X Change Request

Date Submitted: 01/19/18 5:39 pm

Viewing: **COM S 413x / COM S 513X / CPR E 513X**

Foundations and Applications of Program Analysis

Last approved: 10/23/17 2:57 pm

Last edit: 02/19/18 1:33 pm

Last edited by: slh

Changes proposed by: weile

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College
Liberal Arts and Sciences

Department
COM S - Computer Science

Course Number 513X
Catalog Year 2018-2019
2017-2018

First Expected Offering Term
Spring

Instructor Wei Le

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Title
Foundations and Applications of Program Analysis

Primary or Lead Department
COM S - Computer Science

Dual Listed Courses
COM S 413x

Cross Listed Courses
CPR E 513X

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**Course Details**

Credit Hour Details
Credit Type Credit Hours
Fixed 3

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In Workflow

1. Registrar pre-check
2. COM S Curr Chair
3. CPR E Curr Chair
4. COM S Chair
5. CPR E Chair
6. slh
7. LAS Coordinator
8. Grad Coordinator
9. Scheduling

History

1. Dec 14, 2015 by weile
2. Oct 23, 2017 by asminer

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Course Details
Credit Hour Details
Credit Type Credit Hours
Fixed 3
Grading Method: A-F
Instruction Type:

<table>
<thead>
<tr>
<th>Instruction Type</th>
<th>Contact Hours per Week</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>3</td>
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Repeatable?: No
Maximum number of times or credits for this course that can appear on the transcript.

Semesters Offered:
- Spring: Yes
- Annually

Prerequisites:
COM S 331, COM S 342

Description:
**COM S 513X Description:**
Algorithms and tools techniques for automatically automatic reasoning about of code and and program executions to predict execution for predicting software behavior. Theory and foundations related to control flow of points to analysis, dataflow data-flow analysis, abstract interpretation control-flow analysis, taint analysis, dependency analysis, and symbolic execution, inter-procedural analysis. Applications Development of program analysis algorithms, tools, benchmarks, and methodology needed to improve software security, performance and testing. Solve problems using program analysis and to establish foundations for program analysis research. Concepts, algorithms, tools, benchmarks, methodologies for solving problems using program analysis and for preparing research in program analysis.

**COM S 413X Description:**
Algorithms and tools for automatically reasoning about code and program executions to predict software behavior. Theory and foundations related to control flow analysis, dataflow analysis, abstract interpretation and symbolic execution. Applications of program analysis to improve software security, performance and testing. Concepts, algorithms, tools, benchmarks, methodologies for solving problems using program analysis and for preparing research in program analysis.

Meets U.S. Diversity Requirement? No
Meets International Perspectives Requirement? No
Special Fee? No
Do you propose that the course be acceptable for General Education Requirement credit?

No

Syllabus & Supporting Documentation

COMS-542X-Syllabus-Wei.pdf
Com S 413&513 Syllabus.pdf
ComS413&513 dual list LASCC 02192018.doc

Reason for proposal (programmatic justification, need for course, intended use, etc.)

Feb 2018 - Dual listing COM S 513x and COM S 413x; updated catalog description, as needed for the dual-listing; new syllabus attached.

Course outcomes/objective

After successfully completing this course, students will:

1) learn terminologies and mathematical frameworks needed to read program analysis literature,
2) understand classical program analysis algorithms and have experience of implementing them,
3) understand the capabilities and tradeoffs of program analysis and know what problems can be solved and how well they can be solved by program analysis,
4) gain problem solving skills and learn to apply program analysis to solve software engineering and security problems, and
5) explore the potential interest in program analysis research.

Course content/major topics to be addressed (attach syllabus if by your college/department)

1. Overview: Concepts and Frameworks in Program Analysis
2. Control Flow Analysis
3. Data Flow Analysis
4. Abstract Interpretation
5. Program Slicing
6. Pointer Analysis
7. Symbolic Execution
8. Interprocedural Analysis
9. Dynamic Analysis
10. Applications of Program Analysis

Assessment Plans: Mechanism for assessing student mastery of course outcomes/objectives

The assessment will involve the following components:

1. Reading Assignment: students will be required to read and participate in discussion on research papers (papers will be selected by the faculty instructor).

2. Programming Assignments/homework assignments: students will be required to implement some program analysis algorithms. This may include half-semester long projects as well.

3. Final Examination

Relationship of this course to existing courses in other departments and programs (supporting, overlap, etc.)

There are two other courses in programming languages:

COMS 540 (Principles and Practice of Compiling): This course focuses on the algorithms for compilation, in particular the challenges in translating high-level languages into executable program.

COMS 541 (Programming Languages): This course focuses on the design issues in programming languages.

In contrast, the proposed course focuses on analyzing the code and program execution to understand the results of the program. This is useful in proving correctness of program execution results as well.

Results of consultation with relevant departments and programs

The director of Software Engineering undergraduate program, Prof. Johnny Wong, supports this proposal.

The director of Graduate Education in ECE, Prof. Daji Qiao, has been informed about this course proposal, and he does not see any problem with offering this course.

The Chair of the Curriculum Committee in ECE, Dr. Joseph Zambrano, has been informed about
this course proposal, and he does not see any problem with offering this course. He has suggested to consider cross-listing this course with CPRE in future.

The course has been approved by CCCC on 11/11. As per the request, the course numbering has been updated to allow for cross-listing with CPRE.

Course reviewer comments

jlak (01/18/18 12:49 pm): Rollback: Course description in attachment is different than description on proposal for catalog. Confirming that description for catalog will stay the same? Also, please confirm first term of offering. Thank you.

jlak (01/19/18 5:24 pm): Rollback: Please edit proposal to update new course description and first term of offering. For spring 2019, catalog will be 2018-19.

ciardo (01/25/18 10:59 am): The dual-listing was approved by CCCC in Nov 2017. Software Engineering and Computer Engineering have been asked whether they would like to crosslist 413X. SE will consider cross-listing at a later time.

neihart (01/25/18 2:23 pm): The ECpE curriculum committee discussed this on Jan. 25 and decided not to dual list the course as CprE 413X. This is due to the relatively long prerequisite chain ComS 331 and ComS 342) that would be required to take CprE 413X. In addition, CprE students interested in this course could take ComS 413X or even CprE 513X.

slh (02/19/18 1:33 pm): Approving on behalf of Gordon Miller, per his directions.