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ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE:

Revision to the Bachelor of Science in Computer Engineering in the Department of Electrical and Computer Engineering, College of Engineering

SPONSOR:

William H. Sanders
Interim Department Head, Electrical and Computer Engineering
(217) 333-2300
whs@illinois.edu

COLLEGE CONTACT:

Umberto Ravaioli
Interim Associate Dean for Undergraduate Programs, Engineering
(217) 333-2151
ravaioli@illinois.edu

BRIEF DESCRIPTION:

- Replace the computing core classes ECE 190 and ECE 290, which introduce programming and digital design, with proposed new courses ECE 120 and ECE 220. New course outlines for ECE 120 and ECE 220 and course revision forms to discontinue ECE 190 and ECE 290 have been submitted. See Appendix B for course titles.
- Require CS 374 Algorithms. CS 374 is a new course to be proposed by CS and cross-listed with ECE which contains material of the existing course CS 473 retargeted to 300-level. CS plans to submit a proposal for CS 374 after the course is piloted in spring 2014. CS 473 is a course alternative to be used until CS 374 is approved.
- Replace ECE 329 and ECE 340 requirements with an "EE Foundations" technical elective choice consisting of one course chosen from a wider range of options (Selected from a list maintained by the ECE Department --- see Appendix D). The initial list includes ECE 310, ECE 329, ECE 330, ECE 340, ECE 361, and ECE 486.
- Replace ECE 411 with a "Design Requirement" technical elective chosen from ECE 411, ECE 445, and senior thesis (ECE 496 and ECE 499).
- Relax the single non-ECE and non-CS Technical Elective restriction of the old curriculum by replacing it with a requirement that at least three courses must be chosen from an "Advanced Computing Elective" list (initial list includes ECE 408, ECE 411, ECE 412, ECE 422, ECE 425, ECE 428, ECE 438, ECE 439, ECE 448, ECE 462, ECE 470, ECE 478, ECE 484, ECE 491, CS 357, CS 411, CS 412, CS 413, CS 414, CS 418, CS 421, CS 424, CS 426, CS 431, CS 446, CS 475, and CS 476) as a part of 28

hours of Technical Electives selected from departmentally approved list used in ECE (see Appendix D).

JUSTIFICATION:

The Department wishes to make the Computer Engineering (CE) degree requirements substantially more flexible than they are currently, and in particular to make them similar in flexibility to the requirements for the Electrical Engineering (EE) degree. These changes are the result of a multi-year department-wide re-evaluation of the content of the CE degree. Algorithms were identified as a key element missing from our current curriculum, and we have been working with Computer Science to ensure that this need can be met in the future. Similarly, while classes such as ECE329 and ECE340 have been critical historically, the department feels that our students would be better served by a wider range of options in their choice of advanced technical electives. To ensure that CE majors come away with essential practical information in ECE 329 and ECE 340, e.g. a basic understanding of radiation in high-frequency circuits and the physics of semiconductors, a few key experiments will be devoted to these subjects in required laboratory courses taken in junior year (e.g., ECE 385).

The replacement of ECE 190 and ECE 290 with the new courses ECE 120 and ECE 220 is a change that ECE proposes to make with both the CE and EE curricula. A separate proposal for revision of the EE curriculum will be sent at a later date. The idea arose from discussions among Computer Engineering faculty and among the members of the ECE Curriculum Committee. The primary goals of this change include:

- Revitalization of the digital design content of ECE's computing core.
- Improvements in both motivation and retention.
- Extension of the time allotted to introductory programming in the ECE sequence by spreading current ECE190 content into an earlier semester.
- Enabling substantially more ECE students to be prepared for advanced classes, summer internships, and software-based research opportunities by the end of their sophomore year.
- Decoupling the computing core from the electrical core topics, allowing students to progress separately on either/both and thereby shortening the overall length of the core prerequisite chain.
- Preparing students without prior programming experience for ECE 190, to address the current bimodal distribution that makes the course difficult for many such students.

The new courses ECE 120 and ECE 220 reverse the order of the core material covered in ECE 190 and ECE 290 --- digital design first under the revised curriculum, followed by computer systems and programming --- and update the digital logic aspects, and more carefully integrate the introductory material with both hardware and software elements in a way that excites and motivates new ECE students. Experimental versions of the courses have been offered several times (every semester starting in Fall 2012 for ECE 120/ECE 198JL, and every semester starting in Spring 2013 for ECE 220/ECE198KL). Completion of the revised ECE 385 lab (3 hrs) during the sophomore year will prepare the CE students for summer internship possibilities after their sophomore year --- this will be possible for those students who will be starting their core CE courses during their freshman year.

