TO: The Faculty of the College of Engineering

FROM: School of Electrical and Computer Engineering of the College of Engineering

RE: New Graduate Course, ECE 60825 Operating Systems Design and Implementation

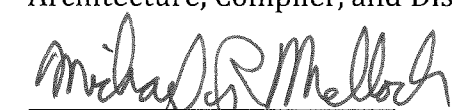
The faculty of the School of Electrical and Computer Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ECE 60825 Operating Systems Design and Implementation
Sem. 2, Lecture 3, Cr. 3.
Prerequisite: Graduate Standing

Prerequisite by Topic: Programming in C

Description: This course covers advanced topics in modern Operating Systems, including the modern topics. It will introduce modern operating system design challenges and solutions in response to emerging hardware evolution such as many core, mobile system, and IoT, and application revolution such as mobile apps and cloud services, and advanced topics such as operating systems bugs detection, energy efficiency, and security.
This course will convey useful techniques in system software construction through hands-on projects, as well as important design principles commonly seen in system software, including abstraction, modularity, policy vs mechanism, interface vs implementation, etc.

Reason: The course is suitable as a 600-level course because:
(1) Content-wise it covers advanced topics in Modern Operating Systems design and implementation;
(2) It has a vigorous project component where student will be building components or enhancements to a modern operating System Linux.
(3) It will prepare graduate students with the knowledge and methodology to conduct research in Operating Systems and Experimental Systems in general including Architecture, Compiler, and Distributed Systems.



Michael R. Melloch, Associate Head
School of Electrical and Computer Engineering

Office of the Registrar
FORM 40G REV. 4/13

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

DEPARTMENT: Electrical and Computer Engineering EFFECTIVE SESSION: Spring 2017

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

- [x] 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:		EXISTING:	
Subject Abbreviation	ECE	Subject Abbreviation	
Course Number	60825	Course Number	
Long Title	Operating Systems Design and Implementation		
Short Title	Operating Sys Design & Implem		

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

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3.0
2. Variable Credit Range:
   Minimum Cr. Hrs
   (Check One) To [ ] Or [ ]
   Maximum Cr. Hrs
3. Equivalent Credit: Yes [ ] No [x]
4. Thesis Credit: Yes [ ] No [x]

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	75	2	16	100%
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

This course covers advanced topics in modern Operating Systems, including the modern topics. It will introduce modern operating system design challenges and solutions in response to emerging hardware evolution such as many core, mobile system, and IoT, and application revolution such as mobile apps and cloud services, and advanced topics such as operating systems bugs detection, energy efficiency, and security.
This course will convey useful techniques in system software construction through hands-on projects, as well as important design principles commonly seen in system software, including abstraction,

*COURSE LEARNING OUTCOMES:

1. Explain strengths and weaknesses of computational techniques for electro-optic systems
2. Calculate computational complexity of a given algorithm
3. Perform conventional and Fast Fourier transforms, based on existing codes
4. Solve for eigenvalues and eigenvectors, for both standard and generalized eigenproblems

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
Michael R Melloch 10/6/16					
West Lafayette Department Head	Date	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

Supporting Document to the Form 40G
for a New Graduate Course

To: Purdue University Graduate Council

From: Faculty Member: Felix Xiaozhu Lin

Department: Electrical and Computer Engineering

Campus: West Lafayette

Date:

Subject: Proposal for New Graduate Course6+

Contact for information if questions arise:
Name: Matt Golden
Phone: 494-3374
Email: goldenm@purdue.edu
Address: EE Building, Room 135

Course Subject Abbreviation and Number: ECE 608??

Course Title: Operating Systems Design and Implementation

Course Description:

This course covers advanced topics in modern Operating Systems, including the modern topics. It will introduce modern operating system design challenges and solutions in response to emerging hardware evolution such as many core, mobile system, and IoT, and application revolution such as mobile apps and cloud services, and advanced topics such as operating systems bugs detection, energy efficiency, and security.
This course will convey useful techniques in system software construction through hands-on projects, as well as important design principles commonly seen in system software, including abstraction, modularity, policy vs mechanism, interface vs implementation, etc.

Semesters Offered:

For the benefit of graduate student plan of study development, how frequently will this prototype be offered? Which semesters?
Each Spring

A. Justification for the Course:

Provide a complete and detailed explanation of the need for the course (e. g., in the preparation of students, in providing new knowledge/training in one or more topics, in meeting degree requirements, etc.), how the course contributes to existing majors and/or concentrations, and how the course relates to other graduate courses offered by the department, other departments, or interdisciplinary programs.

