Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE: Proposal to revise the Computer Science B.S. degree in the College of Engineering.

SPONSOR: Lenny Pitt, Professor and Director of Undergraduate Programs, Computer Science Tel: 333-7505, Email: pitt@illinois.edu.

COLLEGE CONTACT: Kevin Pitts, Associate Dean for Undergraduate Programs and Professor, College of Engineering, 217-333-3946, kpitts@illinois.edu.

BRIEF DESCRIPTION:

This is a major revision that includes a variety of changes:

1. Replace and discontinue CS 242 with new course CS 126
2. Replace CS 231 + CS 232 requirement with CS 233
3. Replace CS 373 + CS 473 requirement with new course CS 374
4. Replace MATH 461 or 463 requirement with new course CS 361
5. Remove requirement of taking either PHYS 213 or 214
6. Replace CHEM 102 + 103 requirement with a broader “additional science” requirement.
7. Replace the “Technical Track” requirement with the requirement to take at least eight technical electives from a list maintained by the CS department, and meeting additional criteria determined by the CS faculty.

JUSTIFICATION:

1. CS 242 is taken too late in the current curriculum to allow students to benefit from the instruction on good coding practice. Also, CS 126 will introduce a number of topics that are currently not covered in the curriculum. Finally, CS 126, placed between software/programming courses CS 125 and CS 225, will engage students in the practice of programming during their second semester, where there is currently a hole in the curriculum that has resulted in students going eight months or more without programming following their initial exposure.
2. CS 233 combines material from both CS 231 and CS 232, while eliminating an undue focus on digital logic more relevant to computer engineering. CS 233 also includes deeper coverage of important topics such as parallel architectures. The reduction of two credit hours (3+3 to 4) will also allow students to take more advanced technical electives.
3. CS 373 contained dated material that was of dubious value for current CS students. CS 473 was taken too late in the curriculum for other courses to benefit, because CS 373 was a prerequisite. The new four-hour CS 374 blends together topics from these two computer science theory courses, presenting them in a more unified manner, and accessible earlier in the curriculum. The reduction of two credit hours (from 3+3 to 4) will also allow students to take more technical electives.

4. Modern computer science practice increasingly relies on probabilistic and statistical methods to deal with large amounts of data. It has become a sufficiently important topic that it is desirable to introduce this material earlier in the curriculum than MATH 461 or 463 could (since the latter two require MATH 241 instead of just MATH 221 and 225). It is also important to focus on the particular topics that are relevant to CS, and to have students solve real-world problems via programming applied statistical and probabilistic methods.

5. There is no reason that CS students would need either PHYS 213 or 214; this requirement is inherited from the Engineering College, in which many other departments need this material. Data collected also shows that only a very small number of CS students transfer into other Engineering College departments; they mostly transfer into LAS, where these courses are not required.

6. CS is widely applicable across many sciences, and there is little reason to require chemistry over, say, biology or astronomy or genetics or a number of other serious science courses in which computing applications are numerous.

7. Our old track options are obsolete, and two of the three did not meet ABET accreditation requirements. We have moved to a simpler structure requiring that students first take a solid but condensed core of foundational courses, followed by eight technical electives (two more than our current program), reflecting the breadth of the field. Students will also be required to obtain depth in one focus area of computer science. The list of technical electives and focus areas will vary as new courses are introduced, and dated courses retired. Consequently, it is desirable to allow revision of the list to be approved at the department level, just as are the details of the current “technical tracks”.

**BUDGETARY AND STAFF IMPLICATIONS:**

1) Resources

   a. How does the unit intend to financially support this proposal?

      There is no net gain in the number of CS courses required. If anything, by shrinking the number of specifically required courses and allowing more technical electives course demand will be better balanced across upper level courses.

   b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

      No surplus or additional capacity is needed beyond that which is already required to handle our natural growth.

   c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.
No additional campus or external resources will be needed due to the revision in program

d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

2) Resource Implications
   a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

   No additional faculty resources will be needed due to this revision, as the revision does not increase the overall teaching load, rather it redistributes students across technical electives.

   b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. *(A letter of acknowledgment from units impacted should be included.)*

   There will be a drop in students electing MATH 461 or STAT 400. Recently, there have been no more than 60 CS students in each course each semester. The math and statistics departments are aware of these changes. There will be a drop in enrollments in PHYS 213 and 214 (on average 50-75/course/semester). There will be a drop in enrollment in CHEM 102 and CHEM 103, and likely increase in enrollments in other sciences, but we cannot anticipate how much interest there may be in any one course. However, many of our students already come in with AP Chemistry credit, so would not need to take another science besides physics.

   c. Please address the impact on the University Library *(A letter of estimated impact from the University Librarian must be included for all new program proposals. If the impact is above and beyond normal library business practices, describe provisions for how this will be resourced.)*

      None anticipated

   d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

      None anticipated

**DESIRED EFFECTIVE DATE:**

Fall, 2015
For the Degree of Bachelor of Science in Computer Science

The computer science curriculum provides both a broad and deep knowledge of the theory, design, and application of computer systems, with an emphasis on software systems. Because computing is ubiquitous, application areas involve virtually any field imaginable—from developing gene sequencing algorithms via techniques in computational biology, to designing user interfaces for mobile applications, from designing methods for high frequency trading, to creating computer generated graphics and special effects in the gaming industry, and from creating embedded real-time systems to be deployed in medical devices, to analyzing social data from internet communication patterns. During the first two years the curriculum provides a strong foundation in mathematics, science, and computation. Advanced coursework in areas of the student’s choosing follows in the second two years, which include either a senior thesis or a senior project. Graduates may go on to graduate study or leading positions in industry.

A combined B.S.-M.S. Computer Science degree program is available. Its admission and course requirements are described in the College of Engineering program information section.

A Software Engineering Certificate is also available to all students in the computer science curriculum interested in a career in software engineering. It provides the depth and breadth necessary for satisfying possible future software engineering accreditation requirements.

Overview of Curricular Requirements

The curriculum requires 120 hours for graduation and is organized as shown below. A technical grade point average requirement for graduation applies to students in this curriculum. This rule is summarized at the College of Engineering’s undergraduate advising website.

Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 100</td>
<td>Freshman Orientation</td>
</tr>
<tr>
<td>CS 210</td>
<td>Ethical &amp; Professional Issues</td>
</tr>
<tr>
<td>ENGR 100</td>
<td>Engineering Orientation</td>
</tr>
</tbody>
</table>

Total Hours:

3

This optional course is highly recommended and may be used to help meet free elective requirements.

Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 221</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 222</td>
<td>Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 223</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 224</td>
<td>Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>University Physics: Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>University Physics: Elect Mag</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits: 20
**Computer Science Technical Core**

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of computer science:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1125</td>
<td>Intro to Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>CS1276</td>
<td>Software Design Studio</td>
<td>1</td>
</tr>
<tr>
<td>CS1277</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS1278</td>
<td>Data Structures</td>
<td>1</td>
</tr>
<tr>
<td>CS1281</td>
<td>Computer Architecture</td>
<td>1</td>
</tr>
<tr>
<td>CS1241</td>
<td>System Programming</td>
<td>1</td>
</tr>
</tbody>
</table>

**Technical Electives**

These courses stress the rigorous analysis and design principles practiced in major subdisciplines of computer science. Students select eight courses, at least six of which must be advanced CS courses. Three courses must be selected from one area of CS.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS2045</td>
<td>Numerical Methods I</td>
<td>1</td>
</tr>
<tr>
<td>CS261</td>
<td>Probability &amp; Statistics for CS</td>
<td>1</td>
</tr>
<tr>
<td>CS3721</td>
<td>Theory of Computation: Advanced Models of Computation</td>
<td>2</td>
</tr>
<tr>
<td>CS321</td>
<td>Programming Languages &amp; Compilers</td>
<td>1</td>
</tr>
<tr>
<td>STAT400</td>
<td>Mathematical Statistics</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Hours: 24

**Technical-Track-Option Electives**

These courses stress the rigorous analysis and design principles practiced in several major subdisciplines of computer science. Students must choose to specialize in one of the following technical tracks:

- Computational Science
- Computational Science and Engineering (discouraged for students entering Fall 2013 or later)
- Mathematics (advisement for students entering Fall 2013 or later)

In the Computational Science and Engineering track, a specific specialization must be selected from a departmentally approved list. Since specializations are subject to change, please consult the department website for the most current information.

Technical-Track-Option Electives have been based on departmentally approved lists for the Technical-Track-Option choices presented above.

**Liberal Education**

The Liberal Education courses develop students' understanding of human culture and society, build skills of inquiry and critical thinking, and lay a foundation for civic engagement and lifelong learning.
Electives from the campus General Education social & behavioral sciences list: 6
Electives from the campus General Education humanities & the arts list: 6
Electives either from a list approved by the college, or from the campus General Education lists for social & behavioral sciences or humanities & the arts: 6

Total Hours: 18

Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.

Composition

These courses teach fundamentals of expository writing.