BUDGETARY AND STAFF IMPLICATIONS:

a. Additional staff and dollars needed:

None anticipated as a result of these changes.

b. Internal reallocations (e.g., change in class size, teaching loads, student-faculty ratio, etc.):

Within ECE, enrollments in ECE 329 and ECE 340 will drop, although we anticipate that some fraction of the CEs will still choose to take these classes. Similarly, enrollments in those classes included in the EE Foundations list will rise to some degree. We have discussed these changes in our Curriculum Committee and expect to be able to handle them through reallocations of faculty, TAs, and graders among the courses offered by ECE.

The most challenging change rising from this proposal is likely to be the influx of CE students into the ECE 445 senior design course. We anticipate a substantial increase in attendance, since ECE 445 allows students to select their own projects, while ECE 411 focuses on microprocessor design to provide a rigorous design experience for the students. We have discussed limitations in lab space, equipment, and teaching resources for ECE 445, and expect that the department will be able to address these concerns with internal teaching assignments and creative use of space in the new ECE building (which opens in Fall 2014).

The replacement of ECE 190 and ECE 290 with ECE 120 and ECE 220 will create a bubble of additional teaching load for ECE faculty as the time at which students take these courses shifts from sophomore/junior years down to freshman/sophomore years. We have already managed about half of the additional load through enrollment in the experimental versions of the courses, which are quite popular, and we anticipate being able to manage the remaining effects of the bubble internally. Eventually, we anticipate that the steady state loads will show negligible differences with current loads as a result of this replacement.

c. Effect on course enrollment in other units and explanations of discussions with representatives of those departments:

Enrollment in the algorithms class will increase substantially, as relatively few of the CE students currently take CS 473. ECE and CS have discussed this change and have agreed to cross-list the course and to have ECE provide both faculty and TAs to support the course.

Other enrollments outside of ECE are not expected to change dramatically. Although students have more flexibility, ECE and CS offer many attractive options, and these classes are nearly all available as technical electives now. The list of technical electives include many outside courses, so the impact on any given outside course due to additional CE enrollment is expected to be small.

d. Impact on the University Library:

No major impact on the Library is expected. There may be some slight increase in utilization as students shift from the specific design requirement in ECE 411 into the more student-tailored projects possible with ECE 445. Senior theses are governed by faculty willingness to supervise them, thus little absolute increase in students pursuing this option is expected.

e. Impact on computer use, laboratory use, equipment, etc.:

The largest expected impact of these changes will occur in Senior Design (ECE 445), which poses some problems in terms of space and equipment needs. ECE 411 uses CAD tools and requires only EWS (Engineering Workstation Laboratory) access, whereas students in ECE 445 typically build hardware projects. Although we plan to open ECE 445 to software-only projects for groups of CE students, the hope is that students will use both hardware and software in their projects, thus requiring increased lab space and equipment. Load on the EWS systems may be reduced somewhat by this same shift away from CAD tools used for projects. The ECE department is aware of these needs and will address them internally.

We also anticipate increased lab requirements in some of the EE Foundations courses, but expect those impacts to be smaller and more readily addressed by internal reallocation of departmental resources as students shift from one ECE class to another.

The bubble of additional students mentioned earlier will also increase the load on EWS temporarily for students in ECE 220. However, the long-term steady state load will not change due to the change.

DESIRED EFFECTIVE DATE: Fall 2014

STATEMENT FOR PROGRAMS OF STUDY CATALOG: See Appendix C.

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:

Nov 18, 13

Date:

College Representative:

2-20-14

Date:

Graduate College Representative:

Date:

Council on Teacher Education Representative:

Date:

Appendix A:
(Budgetary and Staff Implications)

Revised Programs – Notes on Budgetary and Staff Implications

Course	Estimated Annual Enrollment Before Change (CE only)	Estimated* Annual Enrollment After Change (CE only)
CS 374 – Introduction to Algorithms	10	250
ECE 329 – Fields and Waves I	250	80
ECE 340 – Semiconductor Electronics	250	70
ECE 310 –Digital Signal Processing	30	60
ECE 330 – Power Circuits & Electromechanics	40	80
ECE 361 – Digital Communications	5	10
ECE 486 – Control Systems	10	20
ECE 411 – Computer Organization and Design	250	75
ECE 445 – Senior Design Project Lab	25	140
ECE 496/499 – Senior Project/Thesis	5	35
Other classes	negligible change	

*Estimates are based on current enrollment of roughly 250 CE students per year.

