PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF A GRADUATE COURSE
(500-600 LEVEL)

Print Form

12-07

DEPARTMENT ECE   EFFECTIVE SESSION Fall 2008 9

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

☐ 1. New course with supporting documents (complete proposal form)	☐ 7.	Change in course attributes
☐ 2. Add existing course offered at another campus	☐ 8.	Change in instructional hours
☐ 3. Expiration of a course	☐ 9.	Change in course description
☐ 4. Change in course number	☒ 10.	Change in course requisites
☐ 5. Change in course title	☒ 11.	Change in semesters offered *No change*
☐ 6. Change in course credit/type	☐ 12.	Transfer from one department to another

PROPOSED: **EXISTING:**

Subject Abbreviation _____   Subject Abbreviation ECE

Course Number _____   Course Number 670

Long Title Modeling and Optimization of High-Performance Interconnects

Short Title _____

Abbreviated title will be entered by the Office of the Registrar if omitted. (22 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
☐ Summer   ☒ Fall   ☐ Spring

CAMPUS(ES) INVOLVED
☐ Calumet   ☐ N. Central
☐ Cont Ed   ☐ Tech Statewide
☐ Ft. Wayne   ☒ W. Lafayette
☐ Indianapolis

CREDIT TYPE

1. Fixed Credit: Cr. Hrs. _____
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. Designator Required ☐
6. Special Fees ☐
7. Registration Approval Type
   Department ☐   Instructor ☐
8. Variable Title ☐
9. Remedial ☐
10. Honors ☐
11. Full Time Privilege ☐
12. Off Campus Experience ☐

Instructional Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated	Delivery Method (Asyn. Or Syn.)	Delivery Medium (Audio, Internet, Live, Text-Based, Video)	Cross-Listed Courses
Lecture							
Recitation							
Presentation							
Laboratory							
Lab Prep							
Studio							
Distance							
Clinic							
Experiential							
Research							
Ind. Study							
Pract/Observ							

COURSE DESCRIPTION (INCLUDE REQUISITES):

Sem. 1 of even years.

Prerequisite: ECE-559 (or equivalent), or consent of instructor

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 R. Cipra 12/03/08
Indianapolis Department Head Date	Indianapolis School Dean Date	Undergrad Curriculum Committee Date
North Central Department Head Date *signature* 11/18/08	North Central Chancellor Date *signature* 12/9/2008	Date Approved by Graduate Council Marilyn D. Geist 3/2/09
West Lafayette Department Head Date	West Lafayette College/School Dean Date *signature* 3/2/09	Graduate Council Secretary Date Sandra Schafer
Graduate Area Committee Convener Date	Graduate Dean Date Phillip E. Pope 3/2/09	West Lafayette Registrar 3/14/09

OFFICE OF THE REGISTRAR

dt 3-12-09

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF A GRADUATE COURSE
(500-600 LEVEL)

EFD 12-07

DEPARTMENT ECE   EFFECTIVE SESSION Fall 2008

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

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

PROPOSED:

Subject Abbreviation _____

Course Number _____

Long Title Modeling and Optimization of High-Performance Interconnects

Short Title _____

Abbreviated title will be entered by the Office of the Registrar if omitted. (22 CHARACTERS ONLY)

EXISTING:

Subject Abbreviation ECE

Course Number 670

TERMS OFFERED
Check All That Apply:

☐ Summer   ☒ Fall   ☐ Spring

CAMPUS(ES) INVOLVED

☐ Calumet   ☐ N. Central
☐ Cont Ed   ☐ Tech Statewide
☐ Ft. Wayne   ☒ W. Lafayette
☐ Indianapolis

CREDIT TYPE

1. Fixed Credit: Cr. Hrs. _____
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. Designator Required
6. Special Fees

7. Registration Approval Type
   Department ☐   Instructor ☐
8. Variable Title
9. Remedial
10. Honors
11. Full Time Privilege
12. Off Campus Experience

Instructional Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated	Delivery Method (Asyn. Or Syn.)	Delivery Medium (Audio, Internet, Live, Text-Based, Video)	Cross-Listed Courses
Lecture							
Recitation							
Presentation							
Laboratory							
Lab Prep							
Studio							
Distance							
Clinic							
Experiential							
Research							
Ind. Study							
Pract/Observ							

COURSE DESCRIPTION (INCLUDE REQUISITES):

Sem. 1 of even years.