**BET 105**
Writing and Research 4

Advanced Composition. May be satisfied by taking any course in either the liberal education or free elective categories which has the Advanced Composition designation, or by completing GE 419 Senior Thesis.

Advanced Composition. May be satisfied by completing one of the following: GE 402 - GE 403, or course taken in the liberal education or free elective categories which has the Advanced Composition designation.

Total Hours: 8

Free Electives

These unrestricted electives, subject to certain exceptions as noted at the College of Engineering advising Web site, give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

Free electives. Additional unrestricted coursework subject to certain exceptions as noted at the College of Engineering advising Web site, so that there are at least 120 credit hours earned toward the B.S. degree (40-125 credit hour Technical Track is chosen). For a 125 credit hour Technical Track, it is chosen.

College of Engineering advising website.

Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

**First Year**

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHEM 108</strong> General Chemistry Lab</td>
<td>3</td>
</tr>
<tr>
<td><strong>MATH 121</strong> Calculus I</td>
<td>4</td>
</tr>
<tr>
<td><strong>BET 105</strong> Writing and Research</td>
<td>3</td>
</tr>
<tr>
<td><strong>CS 110</strong> Freshman orientation</td>
<td>1</td>
</tr>
<tr>
<td><strong>CS 276</strong> Intro to Computer Science</td>
<td>1</td>
</tr>
<tr>
<td><strong>EGR 100</strong> Engineering Orientation</td>
<td>1</td>
</tr>
<tr>
<td><strong>CS 276</strong> Software Design Studio</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Semester</th>
<th>Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CS 106</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>CS 276</strong> Software Design Studio</td>
<td>3</td>
</tr>
</tbody>
</table>
CS 123
MATH 231
liberal education elective
PHYS 211
HST 105
Semester Hours 16
1212-16

Second Year
First Semester
CS 225
CS 233
MATH 241
PHYS 212
liberal education elective
Semester Hours 1816

Second Semester
CS 241
CS 244FCS 361
MATH 415
PHYS 343
liberal education elective
Semester Hours 1816

Third Year
First Semester
CS 246CS 357
CS 244
CS 372F
CS Technical elective
liberal education elective
Free elective
Semester Hours 1816

Second Semester
MATH 446CS 210
CS Technical elective
liberal education elective
Free elective
Semester Hours 1816
<table>
<thead>
<tr>
<th>Fourth Year</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td>126</td>
</tr>
<tr>
<td>CS 121, Programming Languages &amp; Compilers</td>
<td>3</td>
</tr>
<tr>
<td>CS Technical track elective</td>
<td>3</td>
</tr>
<tr>
<td>Liberal education elective</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>3</td>
</tr>
<tr>
<td>Semester Hours</td>
<td>165</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second Semester</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS Technical track elective</td>
<td>6</td>
</tr>
<tr>
<td>Technical track elective</td>
<td>2</td>
</tr>
<tr>
<td>Electives</td>
<td>2</td>
</tr>
<tr>
<td>Semester Hours</td>
<td>152</td>
</tr>
<tr>
<td>Total Hours:</td>
<td>128</td>
</tr>
</tbody>
</table>

This optional course is highly recommended for freshmen who may use it to help meet elective requirements.

* Normally, CS entering freshmen should take CS 121 in their first semester and CS 122 in their second semester. Students planning on studying abroad should take CS 121 in their first semester.
* MATH 220 may be substituted with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with an background in calculus.
* BIOT 105 should be taken in the first or second semester of the first year or authorized. The alternative is a social sciences or humanities elective.

* Liberal education elective must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus general education lists. The remaining 6 hours may be selected from a list maintained by the college, or, additionally, one course from the campus general education list for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (1) one western/cultural studies course and (2) one non-western/minority culture(s) course from the General Education cultural studies list. Most students select liberal education courses that simultaneously satisfy their cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used to satisfy the cultural studies requirements.

* To be known from departmentally approved list for Technical Track Option enhances, and to include at least three courses from a single focus area and a team project course.
Appendix A:  
(Proposed Curriculum Revisions)

<table>
<thead>
<tr>
<th>Current Requirements:</th>
<th>Current Hours</th>
<th>Revised Requirements:</th>
<th>Revised Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Core Requirement</strong></td>
<td><strong>Major Core Requirement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 100 (recommended)</td>
<td>(1)</td>
<td>CS 100 (recommended)</td>
<td>(1)</td>
</tr>
<tr>
<td>CS 125</td>
<td>4</td>
<td>CS 125</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CS 126</td>
<td>3</td>
</tr>
<tr>
<td>CS 173</td>
<td>3</td>
<td>CS 173</td>
<td>3</td>
</tr>
<tr>
<td>CS 210</td>
<td>2</td>
<td>CS 210</td>
<td>2</td>
</tr>
<tr>
<td>CS 225</td>
<td>4</td>
<td>CS 225</td>
<td>4</td>
</tr>
<tr>
<td>CS 231</td>
<td>3</td>
<td>CS 233</td>
<td>4</td>
</tr>
<tr>
<td>CS 232</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 241</td>
<td>4</td>
<td>CS 241</td>
<td>4</td>
</tr>
<tr>
<td>CS 242</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 357*</td>
<td>3</td>
<td>CS 357*</td>
<td>3</td>
</tr>
<tr>
<td>CS 373</td>
<td>3</td>
<td>CS 374</td>
<td>4</td>
</tr>
<tr>
<td>CS 473*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 421*</td>
<td>3</td>
<td>CS 421*</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL CORE</strong></td>
<td><strong>TOTAL CORE</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* In the current curriculum, CS 357, 473, and 421 are typically listed as part of each CS Technical Track (below). We have separated them out and listed them above because they are viewed as “core” courses, and because this makes clear the proposed changes to the curriculum.

**CS Technical Track Requirement (select one)**
- CS track
- Math track
- CSE track

| CS Technical Electives | 24 |

** The hours listed in the technical tracks excludes those for CS 357, 421, and 473, because those are included above under Core Requirements.

**Supporting Math/Science**

| MATH 221 | 4 | MATH 221 | 4 |
| MATH 231 | 3 | MATH 231 | 3 |
| MATH 241 | 4 | MATH 241 | 4 |
| MATH 415 | 3 | MATH 415 | 3 |
| MATH 461 or 463 | 3 | CS 361 | 3 |
| PHYS 211 | 4 | PHYS 211 | 4 |
| PHYS 212 | 4 | PHYS 212 | 4 |
| PHYS 213 or 214 | 2 | | |
| CHEM 102 & 103 | 4 | Science elective | 3 |
| **TOTAL MATH/SCI** | **TOTAL MATH/SCI** | | |

| **Electives** | **Electives** |
| 41 | 42 |

*** Includes Rhetoric, advanced composition, foreign language, and campus & college general education requirements
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A combined B.S.-M.S. Computer Science degree program is available. Its admission and course requirements are described in the College of Engineering program information section.

A Software Engineering Certificate is also available to all students in the computer science curriculum interested in a career in software engineering. It provides the depth and breadth necessary for satisfying possible future software engineering accreditation requirements.

Overview of Curricular Requirements

The curriculum requires 128 hours for graduation and is organized as shown below.

A technical grade point average requirement for graduation applies to students in this curriculum. This rule is summarized at the College of Engineering's undergraduate advising Web site.

Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your
career goals. They also provide the skills to work effectively and successfully in the engineering profession.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>CS 100—Freshman Orientation in CS\textsuperscript{1,2}</td>
</tr>
<tr>
<td>2</td>
<td>CS 210—Ethical &amp; Professional Issues</td>
</tr>
<tr>
<td>0</td>
<td>ENG 100—Engineering Orientation\textsuperscript{2}</td>
</tr>
<tr>
<td>2</td>
<td>Total</td>
</tr>
</tbody>
</table>

1. This optional course is highly recommended and may be used to help meet free elective requirements. 2. External transfer students take ENG 300 - Transfer Orientation instead.