As mentioned in the main text, we have discussed these changes with Computer Science and have reached an agreement in regard to algorithms classes, as expressed in the included letter. In brief, ECE expects to cross-list the new CS 374 class, to provide faculty to teach a section of the class on a regular basis, and to provide students who will serve as TAs for the class.

Changes to most courses in this list can be handled through internal re-allocations. However, as mentioned in the text of the proposal, Senior Design (ECE 445) uses more physical equipment than ECE 411, which relies primarily on CAD tools and requires only EWS access. We estimate that under the new CE curriculum, for their design project: 15% of CEs would do a thesis, 30% would take ECE 411, and about 55% would take ECE 445. ECE 445 instructor Jonathan Makela discussed with Scott Carney (course director) and Dan Mast about how ECE 445 could accommodate this influx of CE students. ECE 445 also has the highest TA staffing rate of any class in our department, but ECE 411 also has a high rate (both are design courses and require substantial interaction between the students and the staff). The number of TAs may still go up slightly overall. The ECE department is aware of these needs and will address them internally.

The shift from ECE 190 and ECE 290 to ECE 120 and ECE 220 has already been partly accomplished through opening large sections of the experimental versions of the new courses. Lab and computer loads are similar between the corresponding courses, but, as mentioned earlier, a temporary bubble of added load will be created by shifting material forward in the curriculum. The experimental versions of the courses have attracted sufficiently many students to enable us to have already addressed part of this bubble effect, and we do not anticipate insurmountable difficulties in completing this process internally to ECE.

Appendix B:
(Proposed Curriculum Revisions)

Current Requirements:	Current Hours	Revised Requirements:	Revised Hours
Major Core Requirement		***Major Core Requirement***	
ECE 110 – Intro to Elec and Comp Engineering **ECE 190** – Intro to Computing Systems **AND** **ECE 290** – Computer Engineering I	11 Hours	**ECE 110 – Intro to Electronics** **ECE 120** – Intro to Computing **AND** **ECE 220** – Computer Systems & Programming	11 Hours
CS 225 – Data Structures and Programming Principles	4 Hours	**CS 225** – Data Structures and Programming Principles **AND** **CS 374** – Intro to Algorithms (new version of CS 473—see letter from CS)	7 Hours
ECE 329 – Fields and Waves I **AND** **ECE 340** – Semiconductor Electronics	6 Hours	**EE Foundations Elective**: one course chosen from list of 300-level EE classes	3 to 4 Hours (to be counted as technical elective)
ECE 411 – Computer Organization and Design	4 Hours	**Design Elective:** **ECE 411** – Computer Organization and Design **OR** **ECE 445** – Senior Design Project Lab **OR** **(ECE 496** – Senior Research Project **AND ECE 499** – Senior Thesis)	4 Hours (to be counted as technical elective)
Total Core Required Hours (only those listed above)	25 Hours	**Total Core Required Hours (only those listed above)**	18 Hours
Technical Electives Chosen from departmentally approved list, with one course outside of ECE/CS, and the remainder in ECE/CS	22 Hours	**Technical Electives** Chosen from departmentally approved list, including at least three from Advanced Computing Electives list	28 Hours including EE Foundation Elective (3 or 4 Hours --- see above), Design Elective (4 Hours --- see above), and at least three courses from Advanced

			Computing Electives List.

The initial EE Foundations list includes:
ECE 310: Digital Signal Processing, ECE 329: Fields and Waves I,
ECE 330: Power Circuits & Electromechanics, ECE 340: Semiconductor Electronics,
ECE 361: Digital Communications, and ECE 486: Control Systems

The initial Advanced Computing Electives list includes:
ECE 408, ECE 411, ECE 412, ECE 422, ECE 425, ECE 428, ECE 438, ECE 439, ECE 448, ECE 462, ECE 470, ECE 478, ECE 484, ECE 491, CS 357, CS 411, CS 412, CS 413, CS 414, CS 418, CS 421, CS 424, CS 426, CS 431, CS 446, CS 475, and CS 476.

Both lists will be overseen by the ECE Curriculum Committee.

