PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE

(500-600 LEVEL)

DEPARTMENT: ECE
EFFECTIVE SESSION: Fall 2009

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

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

PROPOSED:

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>Subject Abbreviation ECE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Number</td>
<td>563</td>
</tr>
</tbody>
</table>

Long Title: Programming Parallel Machines
Short Title: Prog Parallel Machines

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

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

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

<table>
<thead>
<tr>
<th>CREDIT TYPE</th>
<th>COURSE ATTRIBUTES: Check All That Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fixed Credit: Cr. Hrs.</td>
<td>7. Registration Approval Type</td>
</tr>
<tr>
<td>2. Variable Credit Range: Minimum Cr. Hrs.</td>
<td>Department</td>
</tr>
<tr>
<td>(Check One) To</td>
<td>Instructor</td>
</tr>
<tr>
<td>Maximum Cr. Hrs.</td>
<td></td>
</tr>
<tr>
<td>3. Equivalent Credit: Yes</td>
<td></td>
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<tr>
<td>4. Thesis Credit: Yes</td>
<td></td>
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</tbody>
</table>

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

Minutes Per Week | Meetings Per Week | Weeks Offered | % of Credit Allocated | Delivery Method (Asyn. Or Syn.) | Delivery Medium (Audio, Internet, Live, Text-Based, Video) | Cross-Listed Courses |
|-----------------|------------------|---------------|----------------------|-------------------------------|------------------------------------------------|------------------|

| Course Description (Include Requisites): |
| See attachment. |

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

Indianapolis Department Head Date
Indianapolis School Dean Date
Indianapolis Undergrad Curriculum Committee Date

North Central Department Head Date
North Central School Dean Date
North Central Chancellor Date

West Lafayette Department Head Date
West Lafayette School Dean Date
West Lafayette Undergrad Curriculum Committee Date

Graduate Area Committee Convener Date
Graduate Dean Date
West Lafayette Registrar Date

OFFICE OF THE REGISTRAR

1-87

11/19/08

3-12-09
### INSTRUCTIONS:

- Please check the items below which describe the purpose of this request.
- New course with supporting documents (complete proposal form)
- 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
- Change in instructional hours
- Change in course description
- Change in course prerequisites
- Change in semesters offered
- Transfer from one department to another

#### PROPOSED:

- **Subject Abbreviation**: ECE
- **Course Number**: 563
- **Long Title**: Programming Parallel Machines
- **Short Title**: Prog Parallel Machines

#### EXISTING:

- **Subject Abbreviation**: ECE
- **Course Number**: 563
- **Long Title**: Programming Parallel Machines
- **Short Title**: Prog Parallel Machines

#### TERMS OFFERED:

- Summer
- Fall
- Spring

#### CAMPUS(ES) INVOLVED:

- Calumet
- Cont Ed
- Ft. Wayne
- Indianapolis
- W. Lafayette

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

#### CREDIT TYPE:

<table>
<thead>
<tr>
<th>1. Fixed Credit: Cr. Hrs.</th>
<th>2. Variable Credit Range: Minimum Cr. Hrs.</th>
<th>3. Equivalent Credit: Yes/No</th>
<th>4. Thesis Credit: Yes/No</th>
<th>Instructional Type</th>
<th>Minutes Per Mtg</th>
<th>Meetings Per Week</th>
<th>Weeks Offered</th>
<th>% of Credit Allocated</th>
<th>Delivery Method (Asyn. Or Syn.)</th>
<th>Delivery Medium (Audio, Internet, Live, Text-Based, Video)</th>
</tr>
</thead>
</table>

#### COURSE ATTRIBUTES:

- 1. Pass/Not Pass Only
- 2. Satisfactory/ Unsatisfactory Only
- 3. Repeatable
- 4. Maximum Repeatable Credit:
- 5. Credit by Examination
- 6. Designator Required
- 7. Registration Approval Type (Instructor)
- 8. Variable Title
- 9. Remedial
- 10. Honors
- 11. Full Time Privilege
- 12. Off Campus Experience

#### COURSE DESCRIPTION (INCLUDE REQUISITES):

See attachment.

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**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

**Indiana School of Science Dean** Date

**Indianapolis Department Head** Date

**Undergraduate Curriculum Committee** Date

**North Central Department Head** Date

**North Central Chancellor** Date

**North Central Dean of School Dean** Date

**North Central Area Committee Convener** Date

**Graduate Dean** Date

**Graduate Council Secretary** Date

**West Lafayette Department Head** Date

**West Lafayette Registrar** Date

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OFFICE OF THE REGISTRAR
COURSE DESCRIPTION (INCLUDE REQUISITES):

Terms Offered: Sem. 2, odd years. Prerequisite: ECE 565 or equivalent.