**Foundational Mathematics and Science**

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>MATH 221—Calculus I\textsuperscript{1}</td>
</tr>
<tr>
<td>3</td>
<td>MATH 231—Calculus II</td>
</tr>
<tr>
<td>4</td>
<td>MATH 241—Calculus III</td>
</tr>
<tr>
<td>3</td>
<td>MATH 415—Applied Linear Algebra</td>
</tr>
<tr>
<td>4</td>
<td>PHYS 211—University Physics: Mechanics</td>
</tr>
<tr>
<td>4</td>
<td>PHYS 212—University Physics: Elec &amp; Mag</td>
</tr>
<tr>
<td>3</td>
<td>Science elective, from departmentally approved list</td>
</tr>
<tr>
<td>25</td>
<td>Total</td>
</tr>
</tbody>
</table>

1. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

**Computer Science Technical Core**

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of computer science.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>CS 125—Intro to Computer Science</td>
</tr>
<tr>
<td>3</td>
<td>CS 126—Software Design Studio</td>
</tr>
<tr>
<td>3</td>
<td>CS 173—Discrete Structures</td>
</tr>
<tr>
<td>4</td>
<td>CS 225—Data Structures</td>
</tr>
<tr>
<td>4</td>
<td>CS 233—Computer Architecture</td>
</tr>
<tr>
<td>4</td>
<td>CS 241—Systems Programming</td>
</tr>
<tr>
<td>3</td>
<td>CS 357—Numerical Methods I</td>
</tr>
</tbody>
</table>
Technical Electives

These courses stress the rigorous analysis and design principles practiced in major subdisciplines of computer science. Students select eight courses, at least six of which must be advanced CS courses. Three courses must be selected from one area of CS.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Technical electives to be chosen from departmentally approved list. Refer to department website.</td>
</tr>
</tbody>
</table>

Liberal Education

The liberal education courses develop students’ understanding of human culture and society, build skills of inquiry and critical thinking, and lay a foundation for civic engagement and lifelong learning.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Electives from the campus General Education social &amp; behavioral sciences list.</td>
</tr>
<tr>
<td>6</td>
<td>Electives from the campus General Education humanities &amp; the arts list.</td>
</tr>
<tr>
<td>6</td>
<td>Electives either from a list approved by the college, or from the campus General Education lists for social &amp; behavioral sciences or humanities &amp; the arts.</td>
</tr>
<tr>
<td>18</td>
<td>Total</td>
</tr>
</tbody>
</table>

Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.

Composition

These courses teach fundamentals of expository writing.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>RHET 105—Principles of Composition</td>
</tr>
<tr>
<td></td>
<td>Advanced Composition. May be satisfied by taking any course in either the</td>
</tr>
</tbody>
</table>
liberal education or free elective categories which has the Advanced Composition designation, or by completing CS 499 Senior Thesis.

| 4 | Total |

**Free Electives**
These unrestricted electives, subject to certain exceptions as noted at the College of Engineering advising Web site, give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Free electives not counted above Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site. At least 128 credit hours must be earned to graduate.</td>
</tr>
</tbody>
</table>

**Suggested Sequence**
The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

**First year**

<table>
<thead>
<tr>
<th>Hours</th>
<th>First Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Science elective</td>
</tr>
<tr>
<td>1</td>
<td>CS 100—Freshman Orientation in CS¹</td>
</tr>
<tr>
<td>4</td>
<td>CS 125—Intro to Computer Science</td>
</tr>
<tr>
<td>0</td>
<td>ENG 100—Engineering Orientation</td>
</tr>
<tr>
<td>4</td>
<td>MATH 221—Calculus ²</td>
</tr>
<tr>
<td>4-3</td>
<td>RHET 105—Principles of Composition ³ or Liberal education elective⁴</td>
</tr>
<tr>
<td>15-16</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CS 126—Software Design Studio</td>
</tr>
<tr>
<td>3</td>
<td>CS 173—Discrete Structures</td>
</tr>
<tr>
<td>3</td>
<td>MATH 231—Calculus II</td>
</tr>
<tr>
<td>4</td>
<td>PHYS 211—University Physics: Mechanics</td>
</tr>
<tr>
<td>Hours</td>
<td>Liberal education elective&lt;sup&gt;4&lt;/sup&gt; or RHET 105—Principles of Composition&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>16-17</td>
<td>Total</td>
</tr>
</tbody>
</table>

**Second year**

<table>
<thead>
<tr>
<th>Hours</th>
<th>First Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>CS 225—Data Structures</td>
</tr>
<tr>
<td>4</td>
<td>CS 233—Computer Architecture</td>
</tr>
<tr>
<td>4</td>
<td>MATH 241—Calculus III</td>
</tr>
<tr>
<td>4</td>
<td>PHYS 212—University Physics: Elec &amp; Mag</td>
</tr>
<tr>
<td>16</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>CS 241—Systems Programming</td>
</tr>
<tr>
<td>3</td>
<td>CS 361—Probability and Statistics for CS</td>
</tr>
<tr>
<td>3</td>
<td>MATH 415—Applied Linear Algebra</td>
</tr>
<tr>
<td>6</td>
<td>Liberal education electives&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>16</td>
<td>Total</td>
</tr>
</tbody>
</table>

**Third year**

<table>
<thead>
<tr>
<th>Hours</th>
<th>First Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CS 357—Numerical Methods I</td>
</tr>
<tr>
<td>4</td>
<td>CS 374—Algorithms and Models of Computation</td>
</tr>
<tr>
<td>3</td>
<td>CS Technical elective</td>
</tr>
<tr>
<td>3</td>
<td>Liberal education elective&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Free elective</td>
</tr>
<tr>
<td>16</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hours</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>CS Technical electives&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>CS 210—Ethical &amp; Professional Issues</td>
</tr>
<tr>
<td>3</td>
<td>Liberal education elective&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Free elective</td>
</tr>
<tr>
<td>17</td>
<td>Total</td>
</tr>
</tbody>
</table>

**Fourth year**

<table>
<thead>
<tr>
<th>Hours</th>
<th>First Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CS 421—Programming languages and compilers</td>
</tr>
<tr>
<td>6</td>
<td>CS Technical electives&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Liberal education elective&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
1. This optional course is highly recommended for freshmen, who may use it to help meet free elective requirements.

2. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

3. RHET 105 should be taken in the first or second semester of the first year as authorized. The alternative is a social sciences or humanities elective.

4. Liberal education electives must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used to satisfy the cultural studies requirements.

5. To be chosen from a departmentally approved list, and to include at least three courses from a single focus area.
CLEARANCES: (Clearances should include signatures and dates of approval. These signatures must appear on a separate sheet. If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)

Signatures:

_______________________________________  __________________________
Unit Representative:  Date:  2/1/2015

_______________________________________  __________________________
College Representative:  Date:

_______________________________________  __________________________
Graduate College Representative:  Date:

_______________________________________  __________________________
Council on Teacher Education Representative:  Date:
NEW COURSE OUTLINE

Departments/units should complete this form, obtain all necessary approvals and submit to their College Office to establish a new course. The outline will be reviewed by the College and forwarded to appropriate campus offices for additional approval.

All gray boxes on this form, except gray check boxes, are expandable text fields. Place your cursor in the box and start typing.

Instructions and guidance to complete certain numbered items in this form are contained in Proposing New Courses (http://provost.illinois.edu/programs/cps/proposingcourses.html) and Procedures for Presenting New or Revised Graduate Courses (http://www.grnd.illinois.edu/courses-procedures).

Proposed Effective Term: ☑ Fall  ☐ Spring  ☐ Summer – 2016
Department/Unit Name: CS
Department/Unit ORG Code: 1434

1. Course Subject and Number: CS 126
2. Course Title (limit to 30 characters): Software Design Studio
3. Course description (Include subject matter, and any special course requirements such as field trips, special equipment, etc. Exclude other course information of any numbered items below; the Office of the Registrar will include it in the Course Catalog entry. It should read like a publication abstract and ideally be limited to about 75 words): Fundamental principles and techniques of software development. Design, documentation, testing, and debugging software, with a significant emphasis on code review.
4. Course prerequisites (prerequisite statements are not enforced through the Banner system):
   CS 125
5. Is there a restricted audience for this course? (Audience restrictions may only be placed in the Class Schedule. Do not include in prerequisite statement.)
   ☑ Yes  ☐ No  If yes, please specify the restrictions (e.g., “for majors only” or “junior standing required”): for majors only

COURSE JUSTIFICATION

6. Please attach the course syllabus. The syllabus should include basic and recommended texts (author, title, year of publication) as well as a list of the principal topics covered in this course, number of examinations, contact hours, work required of students, and basis for determining grade.
7. Justify the course in terms of new subject matter and how the addition of this course relates to the overall pattern of courses in your unit: This course is being created to replace CS242-Programming Studio because we’ve recognized that our students would benefit from encountering the course material earlier in the curriculum. Changes are being made to make the course suitable for students who are
at an earlier point in our program and to introduce some human-computer interface content into our required course sequence.

8. Explain the nature and degree of duplication or overlap with existing courses on campus: This course has a significant degree of overlap with CS 242, which it will replace. This course contains introductory material related to a number of our electives (e.g., CS 427: Software Engineering, CS 465: User Interface Design), but is taught in considerably less depth and at a lower level than these courses.

Note: If the proposed course has significant overlap with an existing course outside your unit, please obtain a letter of comment from that unit’s executive officer.

COURSE DETAIL

9. Frequency with which this course will be offered (mark all that apply):
   - ☒ Every fall
   - ☒ Every spring
   - ☐ Every summer
   - ☐ Other (describe, e.g., “Spring terms, odd years”):

10. Duration of course: ☒ Full term
    ☐ Less than full term (describe):

11. Anticipated enrollment: 200

12. Expected distribution of student registration:
   - Freshman: 90%
   - Sophomore: 10%
   - Junior: ___%
   - Senior: ___%
   - Graduate: ___%
   - Professional: ___%

13. Course credit (The number of class contact hours in organized instruction is one factor affecting the amount of credit earned. It is customary for courses to meet 14 to 20 hours per semester for each hour of credit earned. See Student Code Article 3, Part 7, § 3-704 (b) [http://admin.illinois.edu/policy/code/article3_part7_3-704.html] for an explanation of the relationship between course credit and contact hours.):

   A. Undergraduate credit only
      100- to 300-level: ___* undergraduate hours
      400-level: _____* undergraduate hours (no graduate credit available)

   B. Both Undergraduate and Graduate credit
      400-level: _____* undergraduate hours and 400-level: _____* graduate hours
      Note: Courses offered for both undergraduate and graduate credit require completion of Item 14.