Appendix C:
Statement for Programs of Study Catalog

Electrical and Computer Engineering

ece.illinois.edu
Head of Department: William H. Sanders
Department Office: 155 Everitt Laboratory, 1406 West Green, Urbana, (217) 333-2300
Curriculum in Computer Engineering

ece.illinois.edu

For the Degree of Bachelor of Science in Computer Engineering

Computer Engineering at Illinois focuses on the development of vital computing technologies, ranging from chips to computers to networks to programming tools to key algorithms for building exciting applications. Fundamentally, Computer Engineering addresses the problem of building scalable, trustworthy computing systems, and our faculty's interests span a broad spectrum of issues pertinent to this theme. We have taken the lead in revolutionizing many science and engineering disciplines with parallel computing, from chips to clouds to planet-scale critical infrastructures, and we have defined new standards of security, privacy, and dependability for systems ranging from small circuits to the electric power grids of many nations. Our students need a broad and sound set of mathematical and computing skills, and are well-served by a flexible curriculum that enables them to pursue topics of interest among the many subdisciplines in computing.

The computer engineering core curriculum focuses on fundamental computer engineering knowledge: circuits, systems, electromagnetics, computer systems, electronics for information processing and communication, and computer science. The rich set of ECE elective courses permits students to concentrate in any sub-discipline of computer engineering including: computer systems; electronic circuits; networks; engineering applications; software, languages, and theory; and algorithms and mathematical tools.

Overview of Curricular Requirements

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

Technical grade point average requirements for graduation and advanced-level course registration apply to students in this curriculum. These rules are 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.

Hours	Requirements
0	ENG 100—Engineering Orientation[1]
0	Total

1. External transfer students take ENG 300—Engrg Transfer Orientation instead.

Foundational Mathematics and Science

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

Hours	Requirements
3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
4	MATH 221—Calculus I[1]
3	MATH 231—Calculus II
4	MATH 241—Calculus III
4	MATH 286—Intro to Differential Eq Plus
4	PHYS 211—University Physics: Mechanics
4	PHYS 212—University Physics: Elec & Mag
2	PHYS 213—Univ Physics: Thermal Physics
2	PHYS 214—Univ Physics: Quantum Physics
31	Total

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 Engineering Technical Core

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

Hours	Requirements
3	CS 173—Discrete Structures[1]
3	ECE 110—Intro Elec & Computer Engrg
4	ECE 120—Intro to Computing
4	ECE 210—Analog Signal Processing
4	ECE 220—Computer Sys & Programming
4	CS 225—Data Structures
3	ECE 313—Probability with Engrg Applic[2]
3	ECE 385—Digital Systems Laboratory
3	CS 374—Introduction to Algorithms
4	ECE 391—Computer Systems Engineering
35	Total

1. MATH 213—Basic Discrete Mathematics may be substituted.

2. STAT 410—Statistics and Probability II may be substituted.

Technical Electives

These courses stress the rigorous analysis and design principles practiced in the major subdisciplines of computer engineering.

Hours	Requirements
28 to *include at least:*	Selected from the departmentally approved List of Technical Electives
(i) 1 course	Chosen from the departmentally approved list of EE Foundations Courses
(ii) 3 courses	Chosen from the departmentally approved list of Advanced Computing Electives
(iii) one of	ECE 411—Comp Organization & Design ECE 445—Senior Design Project Lab ECE 496—Senior Research Project **AND** ECE 499—Senior Thesis

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.

Hours	Requirements
6	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.
18	Total

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.

Hours	Requirements
4	RHET 105—Principles of Composition
	Advanced Composition. May be satisfied by completing ECE 496 and ECE 499 or a course within either the liberal education or free elective categories which has the Advanced Composition designation.
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.

Hours	Requirements
12	Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site, so that there are at least 128 credit hours earned toward the degree. At least seven hours must be taken for a grade.

