer Handbook of Automation*, 2009):

Level↓	Automation	Automated Human Attribute	Example
A_8	Mobile machine	Guided mobility	Hovering motes
A_9	Collaborative network	Collaboration	CI-Hub
A_{10}	Originality	Creativity	Virtual reality game
A_{11}	Human and animal special needs Support	Compassion	Nursing device
A_{12}	Interactive companion	Humor	Advisory agent

Study and Research Topics include:

1. e-Collaborative algorithms and protocols, and active interaction theories
2. Synchronization and recovery with wireless facility networks
3. Visual analytics and informatics for supply flow decisions
4. Swarm algorithms and sensor/RFID networks
5. Human-robot interaction and collaborative robotics
6. Data mining, brain models, and machine learning in automation with sustainability.

Requirements and Grading

- Bi-weekly homework -- 35%;
- Mid-term take-home exam – 30%;
- Semester project (individual) in three parts – 35%.