   C. Graduate credit only
      500-level: _____* graduate hours
      Note: Courses offered for graduate credit require completion of Item 14.

   D. Professional credit only
      600- and 700-level: _____* professional hours

   E. Both Graduate and Professional credit
* graduate hours and * professional hours

Note: Courses offered for both graduate and professional credit require completion of Item 14.

* For A-E, if a course is offered for varying amounts of credit please select one of the two options
  □ Variable credit: this course is available for a range of credit hours (e.g., 1 to 3 hours)
  □ Differential credit: this course is only available for two distinct credit-hour options (e.g., 1 or 3 hours)

In addition, complete Item 15.

14. For any course awarding graduate credit, please justify why it should, in terms of level of content, previous knowledge required, relevance to current research, methodology, etc. (See *Graduate College Policy for Proposed New and Revised Courses that Carry Graduate Credit* for criteria to judge graduate courses.): ______

15. For any course requesting variable or differential credit, please justify why the amount of credit varies and specify the work required for the additional credit: ______

16. May this course be repeated? (See *Procedures for Presenting New or Revised Graduate Courses* or Provost's *Proposing New Courses* for guidance in completing Parts A - C.)
   □ Yes  ☑ No  If yes, please fill out A - C below:

   A. Course Type

   Indicate the one type of course the proposed course matches:

   □ Honors  □ Subject mastery/skill proficiency  □ Individualized instruction
   □ Research or ongoing study  □ Special topics, seminars  □ Applied experiences

   B. Repeatable – same term

   May students register in this course more than once (duplicate registration) in the same term?

   □ Yes  □ No  If yes, for how many total hours (fill all fields: NA = not applicable; U = unlimited)?

   ______ undergraduate; ______ graduate; ______ professional

   □ check if “if topics vary” is an added qualifier

   C. Repeatable – separate terms

   May this course be repeated in separate terms?

   □ Yes  □ No  If yes, for how many total hours (fill all fields: NA = not applicable; U = unlimited)?

   ______ undergraduate; ______ graduate; ______ professional

   □ check if “if topics vary” is an added qualifier

17. Are there credit restrictions?

   ☑ Yes  □ No  If yes, please specify the restrictions (e.g., for MATH 221: “Credit is not given for both MATH 221 and MATH 220.”): Credit is not given for both CS 242 and CS 126.

18. Grading Type:

   ☑ Letter grade
   □ S/U (Any course offered for zero hours of graded credit must include S/U grade mode.)
   □ Both  If Both is selected, which should be the default mode? □ Letter grade  □ S/U
   □ DFR  If DFR is selected, please justify the use of the grade: ______
CROSS-LISTING

19. Is this course to be cross-listed?
   □ Yes  ☒ No     If yes, please complete A and B and take notice of C:

   A. Indicate the subject and course number of the cross-listing(s) (please note, all cross-listed courses must be offered at the same numerical level): _____

   B. Please give the justification for establishing the cross-listing: _____

   C. Note: Additional approvals are required to establish a cross-listing. An authorized official of each non-controlling department must endorse the cross-listing. In addition, if the cross-listing involves a different college, a dean of that college must also approve. (Letter, e-mail, or use of the Additional Approvals signature block at the end of this form are all acceptable methods of endorsement or approval.)

ADDITIONAL COURSE INFORMATION

20. Does this course replace an existing course?
   ☒ Yes  □ No     If yes, please list the course to be discontinued and note that submission of a Course Revision Form is necessary to remove it from the Course Catalog: CS 242 - will be discontinued after students who still need to take it have cycled through

21. Does the addition of this course impact other courses (i.e., prerequisite or credit restriction statements)?
   ☒ Yes  □ No     If yes, please list the course(s) affected, and note that submission of Course Revision Form(s) are necessary to update the impacted course(s): Will serve as a prerequisite course for CS 225.

22. Does the addition of this course have any impact on your department’s current curriculum (i.e., Programs of Study catalog, concentrations, minors, etc.)?
   ☒ Yes  □ No     If yes, please specify the curriculum and explain: Will be a required course for all undergraduate CS programs.

23. Has this course been offered as a special topics or other type of experimental course?
   ☒ Yes  □ No     If yes, please indicate the Banner subject, course number, section ID, term, and enrollment for each offering: CS 142, from which CS 126 is derived has been taught each semester at scale. A pilot of the new CS 126 is currently being taught as CS 199 section SDS, fall 2014, 4 enrolled. Planned offering as CS 199 section 126 in Fall 2015

24. Will this course be submitted for General Education credit?
   □ Yes  ☒ No

25. Does this course require students to register in multiple schedule components (e.g., lecture and a lab)?
   □ Yes  ☒ No

26. Is a special facility needed to effectively teach this class (e.g., lab, studio, or ITS room)?
   □ Yes  ☒ No     If yes, please describe: _____

27. Will this course be offered on-line?
☐ Yes, online only  ☐ Yes, online and traditionally  ☒ No
28. Faculty member(s) who will teach this course: Mike Woodley, Lawrence Angrave
29. Course proposed by: Lenny Pitt  Date: August 21, 2015
NEW COURSE OUTLINE APPROVALS  Course Subject and Number: CS 126

(Signatures required)

[Signature]
Department/Unit

8/21/2015
Date

[Signature]
School (if applicable)

9/28/15
Date

[Signature]
College

Graduate College (Requests for Graduate Credit)

Kathryn A. Martensen
Provost

Date

ADDITIONAL APPROVAL(S)

The space below may be used for additional approvals involving cross-listed courses. – see Section 19.C. – in lieu of letters or e mails, indicate department or college after signature and provide date.

Revised 8/2012
Syllabus for CS 126 - Software Design Studio

**CREDIT:** 3 undergraduate hours

**MEETING SCHEDULE/CONTACT HOURS:** Three 50-minute or two 75-minute lectures and/or guided discussion sections (3 contact hours) per week.


**TOPIC OUTLINE:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style, refactoring, code reviews</td>
<td>7</td>
</tr>
<tr>
<td><em>layout, commenting, variable usage and naming, writing control structures</em></td>
<td></td>
</tr>
<tr>
<td>Test-driven development, testing frameworks, coverage</td>
<td>6</td>
</tr>
<tr>
<td><em>Defensive programming, assertions, exceptions recursion review in assignments (in this section or the one above)</em></td>
<td></td>
</tr>
<tr>
<td>Design, design of routines, object-oriented design</td>
<td>7</td>
</tr>
<tr>
<td><em>Design patterns, event-driven programming, model/view/controller (MVC)</em></td>
<td></td>
</tr>
<tr>
<td>User interface design, usability guidelines, GUI frameworks, prototyping, user testing</td>
<td>6</td>
</tr>
<tr>
<td>Debugging and debuggers</td>
<td>3</td>
</tr>
<tr>
<td>Client/server architecture, http, JSON, noSQL data storage</td>
<td>3</td>
</tr>
<tr>
<td>C++ syntax; pointers (new/free), operator overloading, templates; tools: make, valgrind, gdb</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

**GRADING BASIS:**
Students do weekly programming assignments and meet in groups for code reviews, moderated by teaching assistants. The grade is based 90% on the assignments, and 10% on a handful of quizzes throughout the semester.

**PROPOSED BY:** Lenny Pitt
NEW COURSE OUTLINE

Departments/units should complete this form, obtain all necessary approvals and submit to their College Office to establish a new course. The outline will be reviewed by the College and forwarded to appropriate campus offices for additional approval.

All gray boxes on this form, except gray check boxes, are expandable text fields. Place your cursor in the box and start typing.

Instructions and guidance to complete certain numbered items in this form are contained in Proposing New Courses (http://provost.illinois.edu/programs/cps/proposingcourses.html) and Procedures for Presenting New or Revised Graduate Courses (http://www.grad.illinois.edu/courses-procedures).