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

Hours	First Semester
4	ECE 120—Introduction to Computing
0	ENG 100—Engineering Orientation
4	MATH 221—Calculus I
4	RHET 105—Principles of Composition
3	Liberal education elective[3]
15	Total

Hours	Second Semester
3	ECE 110—Intro Elec & Computer Engrg
3	MATH 231—Calculus II
4	CHEM 102 & 103—General Chemistry I and General Chemistry Lab I
3	Liberal education elective[3]
4	PHYS 211—University Physics: Mechanics
17	Total

Second Year

Hours	First Semester
4	ECE 220—Computer Systems & Programming
3	CS 173—Discrete Structures[4]
4	MATH 241—Calculus III
4	PHYS 212—University Physics: Elec & Mag
15	Total

Hours	Second Semester
4	ECE 210—Analog Signal Processing
4	MATH 286—Intro to Differential Eq Plus
4	CS 225—Data Structures
2	PHYS 214—Univ Physics: Quantum Physics
3	Liberal education elective[3]
17	Total

Third Year

Hours	First Semester
2	PHYS 213—Univ Physics: Thermal Physics
3	ECE 313—Probability with Engrg Applic[6]
3	ECE 385—Digital Systems Laboratory
4	Technical elective[5]
3	Liberal education elective[3]
15	Total

Hours	Second Semester
4	ECE 391—Computer Systems Engineering
3	CS 374—Introduction to Algorithms
3	Technical elective[5]
3	Liberal education elective[3]

4	Free elective
17	Total

Fourth Year

Hours	First Semester
4	ECE 411—Comp Organization & Design or alternative
6	Technical electives[5]
3	Liberal education elective[3]
4	Free elective
17	Total

Hours	Second Semester
11	Technical electives[5]
4	Free elective
15	Total

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. 2. RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is ECE 110. 3. 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 satisfy the cultural studies requirements. 4. MATH 213—Basic Discrete Mathematics may be substituted. 5. One course must not be either ECE or CS. The remaining classes are ECE and CS electives. All are to be chosen from the departmentally approved List of Technical Electives. 6. STAT 410—Statistics and Probability II may be substituted.

Appendix D

Departmentally Approved List Technical Electives for ECE Programs

Independent Studies offered by the departments in this list may be taken subject to the approval of the ECE Advising Office.

Revised February 8, 2013

Aerospace Eng. (AE): 201, 252, 302, 311, 312, 321, 322, 352, 353, 402, 403, 410, 412, 413, 416, 419, 420, 427, 428, 433, 434, 435, 451, 460, 470, 481
Agri. Bio Eng. (ABE): all 300- and 400-level courses except 440*
Astronomy (ASTR): 210, 330, 350, 404, 405, 406, 414, 450
Atmospheric Science (ATMS): 301, 302, 303, 304, 305, 402, 403, 404, 405, 406, 410, 411, 420, 421, 425, 444, 447, 448, 449
Biochemistry (BIOC): 406, 440, 446, 455
Bioengineering (BIOE): 201, 202, 280, 302, 406, 414, 415, 417, 419, 461, 466, 467, 472, 473, 475, 476, and 480
Biophysics (BIOP): all 400-level courses*
Chem & Bio Eng (CHBE): 221, 321, 421, 422, 424, 430, 431, 440, 451, 452, 453, 456, 457, 471, 472, 473, 474
Chemistry (CHEM): 104/105(+), all 200, 300, 400 level* except 397, 497, 499
Civil & Env. Eng. (CEE): 310, 330, 408, 410, 416, 430, 447, 491
Computer Science (CS): 173**, 225**, 242, 357, 373, 410, 411, 412, 413, 414, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 431, 433, 436, 438, 439 ,440, 446, 450, 460, 461, 463, 465, 467, 473, 475, 476; 477, 481, CS 398 & 498 Special Topics. as approved.
ECE‡: 297, 304, 307, 310, 311, 328, 330, 333, 342, 343, 350, 361, 380, 391**, 395, 396, 397, 398, 402, 403, 408, 411, 412, 414, 415, 416, 417, 418, 419, 420, 422, 424, 425, 428, 431, 432, 435, 437, 438, 439, 441, 444, 447, 448, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 462, 463, 464, 465, 466, 467, 468, 469, 470, 472, 473, 476, 478, 480, 481, 482, 483, 484, 485, 486, 487, 488, 490, 491, 492, 493, 495, 496, 498, 499
Elective Labs: 343, 391, 395, 402, 411, 412, 415, 420, 431, 435, 437, 438, 439, 444, 447, 451, 453, 456, 460, 463, 466, 468, 469, 470, 486, 495

Engineering (ENG): 491, Interdisciplinary Design; CubeSat, Solar Decathlon, Formula SAE, Baja SAE, or by approval. Other Engineering courses by approval.
General Eng (GE): 411, 420, 423, 424
Geology (GEOL): 107, 208, 333, 380, 411, 417, 420, 432, 436, 440, 450, 452, 460
Industrial Eng. (IE): 310, 330, 360, 361, 400, 410, 411, 412, 413, 430, 431, and 485
Integrative Biology (IB): 150, 202, 203, 204, 302, 331, 334, 335, 348, 368, 401,