Prerequisite: ECE-559 (or equivalent), or consent of instructor

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 R. Cp ra 12/03/08 Date
Indianapolis Department Head _____ Date	Indianapolis School Dean _____ Date	Undergrad Curriculum Committee _____ Date
North Central Department Head 11/18/08 Date	North Central Chancellor 12/9/2008 Date	Date Approved by Graduate Council
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

OFFICE OF THE REGISTRAR

TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
RE: ECE 670 Changes in Terms Offered, Prerequisite and Content

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 670. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **ECE 670 – Modeling and Optimization Of High-Performance Interconnects**
Sem. 1. Class 3, cr. 3.
Prerequisite ECE 559, 608. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites.

RLC extraction of VLSI interconnects. Modeling of interconnects as RLC trees or networks. Elmore delay model. Reduced-order modeling: moment matching, Pade approximation, and Krylov-subspace methods. Device modeling with consideration of resistive shielding in the interconnection load. Delay calculation with consideration of devices and interconnects. Repeater insertion and planning at floor planning. Timing-driven placement: zero-slack algorithm for delay budgeting, net-based placement, and path-based placement. High-performance clock synthesis: zero-skew routing, bounded-skew routing and useful-skew routing. Term projects investigating interconnect-related issues are assigned.

To: **ECE 670 – Modeling and Optimization of High-Performance Interconnects**
Sem. 1 of even years. Class 3, cr. 3
Prerequisite: ECE 559 (or equivalent), or consent of instructor

RLC extraction of VLSI interconnects. Modeling of interconnects as RLC trees or networks. Elmore delay model. Reduced-order modeling: moment matching, Padé approximation, and Krylov-subspace methods. Device modeling with consideration of resistive shielding in the interconnection load. Delay calculation with consideration of devices and interconnects. Repeater insertion and planning at floorplanning. Timing-driven placement: zero-slack algorithm for delay budgeting, net-based placement, and path-based placement. High-performance clock synthesis: zero-skew routing, bounded-skew routing, and useful-skew routing. Term projects investigating interconnect-related issues are assigned.

Reason: The course prerequisite, text and content have been changed to reflect the updated content of the course.

Mark J. T. Smith
Head, Electrical and Computer Engineering

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes _#9_

Date _10/29/08_

Chairman ECC _R. Cipra_

Supporting Documentation

ECE 670 – Modeling and Optimization Of High-Performance Interconnects

Required Text: None.

Recommended References:
1. *Interconnect Analysis and synthesis*, C. K. Cheng, J. Lillis, S. Lin & N. Chang, John-Wiley, 2000, ISBN No. 0-471-29366-0.
2. *Circuits, Interconnections, and Packaging for VLSI*, H. B. Bakoglu, Addison-Wesley, 1990, ISBN No. 0-201-06008-6.
3. *Performance Optimization of VLSI Interconnect Layout*, J. Cong, L. He, C.K. Koh, & P. H. Madden, Integration, the VLSI Journal, 21, 1996.

Lectures	*Principal Topics*
2	Introduction: Trends of VLSI Interconnects, Challenges of Interconnect Design
6	Extraction of RLC Parasitics
3	RLC Simulation
2	Elmore Delay Model
7	Reduced Order Modeling
2	Driver Modeling and Delay Calculation
6	Repeater Insertion and Planning
6	Timing-Driven Placement
6	High-Performance Routing
1	Mid-term Exam
3	Term Project Presentation