Proposed Effective Term: ☑ Fall ☐ Spring ☐ Summer – 2016
Department/Unit Name: Computer Science
Department/Unit ORG Code: 1434

1. Course Subject and Number: CS 361
2. Course Title (limit to 30 characters): Prob & Stat for Computer Sci
3. Course description (Include subject matter, and any special course requirements such as field trips, special equipment, etc. Exclude other course information of any numbered items below; the Office of the Registrar will include it in the Course Catalog entry. It should read like a publication abstract and ideally be limited to about 75 words.):
   Introduction to probability theory and statistics with applications to computer science. Topics include: visualizing data, datasets, summarizing data, basic descriptive statistics, conditional probability, independence, Bayes theorem, random variables, joint and conditional distributions, expectation, variance and covariance, central limit theorem, Markov inequality, Chebyshev inequality, law of large numbers, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, maximum likelihood estimation, Bayes estimation, hypothesis testing, confidence intervals, linear regression, principal component analysis, classification, and decision trees.
4. Course prerequisites (prerequisite statements are not enforced through the Banner system):
   Math 220 or 221: credit or concurrent registration in Math 225
5. Is there a restricted audience for this course? (Audience restrictions may only be placed in the Class Schedule. Do not include in prerequisite statement.)
   ☑ Yes ☐ No If yes, please specify the restrictions (e.g., “for majors only” or “junior standing required”): For majors only

COURSE JUSTIFICATION
6. Please attach the course syllabus. The syllabus should include basic and recommended texts (author, title, year of publication) as well as a list of the principal topics covered in this course, number of examinations, contact hours, work required of students, and basis for determining grade.

7. Justify the course in terms of new subject matter and how the addition of this course relates to the overall pattern of courses in your unit: This course offers familiarity with practical ideas in probability and statistics. The course is intended to replace a probability/statistics requirement that does not cover topics needed later in Computer Science curricula. The subject matter is a new composite of traditional topics. The course emphasizes statistical topics much more than comparable probability courses. In comparison with statistics courses, there is more information on algorithmic ideas like simulation and pagerank, and we treat topics traditionally omitted from a first course (principal component analysis, classification, linear regression, decision trees), because they are of great value to practicing computer scientists. There is heavier emphasis on multivariate models, common in computer science practice, than in the current requirement. We do not emphasize topics that are traditionally important (hypothesis testing; combinatorial probability; central limit theorem; distributions other than normal, Poisson, beta, gamma, exponential) because they are of less immediate relevance to computer science students. A strong percentage of the homework involves writing practical data analysis programs with messy, publicly available datasets (for example, obtaining data for and constructing estimates of correlation between planetary temperature and FEMA declared disasters; classifying large datasets treating expected earnings).

8. Explain the nature and degree of duplication or overlap with existing courses on campus: Potential overlap is with Math 461, Stat 400, and ECE 313. Math 461 treats: Combinatorial Analysis. 4 hours: Axioms of Probability. 4 hours Conditional Probability and Independence. 4 hours: Random Variables. 6 hours: Continuous Random Variables. 7 hours: Jointly Distributed Random Variables. 5 hours: Properties of Expectations. 7 hours: Limit Theorems. 3 hours (data from http://www.math.uiuc.edu/~kkirkpat/461C13.html). In contrast, this course deals with continuous random variables, limit theorems, combinatorial probability, and expectations rather superficially. This course covers visualizing datasets, summarizing data, basic descriptive statistics, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, maximum likelihood estimation, Bayes estimation, hypothesis testing, confidence intervals, linear regression, principal component analysis, classification, and decision trees. Math 461 does not deal with these topics. The overlap is likely 1/3 of content.

Stat 400 covers: Probability and random variables; Discrete and continuous distributions; The central limit theorem and normal approximation; Point estimation and confidence intervals; Hypothesis testing (data from http://publish.illinois.edu/xiaoluichen/teaching/stat400/). In contrast, this course covers visualizing datasets, summarizing data, basic descriptive statistics, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, linear regression, principal component analysis, classification, and decision trees. Stat 400 does not deal with these topics. The overlap is likely 40% of content.

ECE 313 covers probability and random variables; discrete and continuous distributions; hypothesis testing in
some detail: parameter estimation; correlation; joint distributions in various forms; the law of large numbers; and the central limit theorem (after the description in https://courses.engr.illinois.edu/ece313/). There is considerably more emphasis on mathematical detail and precision than in the proposed course. There is little algorithmic material. The proposed course covers visualizing datasets, summarizing data, basic descriptive statistics, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, linear regression, principal component analysis, classification, and decision trees. ECE 313 does not deal with these topics. The overlap is likely 50% of content.

Note: If the proposed course has significant overlap with an existing course outside your unit, please obtain a letter of comment from that unit's executive officer.

COURSE DETAIL

9. Frequency with which this course will be offered (mark all that apply):
   • Every fall  • Every spring  □ Every summer  □ Other (describe, e.g. “Spring terms, odd years”): ______

10. Duration of course: • Full term  □ Less than full term (describe): ______

11. Anticipated enrollment: 150

12. Expected distribution of student registration:
   Freshman: _____%  Sophomore: 15%
   Junior: 70%  Senior: 15%
   Graduate: _____%  Professional: _____%

13. Course credit (The number of class contact hours in organized instruction is one factor affecting the amount of credit earned. It is customary for courses to meet 14 to 20 hours per semester for each hour of credit earned. See Student Code Article 3, Part 7, § 3-704 (b) [http://admin.illinois.edu/policy/code/article3_part7_3-704.html] for an explanation of the relationship between course credit and contact hours.):

A. Undergraduate credit only
   100- to 300-level: 2* undergraduate hours
   400-level: _____* undergraduate hours (no graduate credit available)

B. Both Undergraduate and Graduate credit
   400-level: _____* undergraduate hours and 400-level: _____* graduate hours
   Note: Courses offered for both undergraduate and graduate credit require completion of Item 14.

C. Graduate credit only
   500-level: _____* graduate hours
   Note: Courses offered for graduate credit require completion of Item 14.

D. Professional credit only
   600- and 700-level: _____* professional hours

E. Both Graduate and Professional credit
graduate hours and professional hours

Note: Courses offered for both graduate and professional credit require completion of Item 14.

* For A-E, if a course is offered for varying amounts of credit please select one of the two options:
  □ Variable credit: this course is available for a range of credit hours (e.g., 1 to 3 hours)
  □ Differential credit: this course is only available for two distinct credit-hour options (e.g., 1 or 3 hours)
  In addition, complete Item 15.

14. For any course awarding graduate credit, please justify why it should, in terms of level of content, previous knowledge required, relevance to current research, methodology, etc. (See Graduate College Policy for Proposed New and Revised Courses that Carry Graduate Credit for criteria to judge graduate courses.): ______

15. For any course requesting variable or differential credit, please justify why the amount of credit varies and specify the work required for the additional credit: ______

16. May this course be repeated? (See Procedures for Presenting New or Revised Graduate Courses or Provost's Proposing New Courses for guidance in completing Parts A - C.)
  □ Yes  □ No  If yes, please fill out A - C below:

A. Course Type
Indicate the one type of course the proposed course matches:
  □ Honors  □ Subject mastery/skill proficiency  □ Individualized instruction
  □ Research or ongoing study  □ Special topics, seminars  □ Applied experiences

B. Repeatable – same term
May students register in this course more than once (duplicate registration) in the same term?
  □ Yes  □ No  If yes, for how many total hours (fill all fields: NA = not applicable; U = unlimited)?
    ______ undergraduate; ______ graduate; ______ professional
  □ check if “if topics vary” is an added qualifier

C. Repeatable – separate terms
May this course be repeated in separate terms?
  □ Yes  □ No  If yes, for how many total hours (fill all fields: NA = not applicable; U = unlimited)?
    ______ undergraduate; ______ graduate; ______ professional
  □ check if “if topics vary” is an added qualifier

17. Are there credit restrictions?
  □ Yes  □ No  If yes, please specify the restrictions (e.g., for MATH 221: “Credit is not given for both MATH 221 and MATH 220.”): Credit is not given for both CS 361 and ECE 313

18. Grading Type:
  □ Letter grade
  □ S/U (Any course offered for zero hours of graded credit must include S/U grade mode.)
  □ Both  If Both is selected, which should be the default mode? □ Letter grade □ S/U
  □ DFR  If DFR is selected, please justify the use of the grade: ______
CROSS-LISTING

19. Is this course to be cross-listed?
☑ Yes ☐ No  If yes, please complete A and B and take notice of C:

A. Indicate the subject and course number of the cross-listing(s) (please note, all cross-listed courses must be offered at the same numerical level): STAT 361

B. Please give the justification for establishing the cross-listing: The course will also be an elective course in the Statistics & CS major. Faculty from Statistics may teach the course from time to time.

C. Note: Additional approvals are required to establish a cross-listing. An authorized official of each non-controlling department must endorse the cross-listing. In addition, if the cross-listing involves a different college, a dean of that college must also approve. (Letter, e-mail, or use of the Additional Approvals signature block at the end of this form are all acceptable methods of endorsement or approval.)

ADDITIONAL COURSE INFORMATION

20. Does this course replace an existing course?
☐ Yes ☑ No  If yes, please list the course to be discontinued and note that submission of a Course Revision Form is necessary to remove it from the Course Catalog: _____

21. Does the addition of this course impact other courses (i.e., prerequisite or credit restriction statements)?
☑ Yes ☐ No  If yes, please list the course(s) affected, and note that submission of Course Revision Form(s) are necessary to update the impacted course(s): ECE 313 credit restriction

22. Does the addition of this course have any impact on your department's current curriculum (i.e., Programs of Study catalog, concentrations, minors, etc.)?
☑ Yes ☐ No  If yes, please specify the curriculum and explain: This course replaces a requirement in our current CS curriculum that students take either MATH 461 or STAT 400.