402, 404, 405, 406, 420, 421, 423, 424, 425, 426, 427, 429, 431, 432, 433, 440, 443, 444, 445, 449, 451, 452, 453, 461, 462, 463, 464, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 481, 482, 483, 484, 485, and 486
Linguistics (LING): 300, 402, 406, 407, and 427
Material Science & Engineering (MSE): 280, all 300- and 400-level courses except 304, 460, 461*
Math:213**, 347, 348, 357, 402, 403, 412, 413, 414, 415, 416, 417, 418, 423, 424, 425, 426, 427, 428, 432, 442, 444, 446, 447, 448, 450, 453, 465, 469, 473, 475, 481, 482, 484, 487, 488, 489, 494
Molecular & Cellular Biology (MCB): 150, 250, 251, 252, 253, 300, 301, 315, 316, 354, 400, 401, 402, 403, 404, 405, 406, 408, 410, 412, 413, 414, 415, 416, 417, 419, 421, 424, 425, 426, 430, 431, 433, 435, 441, 446, 480, 481, 482, and 484
Mechanical Eng. (ME): 300, 310, 320, 330, 340, 350, 370, 371, 400, 401, 402, 403, 404, 405, 410, 411, 412, 420, 430, 431, 440, 445, 446, 450, 451, 452, 460, 461, 471, 472, 485, and 487
Nuclear Plasma & Radiological (NPRE): 201, 247, 402, 412, 421, 423, 429, 431, 432, 435, 441, 442, 444, 446, 447, 448, 451, 453, 455, 457, 458, 470, 475
Physics (PHYS): 225, 325, 326, 401, 402, 403, 419, 420, 427, 429, 466, 470, 485, 486, 487
Speech & Hearing Science (SHS): 200, 240, 300, 301, 320, 450, and 470
Statistics (STAT): 420, 424, 429
Technical Systems Management (TSM): all 300- and 400-level courses except 435*
Theoretical & Applied Mechanics (TAM): 211, 212, 251, 324, 335, 412, 435, 445, 451

AP, A-level, and Int'l. Baccalaureate credit cannot be used as technical elective hours
[ ] Classes have been renumbered. Classes taken under the former numbers retain the credit they received when taken
** Elective for EE's
*** Elective for CompE's
* except seminars and special topics courses, which may be reviewed in 156 Everitt Lab
‡ All courses cross listed as ECE courses are counted as ECE courses, i.e. MATH 487 is the same as ECE 493 in the Class Schedule, CS 425 is the same as ECE 428, so they are both counted as ECE hours for tech elective purposes.

Appendix E: ECE Course Descriptions

New and revised courses

ECE 110: Introduction to Electronics
Introduction to selected fundamental concepts and principles in electrical engineering. The course places an emphasis on measurement, modeling, and analysis of circuits and electronics while introducing numerous applications. The course integrates other subdiscipline topics of ECE including, but not limited to, electromagnetics, control, signal processing, microelectronics, communications, and scientific computing basics. The lecture material is driven through lab work where sensors and motors are incorporated into an autonomous moving vehicle which is designed and constructed to perform tasks jointly determined by the instructors and students.

ECE 120: Introduction to Computing
This course provides an introduction to digital logic, computer systems, and computer languages. Topics include representation of information, combinational and sequential logic analysis and design, finite state machines, the von Neumann model, basic computer organization, and machine language programming. Laboratory assignments provide hands-on experience with design, simulation, implementation, and programming of digital systems.

ECE 220: Computer Systems & Programming
Advanced use of LC-3 assembly language for I/O and function calling convention. C programming, covering basic programming concepts, functions, arrays, pointers, I/O, recursion, simple data structures, linked lists, dynamic memory management, and basic algorithms. Information hiding and object-oriented design as commonly implemented in modern software and computer systems programming.

ECE 385: Digital Systems Laboratory
Design, build, and test digital systems using transistor-transistor logic (TTL), SystemVerilog, and field-programmable gate arrays (FPGAs). Topics include combinational and sequential logic, storage elements, input/output and display, timing analysis, design tradeoffs, synchronous and asynchronous design methods, datapath and controller, microprocessor design, software/hardware co-design, and system-on-a-chip.