Description: This course presents methods and techniques for programming parallel computers, such as multicore and high-end parallel architectures. Various parallel algorithms will be presented to demonstrate different techniques for identifying parallel tasks and mapping them onto parallel machines. Realistic science/engineering applications and their characteristics will be discussed. Parallel architectures to be considered are shared-memory and distributed-memory multiprocessor systems. Programming paradigms for these machines will be compared, including directive-based (OpenMP), message passing (MPI) and thread-based (Posix threads) methods. Methodologies for analyzing and improving the performance of parallel programs will be discussed. There will be a class project in which each student parallelizes and tunes the performance of a large computational application or develops/improves a tool that helps this process. Each student will prepare one lecture for a selected topic.
TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
RE: ECE 563 Changes in Terms Offered, Description, Text, and Content

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 563. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: ECE 563 – Programming Parallel Machines
Sem.2. Class 3, cr. 3.
Prerequisite: ECE 264, ECE 463. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites. Departmental approval required.

Examines how to program parallel processing systems. Various parallel algorithms are presented to demonstrate different techniques for mapping tasks onto parallel machines. Parallel architectures to be considered are: SIMD (synchronous), MIMD (asynchronous), and mixed-mode (SIMD/MIMD hybrid). Machines that represent these classes to be used in the course are: the MasPar MP-1 (SIMD); nCUBE 2 (MIMD); and PASM (mixed-mode). There will be three programming projects, one on each machine. The similarities and differences among the machines and their languages will be discussed.

To: ECE 563 – Programming Parallel Machines
Sem. 2, odd years. Class 3, cr. 3
Prerequisite: ECE 565 or equivalent

This course presents methods and techniques for programming parallel computers, such as multicore and high-end parallel architectures. Various parallel algorithms will be presented to demonstrate different techniques for identifying parallel tasks and mapping them onto parallel machines. Realistic science/engineering applications and their characteristics will be discussed. Parallel architectures to be considered are shared-memory and distributed-memory multiprocessor systems. Programming paradigms for these machines will be compared, including directive-based (OpenMP), message passing (MPI) and thread-based (Posix threads) methods. Methodologies for analyzing and improving the performance of parallel programs will be discussed. There will be a class project in which each student parallelizes and tunes the performance of a large computational application or develops/improves a tool that helps this process. Each student will prepare one lecture for a selected topic.

Reason: The course description and content have been changed to reflect the updated content of the course.

Mark J. T. Smith, Head
School of Electrical & Computer Engineering

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

ECC Minutes 115
Date 2-6-08
Chairman ECC
ECE 563 – Programming Parallel Machines

Required Text: Research papers and course handouts.

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Principal Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction and Motivation</td>
</tr>
<tr>
<td>1</td>
<td>Efficiency and Speedup Measures</td>
</tr>
<tr>
<td>1</td>
<td>Automatic Parallelization</td>
</tr>
<tr>
<td>1</td>
<td>Tuning Automatically Parallelized Programs</td>
</tr>
<tr>
<td>2</td>
<td>Explicit Program Parallelization</td>
</tr>
<tr>
<td>1</td>
<td>Open MP</td>
</tr>
<tr>
<td>1</td>
<td>MPI</td>
</tr>
<tr>
<td>1</td>
<td>Pthreads</td>
</tr>
<tr>
<td>2</td>
<td>Programming Methodologies and Tools</td>
</tr>
<tr>
<td>2</td>
<td>Application Studies</td>
</tr>
<tr>
<td>2</td>
<td>Project Discussions</td>
</tr>
</tbody>
</table>

Course Outcomes: A student who successfully fulfills the course requirements will have demonstrated:
1) an understanding of the basic properties of parallel computer architectures and their relationship to parallel program design [3, j, k].
2) an ability to analyze a program for parallelism and express this parallelism for both shared-memory and distributed-memory machines [4, a, b, c, e, k].
3) an understanding of parallel models and programming constructs for OpenMP, MPI, and Posix threads [3, j, k].
4) an understanding of performance factors of parallel programs and their relationship to application characteristics and parallel programming constructs [3, 4, b, e, k].
5) an ability to use parallelizing compilers to parallelize and tune the performance of application programs [3, 4, b, e, j, k].

Outcome Assessment Method: Outcomes 1, 2, 3 and 4 will be assessed all, or in part, by tests. Outcomes 1, 2, 3, 4 and 5 will be measured all, or in part, by programming assignments.