23. Has this course been offered as a special topics or other type of experimental course?
☑ Yes ☐ No  If yes, please indicate the Banner subject, course number, section ID, term, and enrollment for each offering: CS 498 section DAF FA12. 27 enrolled; FA13. 52 enrolled; FA14. 88 enrolled; CS 498 section CI 1 SP15. 72 enrolled. The discrepancy between the proposed enrollment (~150) and the enrollments of previous CS 498 Special Topics offerings of this course (~75-80) can be explained by the persistence of advising material showing the current options for satisfying this requirement (MATH 461 and MATH 463/STAT 400).

24. Will this course be submitted for General Education credit?
☐ Yes ☑ No

25. Does this course require students to register in multiple schedule components (e.g., lecture and a lab)?
☑ Yes ☐ No

26. Is a special facility needed to effectively teach this class (e.g., lab, studio, or ITS room)?

- 5 -
☐ Yes  ☒ No  If yes, please describe:  

27. Will this course be offered on-line?
   ☐ Yes, online only  ☒ Yes, online and traditionally  ☐ No

28. Faculty member(s) who will teach this course: David Forsyth, and others as available and needed

29. Course proposed by: Lenny Pitt  Date: August 20, 2015
NEW COURSE OUTLINE APPROVALS  Course Subject and Number: CS 361
(Signatures required)

[Signature]
Department/Unit

8/20/2015
Date

School (if applicable)

[Signature]
College

9/30/15
Date

Graduate College (Requests for Graduate Credit)

[Signature]
Kathryn A. Martensen
Provost

[Signature]

Date

ADDITIONAL APPROVAL(S)

The space below may be used for additional approvals involving cross-listed courses. — see Section 19.C; — in lieu of letters or e-mails. Indicate department or college after signature and provide date.

Revised 8/2012
Syllabus for CS 361 Prob & Stat for Computer Sci

Credit: 3 hours

Meeting schedule/contact hours: Three 50-minute or two 75-minute lecture/discussion sections


Topic Outline:
See the course website for the most recent syllabus:
http://luthuli.cs.uiuc.edu/~daf/courses/Probcourse/Probcourse_2014/498_home.html

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Statistics</td>
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</tr>
<tr>
<td>Discrete Probability</td>
<td>4</td>
</tr>
<tr>
<td>Expectations</td>
<td>3</td>
</tr>
<tr>
<td>Continuous probability</td>
<td>1.5</td>
</tr>
<tr>
<td>Standard distributions</td>
<td>1.5</td>
</tr>
<tr>
<td>Maximum likelihood inference</td>
<td>4.5</td>
</tr>
<tr>
<td>Bayesian inference</td>
<td>1.5</td>
</tr>
<tr>
<td>Populations and Sampling</td>
<td>3</td>
</tr>
<tr>
<td>Hypothesis testing</td>
<td>1.5</td>
</tr>
<tr>
<td>Confidence intervals</td>
<td>1.5</td>
</tr>
<tr>
<td>Plotting high dimensional data</td>
<td>3</td>
</tr>
<tr>
<td>Principal components analysis</td>
<td>3</td>
</tr>
<tr>
<td>Linear Regression</td>
<td>3</td>
</tr>
<tr>
<td>Classification</td>
<td>4.5</td>
</tr>
<tr>
<td>Randomized Decision Trees</td>
<td>1.5</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

Number of exams: one midterm, one final

Work required of students: Attend lecture and participate. Complete homeworks (currently 7). Complete midterm and final exam.

Basis for determining grade: Homework grades, midterm grades, and final grade. Typical weights: 1 each for first six homeworks; 2 for final homework; 2 for midterm; 4 for final.

Proposed by: Lenny Pitt
Rob A. Rutenbar  
Abel Bliss Professor and Head  
Department of Computer Science  
University of Illinois at Urbana-Champaign

Dear Rob:

I am writing to confirm the support of the Department of Electrical and Computer Engineering for Prob & Stat for Comp Sci, CS 361, despite its substantial overlap (~50% material) with ECE 313. We recognize that the 50% content of the proposed CS 361 that is not covered in ECE 313 is of essential nature for CS majors and, furthermore, large enrollment numbers in both CS and ECE make serving the CS students with a modified version of ECE 313 impracticable. We are therefore comfortable in providing support for the proposed CS 361.

Sincerely,

Erhan Kudeki

Professor and Associate Head for Undergraduate Affairs  
Department of Electrical and Computer Engineering  
University of Illinois at Urbana-Champaign
Subject: CS and Stat/CS course and curriculum proposals
Date: Wednesday, December 3, 2014 12:21:50 PM Central Standard Time
From: Simpson, Douglas G
To: Pitt, Leonard B
CC: Rutenbar, Rob, Simpson, Douglas G, Carney, Karen M

Dear Lenny,

Thank you for the opportunity to review and work with you on the course and curriculum proposals for:

1) Proposed CS 361, "Prob/Stat for Computer Science;"
2) Proposed revision of the STAT/CS major; and
3) Revision of CS requirements in Statistics and probability.

I write to indicate the Department of Statistics approval of the following:

1) Statistics wishes to cross-list CS 361 as STAT 361;
2) Statistics approves of the revised Statistics and Computer Science major;
3) Statistics approves of the change in the undergraduate CS/Engineering degree program that replaces the Math 461 or Stat 400 requirement with the new CS/STAT 361 requirement.

Best regards,
Doug Simpson

================================
Douglas G. Simpson
Professor and Chair
Department of Statistics
University of Illinois at Urbana-Champaign
================================
Subject: Re: Proposal for the UAC
Date: Wednesday, December 31, 2014 1:29:24 PM Central Standard Time
From: Ahlgren, Scott David
To: Pitt, Leonard B
CC: , Muncaster, Robert G, Ando, Matthew A

Dear Lenny,

The Undergraduate Affairs Committee in the Math Department voted on this before the break, and approved the following proposal:

1) We approve of the proposed revision of the Math & CS degree in LAS
2) We approve of the proposed changes to the CS degree in Engineering.
3) We approve of the proposed revision to CS 473, which is cross-listed with MATH 473
4) We are aware of the overlap between our course Math 461 and the proposed course CS 361 (cross-listed with STAT 361), and the overlap with ECE 313 (cross-listed as MATH 362), and we are agreeable to the creation of this course.

Best,
Scott

On Dec 17, 2014, at 6:38 AM, Pitt, Leonard B <pitt@illinois.edu> wrote:

attached

On Wed12/17/14 Dec 17,6:26 AM, "Ahlgren, Scott David" <sahlgren@illinois.edu> wrote:

Hello,

Would you be able to send the revised proposals so that it's clear what is being approved? I think that we only have the old proposals.

Thanks,
Scott

________________________
Subject: CS and Stat/CS course and curriculum proposals  
Date: Wednesday, December 3, 2014 12:21:50 PM Central Standard Time  
From: Simpson, Douglas G  
To: Pitt, Leonard B  
CC: Rutenbar, Rob, Simpson, Douglas G, Carney, Karen M  

Dear Lenny,  

Thank you for the opportunity to review and work with you on the course and curriculum proposals for:  

1) Proposed CS 361, "Prob/Stat for Computer Science;"  
2) Proposed revision of the STAT/CS major; and  
3) Revision of CS requirements in Statistics and probability.  

I write to indicate the Department of Statistics approval of the following:  

1) Statistics wishes to cross-list CS 361 as STAT 361;  
2) Statistics approves of the revised Statistics and Computer Science major;  
3) Statistics approves of the change in the undergraduate CS/Engineering degree program that replaces the Math 461 or Stat 400 requirement with the new CS/STAT 361 requirement.  

Best regards,  
Doug Simpson  

================================  
Douglas G. Simpson  
Professor and Chair  
Department of Statistics  
University of Illinois at Urbana-Champaign  
================================
COURSE REVISION FORM

Departments/units should complete this form, obtain all necessary approvals and submit to their College Office to revise a course. The form will be reviewed by the College and forwarded to appropriate campus offices for additional approval.

All gray boxes on this form, except gray check boxes, are expandable text fields. Place your cursor in the box and start typing.