Previous courses

ECE 110: Introduction to Electrical and Computer Engineering
Integrated introduction to selected fundamental concepts and principles in electrical and computer engineering: circuits; electromagnetics; communications; electronics, controls; computing. Laboratory experiments and lectures focus on a design and construction project, such as an autonomous moving vehicle.

ECE 190: Introduction to Computing Systems
Bits; binary representations; digital logic structures; the von Neumann computing model;

an example instruction set; machine and assembly language programming; machine-level input/output; subroutines; the C programming language; variables and operators; control constructs; functions in C; pointers and arrays; input/output in C; recursion; simple data structures.

ECE 290: Computer Engineering I
Digital logic and computer systems. Representation of information; combinational network analysis and design; sequential network analysis and design; computer organization and control. Laboratory for design and simulation of digital systems.

ECE 385: Digital Systems Laboratory
Experimental analysis and synthesis of digital networks, including use of a microcomputer as a controller.

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Computer Science
201 North Goodwin Avenue
Urbana, IL 61801-2302 USA

14 November, 2013

William H. Sanders
Interim Department Head
Dept. of Electrical and Computer Engineering
University of Illinois at Urbana-Champaign

Dear Bill:

I am writing to confirm the support of the Department of Computer Science for the proposed changes to the Computer Engineering (CE) curriculum in the Department of Electrical and Computer Engineering.

I am pleased that the directions that our departments wish to take in regard to curricular revision seem to align. We are in particular happy to support the algorithm requirement that is being introduced in the new CE curriculum.

In the near future CS will develop a 300-level algorithms class having no prerequisite beyond CS225 (Data Structures) to serve CS and CE juniors. Until that course -- to be dubbed CS 374 (Algorithms) --is ready, CE students who start in your new curriculum will be welcome in CS 473 (Undergraduate Algorithms) that is currently serving the algorithm needs of CS seniors.

Sincerely,

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

telephone 217-333-3373 • *fax* 217-333-3501 • *email* rutenbar@illinois.edu

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

University Library
Office of Dean of Libraries
and University Librarian
230 Main Library, MC-522
1408 West Gregory Drive
Urbana, IL 61801

February 21, 2014

Umberto Ravaioli
Interim Associate Dean
206 Engineering Hall
M/C 272

Dear Dean Ravaioli:

Thank you for providing the University Library with the opportunity to review the College of Engineering's proposal to the Senate Committee on Educational Policy to revise the requirements of the Bachelor of Science in Computer Engineering in the Department of Electrical and Computer Engineering. Based upon the proposal that we reviewed, we do not believe that there will be any substantive impact on existing library offerings—either in terms of library materials or personnel.

The librarians in the Grainger Engineering Library have an excellent relationship with the College and if additional services or materials are required as the program develops, I have every confidence that we will be able to work together to meet the needs of the students.

Sincerely,

John P. Wilkin
Juanita J. and Robert E. Simpson
Dean of Libraries and University Librarian

c: Thomas Teper
William Mischo
Mary Schlembach
Elizabeth Stovall, Graduate Programs Director, CoE

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820

February 27, 2014

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

Dear Professor Miller:

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

The proposal has been reviewed and approved by the College of Engineering Executive Committee. It now requires Senate review.

Sincerely,

Kristi A. Kuntz
Assistant Provost

Enclosures

c: W. Buttlar
U. Ravaioli
D. Ruzic
B. Sanders
E. Stovall

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801

February 21, 2014

Kristi Kuntz
Assistant Provost
217 Swanlund Administration Building
MC-304

Via: Andreas Cangellaris, Engineering College

Dear Provost Kuntz:

The College of Engineering Executive Committee has reviewed and approved the following:

Course Revision: **Revision to the Bachelor of Science in Computer Engineering in the Department of Electrical and Computer Engineering, College of Engineering**

Attached is a copy of the request.

Sincerely yours,

David R. Ruzic

David Ruzic, Vice Chair
Executive Committee

Approval Recommended:

2-21-2014

Andreas Cangellaris, Dean
College of Engineering

Date

Enclosure

c: Bill Sanders
David Ruzic
Bill Buttlar
Umberto Ravaioli
Elizabeth Stovall

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Senate Educational Policy Committee
Proposal Check Sheet

PROPOSAL TITLE (Same as on proposal): Revision to the Bachelor of Science in Computer Engineering in the Department of Electrical and Computer Engineering, College of Engineering

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): Computer Engineering

   ☐ 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