Justify the level of the proposed graduate course (500- or 600-level) including statements on, but not limited to: (1) the target audience, including the anticipated number of undergraduate and graduate students who will enroll in the course; and (2) the rigor of the course.

The course is suitable as a 600-level course because:

(1) Content-wise it covers advanced topics in Modern Operating Systems design and implementation;

(2) It has a vigorous project component where student will be building components or enhancements to a modern operating System Linux.

(3) It will prepare graduate students with the knowledge and methodology to conduct research in Operating Systems and Experimental Systems in general including Architecture, Compiler, and Distributed Systems.

Use the following criteria:
Graduate Council policy requires that courses at the 50000 level in the Purdue system should be taught at the graduate level and meet four criteria: a) the use of primary literature in conjunction with advanced secondary sources (i.e., advanced textbooks); b) assessments that demonstrate synthesis of concepts and ideas by students; c) demonstrations that topics are current, and; d) components that emphasize research approaches/methods or discovery efforts in the course content area (reading the research, critiquing articles, proposing research, performing research). Such courses should be taught so that undergraduate students are expected to rise to the level of graduate work and be assessed in the same manner as the graduate students.

- Anticipated enrollment
  - Undergraduate 0
  - Graduate 20

B. Learning Outcomes and Method of Evaluation or Assessment:

ECE Graduate Learning Outcomes:

a. Knowledge and Scholarship (thesis/non-thesis)
b. Communication (thesis/non-thesis)
c. Critical Thinking (thesis/non-thesis)
d. Ethical and Responsible Research (thesis) or Professional and Ethical Responsibility (non-thesis)

- List Learning Objectives for this course and map each Learning Objective to one or more of the ECE Learning Outcomes (a-d, listed above):

  1) Solid knowledge of operating system fundamentals, including process, file, and lock. (a)

  2) A broad vision of operating system historical development and design space (a) (b) (c)

  3) The ability to apply well-known system software design principles to practice (a)(c)

  4) The ability to construct a small-size operating system and experimentally evaluate it in small teams (a)(b)(c)(d)

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- Methods of Instruction
  - Lecture
- Will/can this course be offered via Distance Learning?
  - No
- Grading Criteria

  Grading criteria (select from checklist); include a statement describing the criteria that will be used to assess students and how the final grade will be determined. Add and delete rows as needed.
  - Papers, projects, and attendance/participation

  ▶ Describe the criteria that will be used to assess students and how the final grade will be determined:

The course will be graded primarily on a combination of examinations, in-class presentation, and course projects. A smaller part of the grade will be based on homeworks and class participation. The examination component may include a mid-term and final examination.

C. Prerequisite(s):

List prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence. Add bullets as needed.

- Graduate Standing
- Prerequisite by Topic: Programming in C

D. Course Instructor(s):

Provide the name, rank, and department/program affiliation of the instructor(s). Is the instructor currently a member of the Graduate Faculty? (If the answer is no, indicate when it is expected that a request will be submitted.) Add rows as needed.

Name	Rank	Dept.	Graduate Faculty or expected date
Felix Xiaozhu Lin	Assistant Professor	ECEN	Yes

E. Course Outline:

Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory of field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course. **(This information must be listed and may be copied from syllabus).**

Weeks	Principal Topics
1	Overview: Kernel and Process
2	Kernel designs: microkernel and exokernel
1	Operating system bugs
1	Overview: Virtual memory
1	Virtual machines
1	Overview: synchronization

2	Novel locks and OS scalability
1	Overview: File systems
1	File system characterization and distributed file system
1	Energy efficiency
2	Mobile operating systems: Android and iOS
1	Modern browsers

F. Reading List (including course text):

A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.

A secondary reading list or bibliography should include material students may use as background information.

- Primary Reading List
    - Operating Systems: Three Easy Pieces, Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau
- Secondary Reading List
    - A Silberschatz, Operating System Concepts, 8th ed., 2012
    - A. Tannenbaum, A. Woodhull: Operating Systems: Design and Implementation, 2nd ed. 1997, Prentice Hall.

G. Library Resources

Describe any library resources that are currently available or the resources needed to support this proposed course.

H. Course Syllabus

(While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the *Graduate School's Policies and Procedures Manual for Administering Graduate Student Program.*
See Appendix K.
http://www.purdue.edu/gradschool/faculty/documents/Graduate_School_Policies_and_Procedures_Manual.pdf