Instructions and guidance to complete certain items in this form are contained in Revising Existing Courses (http://provost.illinois.edu/programs/cps/revisingcourses.html)

<table>
<thead>
<tr>
<th>Department/Unit Name: Computer Science</th>
<th>Course Subject and Number: CS 373</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department/Unit ORG Code: 1434</td>
<td>Course Title: Theory of Computation</td>
</tr>
<tr>
<td>Proposed Effective Term:</td>
<td>Fall ☑ Spring ☑ Summer - 2016</td>
</tr>
</tbody>
</table>

Please indicate current course cross-listings*:

- COURSE DISCONTINUANCE (and all cross-lists*, if any); IF CHECKED, SKIP TO #3
  - OR— (check the box above or below)

- TYPE OF REVISION(S) (check all that apply)

  - Subject ☐ Add ☐ Remove ☐ Revise – Cross-List*
  - Number ☐ Add ☐ Remove ☐ Revise – Differential Credit
  - Title ☐ Add ☐ Remove ☐ Revise – Repeatability
  - Credit Hours ☐ Add ☐ Remove ☐ Revise – Credit Restriction
  - Description (subject matter) ☐ Add ☐ Remove ☐ Revise – Prerequisite
  - Grade Mode (e.g., request for use of DFR) ☐ Add ☐ Remove ☐

- Other, describe:

1. HOW REVISION(S) INDICATED APPEAR CURRENTLY:

2. HOW REVISION(S) INDICATED WOULD APPEAR AFTER CHANGE:

3. JUSTIFY REVISION OR REQUEST:

Some of the material in this course is dated and not of particular use to CS students. Some of the material of this course will be absorbed into a new course, CS 374 (proposal documents submitted at the same time as this document), as part of a revision of all Computer Science majors and the Computer Science minor. CS 374 will retain from CS 373 much of the material on regular languages and finite automata, as well as the topics on computability and limits of computation. Material that has been significantly minimized is that on context-free languages.

The prerequisite statements of several courses will be affected by this proposed revision. These courses are CS 421- Progrmg Languages & Compilers, CS 427-Software Engineering I, CS 446-Machine Learning, CS 447-Natural Language Processing, CS 476-Program Verification and CS 477-Formal Software Devel Methods. As part of the entire revision package, we have submitted course revision forms for each of the courses affected by the discontinuation of CS 373.

No majors or minors outside of the Computer Science department will be affected by the elimination of CS 373.

Proposed By: Lenny Pitt Date: August 28, 2015
*Note: Additional approvals are required.* An authorized official of each non-controlling, cross-listing department must endorse the revisions(s). In addition, if the cross-listing involves a different college, a dean of that college must also approve. (Letter, e-mail, or note written below the Approvals block are all acceptable methods of approval endorsement.)
COURSE REVISION FORM APPROVALS

Course Subject and Number: CS 273

(Signatures required)

[Signature]
Department/Unit

8/28/2015
Date

[Signature]
School (if applicable)

Date

[Signature]
College

9/14/15
Date

[Signature]
Graduate College (Request for Graduate Credit)

Date

Kathryn A. Martensen
Provost

Date

ADDITIONAL APPROVALS

The space below may be used for additional approvals involving cross-listed courses – cf. footnote * above – in lieu of letters or e-mails. Indicate department or college after signature and provide date.

Revised 8/2012
NEW COURSE OUTLINE

Departments/units should complete this form, obtain all necessary approvals and submit to their College Office to establish a new course. The outline will be reviewed by the College and forwarded to appropriate campus offices for additional approval.

All gray boxes on this form, except gray check boxes, are expandable text fields. Place your cursor in the box and start typing.

Instructions and guidance to complete certain numbered items in this form are contained in Proposing New Courses (http://provost.illinois.edu/programs/cps/proposingcourses.html) and Procedures for Presenting New or Revised Graduate Courses (http://www.grad.illinois.edu/courses-procedures).

Proposed Effective Term: ☒ Fall  ☐ Spring  ☐ Summer – 2016
Department/Unit Name: CS
Department/Unit ORG Code: 1434

1. Course Subject and Number: CS 374
2. Course Title (limit to 30 characters): Intro to Algs & Models of Comp
3. Course description (Include subject matter, and any special course requirements such as field trips, special equipment, etc. Exclude other course information of any numbered items below; the Office of the Registrar will include it in the Course Catalog entry. It should read like a publication abstract and ideally be limited to about 75 words):

   Analysis of algorithms, major paradigms of algorithm design including recursive algorithms, divide-and-conquer algorithms, dynamic programming, greedy algorithms, and graph algorithms. Formal models of computation including finite automata and Turing machines. Limitations of computation arising from fundamental notions of algorithm and from complexity-theoretic constraints. Reductions, undecidability and NP-completeness.

4. Course prerequisites (prerequisite statements are not enforced through the Banner system):
   CS 225; MATH 225 or MATH 415
5. Is there a restricted audience for this course? (Audience restrictions may only be placed in the Class Schedule.
   Do not include in prerequisite statement.)
   ☐ Yes  ☒ No  If yes, please specify the restrictions (e.g., “for majors only” or “junior standing required”):

COURSE JUSTIFICATION

6. Please attach the course syllabus. The syllabus should include basic and recommended texts (author, title, year of publication) as well as a list of the principal topics covered in this course, number of examinations, contact hours, work required of students, and basis for determining grade.
7. Justify the course in terms of new subject matter and how the addition of this course relates to the overall pattern of courses in your unit: This course is part of a curriculum revision, and allows students to learn fundamental theoretical concepts from Computer Science by taking a single four-hour course instead of two separate three-hour courses. The course is meant to replace within the curriculum both CS 373 (to be retired) and CS 473 (to be revised and made more advanced). It covers fundamentals of algorithm design and analysis at a junior level, instead of at a senior level, thereby allowing students to benefit from this knowledge in senior-level courses. The course will also be part of the new Computer Engineering curriculum.

8. Explain the nature and degree of duplication or overlap with existing courses on campus: The main overlap is with CS 373, which will be retired, and with CS 473, which will be revised to minimize the overlap. The revised CS 473 will include a deeper coverage of material contained here, but also many topics not covered here, including network flow, randomized and approximation algorithms, amortized analysis, and additional topics.

Note: If the proposed course has significant overlap with an existing course outside your unit, please obtain a letter of comment from that unit’s executive officer.

COURSE DETAIL

9. Frequency with which this course will be offered (mark all that apply):
   - Every fall
   - Every spring
   - Every summer
   - Other (describe, e.g. “Spring terms, odd years”):
   ____

10. Duration of course: Full term
    Less than full term (describe): ____

11. Anticipated enrollment: 300

12. Expected distribution of student registration:
    Freshman: ____
    Sophomore: 20%
    Junior: 60%
    Senior: 20%
    Graduate: ____
    Professional: ____

13. Course credit (The number of class contact hours in organized instruction is one factor affecting the amount of credit earned. It is customary for courses to meet 14 to 20 hours per semester for each hour of credit earned. See Student Code Article 3, Part 7, § 3-704 (b) [http://admin.illinois.edu/policy/code/article3_part7_3-704.html] for an explanation of the relationship between course credit and contact hours.):

   A. Undergraduate credit only
      100- to 300-level: 4* undergraduate hours
      400-level: ____* undergraduate hours (no graduate credit available)

   B. Both Undergraduate and Graduate credit
      400-level: ____* undergraduate hours and 400-level: ____* graduate hours
Note: Courses offered for both undergraduate and graduate credit require completion of Item 14.

C. Graduate credit only
500-level: _____* graduate hours
Note: Courses offered for graduate credit require completion of Item 14.

D. Professional credit only
600- and 700-level: _____* professional hours

E. Both Graduate and Professional credit
_____* graduate hours and _____* professional hours
Note: Courses offered for both graduate and professional credit require completion of Item 14.

* For A-E, if a course is offered for varying amounts of credit please select one of the two options:
  □ Variable credit: this course is available for a range of credit hours (e.g., 1 to 3 hours)
  □ Differential credit: this course is only available for two distinct credit-hour options (e.g., 1 or 3 hours)
In addition, complete Item 15.

14. For any course awarding graduate credit, please justify why it should, in terms of level of content, previous knowledge required, relevance to current research, methodology, etc. (See Graduate College Policy for Proposed New and Revised Courses that Carry Graduate Credit for criteria to judge graduate courses.): ______

15. For any course requesting variable or differential credit, please justify why the amount of credit varies and specify the work required for the additional credit: ______

16. May this course be repeated? (See Procedures for Presenting New or Revised Graduate Courses or Provost's Proposing New Courses for guidance in completing Parts A - C.)
  □ Yes  □ No  If yes, please fill out A - C below:

A. Course Type
Indicate the one type of course the proposed course matches:
  □ Honors  □ Subject mastery/skill proficiency  □ Individualized instruction
  □ Research or ongoing study  □ Special topics, seminars  □ Applied experiences

B. Repeatable – same term
May students register in this course more than once (duplicate registration) in the same term?
  □ Yes  □ No  If yes, for how many total hours (fill all fields: NA = not applicable; U = unlimited)?
     _____ undergraduate;   _____ graduate;   _____ professional
  □ check if “if topics vary” is an added qualifier

C. Repeatable – separate terms
May this course be repeated in separate terms?
  □ Yes  □ No  If yes, for how many total hours (fill all fields: NA = not applicable; U = unlimited)?
     _____ undergraduate;   _____ graduate;   _____ professional
  □ check if “if topics vary” is an added qualifier

17. Are there credit restrictions?
☐ Yes  ☒ No If yes, please specify the restrictions (e.g., for MATH 221: “Credit is not given for both MATH 221 and MATH 220.”): ______

18. Grading Type:

☒ Letter grade
☐ S/U (Any course offered for zero hours of graded credit must include S/U grade mode.)
☐ Both If Both is selected, which should be the default mode? ☐ Letter grade ☐ S/U
☐ DFR If DFR is selected, please justify the use of the grade: ______

CROSS-LISTING

19. Is this course to be cross-listed?

☒ Yes  ☐ No If yes, please complete A and B and take notice of C:

A. Indicate the subject and course number of the cross-listing(s) (please note, all cross-listed courses must be offered at the same numerical level): ECE 374

B. Please give the justification for establishing the cross-listing: It is a required course in both curricula, and both departments will contribute resources towards its delivery.

C. Note: Additional approvals are required to establish a cross-listing. An authorized official of each non-controlling department must endorse the cross-listing. In addition, if the cross-listing involves a different college, a dean of that college must also approve. (Letter, e-mail, or use of the Additional Approvals signature block at the end of this form are all acceptable methods of endorsement or approval.)

ADDITIONAL COURSE INFORMATION

20. Does this course replace an existing course?

☒ Yes  ☐ No If yes, please list the course to be discontinued and note that submission of a Course Revision Form is necessary to remove it from the Course Catalog: CS 373

21. Does the addition of this course impact other courses (i.e., prerequisite or credit restriction statements)?

☒ Yes  ☐ No If yes, please list the course(s) affected, and note that submission of Course Revision Form(s) are necessary to update the impacted course(s): CS 473

22. Does the addition of this course have any impact on your department’s current curriculum (i.e., Programs of Study catalog, concentrations, minors, etc.)?

☒ Yes  ☐ No If yes, please specify the curriculum and explain: As explained in the justification section, the course will replace CS 373 and CS 473 in the present curriculum.

23. Has this course been offered as a special topics or other type of experimental course?

☒ Yes  ☐ No If yes, please indicate the Banner subject, course number, section ID, term, and enrollment for each offering: CS 498 (special topics) section 374, spring 2014, 49 students; CS 498 Section BL1, FA14, 80 students; SP15, 385 students

- 4 -
24. Will this course be submitted for General Education credit?
   ☒ Yes  ☐ No

25. Does this course require students to register in multiple schedule components (e.g., lecture and a lab)?
   ☒ Yes  ☐ No

26. Is a special facility needed to effectively teach this class (e.g., lab, studio, or ITS room)?
   ☐ Yes  ☒ No  If yes, please describe: ____

27. Will this course be offered on-line?
   ☐ Yes, online only  ☒ Yes, online and traditionally  ☐ No

28. Faculty member(s) who will teach this course: Jeff Erickson, Chandra Chekuri, Lenny Pitt, Madhu Parthasarathy, Nitin Vaidya

29. Course proposed by: Lenny Pitt and Jeff Erickson  Date: August 27, 2015
NEW COURSE OUTLINE APPROVALS  Course Subject and Number: CS 374
(Signatures required)

Department/Unit

8/27/2015
Date

School (if applicable)

9/14/15
Date

College

Graduate College (Requests for Graduate Credit)

Kathryn A. Martensen

Provost

ADDITIONAL APPROVAL(S)

The space below may be used for additional approvals involving cross-listed courses, see Section 19.C; in lieu of letters or e-mails. Indicate department or college after signature and provide date.

Revised 8/2012
Syllabus: CS 374

Credit: 4 hours.

Textbook: None required, extensive notes are available online from instructors of this and other courses. Notes from the latest offering can be found here: https://courses. engr.illinois.edu/cs498374/lectures.html.

Exams: two 75-minute exams, plus final exam.

Contact hours: Three lecture hours and two discussion hours.

Work required: Regular written homework and quizzes, plus exams

Grade basis: Typical: 70% exams and quizzes, 30% homework

Topics Covered:

<table>
<thead>
<tr>
<th>Hours</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Intro to analysis of algorithms</td>
</tr>
<tr>
<td>4</td>
<td>Graph representations, traversal, topological sort</td>
</tr>
<tr>
<td>8</td>
<td>Finite automata and regular languages</td>
</tr>
<tr>
<td>4</td>
<td>Recursion, divide &amp; conquer</td>
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<tr>
<td>6</td>
<td>Dynamic programming</td>
</tr>
<tr>
<td>6</td>
<td>Greedy algorithms, shortest paths, minimum spanning trees</td>
</tr>
<tr>
<td>4</td>
<td>Context-free grammars and languages</td>
</tr>
<tr>
<td>10</td>
<td>Turing machines, universality, reductions, and computability</td>
</tr>
<tr>
<td>8</td>
<td>Reductions/NP-completeness/Cook-Levin theorem</td>
</tr>
<tr>
<td>4</td>
<td>Hourly exams and review</td>
</tr>
<tr>
<td>56</td>
<td><strong>TOTAL</strong> (this assumes four hours per week of new material and one hour per week of skills practice)</td>
</tr>
</tbody>
</table>

Proposed by: Lenny Pitt and Jeff Erickson
Below is an email from ECE dept. head Bill Sanders, endorsing CS/ECE 374.

From: Sanders, William H
Sent: Friday, October 31, 2014 4:41 PM
To: Pitt, Leonard B
Cc: Erickson, Jeff G; Kudeki, Erhan; Beck, Jeannette Garinger; Carlson, Jennifer Merry
Subject: Endorsement of new CS/ECE 374

Rob A. Ruttenbar
Abel Bliss Professor and Head
Department of Computer Science
University of Illinois at Urbana-Champaign

Dear Rob:

I am writing to confirm the support of the Department of Electrical and Computer Engineering for the new “Algorithms & Models of Comp” course, CS 374, which we would like to cross list as ECE 374. Computer Engineering majors will be taking ECE 374 as a required course for graduation. ECE is also willing and planning to help with the staffing of CS 374.

Sincerely,

William H. Sanders

Donald Biggar Willett Professor and Head
Department of Electrical and Computer Engineering
University of Illinois at Urbana-Champaign
December 23, 2015

Bettina Francis, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Francis:

Enclosed is a copy of a proposal from the College of Engineering to revise the Bachelor of Science in Computer Science.

Sincerely,

[Signature]
Kathryn A. Martensøn
Assistant Provost

Enclosures

c: K. Pitts
   L. Pitt
   A. Waranyuwat
Senate Educational Policy Committee
Proposal Check Sheet

PROPOSAL TITLE (Same as on proposal): _____

PROPOSAL TYPE (select all that apply below):

A. ☒ Proposal for a NEW or REVISED degree program. Please consult the Programs of Study Catalog for official titles of existing degree programs.

   1. Degree program level:
      ☐ Graduate    ☐ Professional    ☐ Undergraduate

   2. ☐ Proposal for a new degree (e.g. B.S., M.A. or Ph.D.):

      Degree name, “e.g., Bachelor of Arts or Master of Science”: _____

3. ☐ Proposal for a new or revised major, concentration, or minor:

   ☐ New or ☐ Revised Major in (name of existing or proposed major): _____

   ☐ New or ☐ Revised Concentration in (name of existing or proposed concentration): _____

   ☐ New or ☐ Revised Minor in (name of existing or proposed minor): _____

4. ☐ Proposal to rename an existing major, concentration, or minor:

   ☐ Major    ☐ Concentration    ☐ Minor

      Current name: _____

      Proposed new name: _____

5. ☐ Proposal to terminate an existing degree, major, concentration, or minor:

   ☐ Degree    ☐ Major    ☐ Concentration    ☐ Minor

      Name of existing degree, major, or concentration: _____

6. ☐ Proposal involving a multi-institutional degree:

   ☐ New    ☐ Revision    ☐ Termination

      Name of existing Illinois (UIUC) degree: _____

      Name of non-Illinois partnering institution: _____
Location of non-Illinois partnering institution:

☐ State of Illinois    ☐ US State: _____    ☐ Foreign country: _____

B. ☐ Proposal to create a new academic unit (college, school, department, program or other academic unit):

   Name of proposed new unit: _____

C. ☐ Proposal to rename an existing academic unit (college, school, department, or other academic unit):

   Current name of unit: _____
   Proposed new name of unit: _____

D. ☐ Proposal to reorganize existing units (colleges, schools, departments, or program):

   1. ☐ Proposal to change the status of an existing and approved unit (e.g., change from a program to department)

      Name of current unit including status: _____

   2. ☐ Proposal to transfer an existing unit:

      Current unit's name and home: _____
      Proposed new home for the unit: _____

   3. ☐ Proposal to merge two or more existing units (e.g., merge department A with department B):

      Name and college of unit one to be merged: _____
      Name and college of unit two to be merged: _____
      Proposed name and college of new (merged) unit: _____

   4. ☐ Proposal to terminate an existing unit:

      Current unit's name and status: _____

E. ☐ Other educational policy proposals (e.g., academic calendar, grading policies, etc.)

      Nature of the proposal: _____

   Revised 10/2012