Program Change Request

APPROVED BY SENATE 03/07/2022

Rollback to 1434 Head for KP

Date Submitted: 12/20/21 3:45 pm In Workflow Viewing: 10KP0112BS : Computer Science, 1. U Program BS Review 2. 1434 Head Last approved: 10/08/21 12:48 pm 3. KP Committee Chair Last edit: 02/15/22 10:34 am 4. KP Dean Changes proposed by: Steve Herzog 5. University Computer Science, BS Librarian Catalog Pages 6. Provost Using this 7. Senate EPC Program 8. Senate 9. U Senate Conf 10. Board of Trustees Proposal Type: **11. IBHE** 12. HLC 13. DMI **Approval Path** 1. 01/05/22 2:31 pm **Deb Forgacs** (dforgacs): Approved for U **Program Review** 2.01/05/22 10:58 pm Elsa Gunter (egunter): Approved for 1434 Head 3. 01/06/22 6:23 am Brooke Newell (bsnewell): Rollback to 1434 Head for KP **Committee Chair** 4. 01/06/22 3:46 pm Elsa Gunter (egunter): Approved for 1434 Head 5. 01/06/22 4:44 pm Brooke Newell (bsnewell):

Committee Chair 6. 01/07/22 12:13 am Elsa Gunter (egunter): Approved for 1434 Head 7.02/03/22 11:39 am Brooke Newell (bsnewell): Approved for KP **Committee Chair** 8. 02/03/22 11:47 am Candy Deaville (candyd): Approved for KP Dean 9. 02/03/22 11:54 am John Wilkin (jpwilkin): Approved for University Librarian 10. 02/03/22 4:15 pm Kathy Martensen (kmartens): Approved for Provost 11. 02/15/22 11:02 am Barbara Lehman (bjlehman): Approved for Senate EPC

History

- 1. Dec 13, 2018 by Deb Forgacs (dforgacs)
- 2. Apr 11, 2019 by Deb Forgacs (dforgacs)
- 3. May 2, 2019 by Deb Forgacs (dforgacs)
- 4. Aug 9, 2019 by Deb Forgacs (dforgacs)

- 5. Aug 12, 2019 by Deb Forgacs (dforgacs)
- 6. Feb 26, 2020 by Brooke Newell (bsnewell)
- 7. Mar 31, 2020 by Deb Forgacs (dforgacs)
- 8. Jun 2, 2021 by Steve Herzog (smherzog)
- 9. Oct 8, 2021 by Brooke Newell (bsnewell)

Major (ex. Special Education)

This proposal is for a: Revision

Administration Details

Official Program Name	Computer Science, BS	
Sponsor College	Grainger College of Engineering	
Sponsor Department	Computer Science	
Sponsor Name	Elsa Gunter	
Sponsor Email	egunter@illinois.edu	
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College Budget	<u>tmhile@illinois.edu</u>	

College Budget Officer Email

List the role for rollbacks (which role will edit the proposal on questions from EPC, e.g., Dept Head or Initiator) and/or any additional stakeholders. *Purpose: List here who will do the editing work if proposal needs rolled back. And any other stakeholders.*

<u>Brooke Newell, bsnewell@illinois.edu, GCoE; Elsa Gunter, egunter@illinois.edu, CS;</u> <u>Steve Herzog, smherzog@illinois.edu, CS.</u>

Does this program have inter-departmental administration?

No

	Effective Catalog	Fall 2022
	Effective Catalog Term	
Provide a brief, concise description (not justification) of your proposal.		cise description (not justification) of your proposal.
Removed Liberal Education Electives, updated number of free elective hours, an moved footnotes(when possible) into the Program of Study Table (to improve accessibility).		
		Clarified the role of CS 100, removing the one hour from the table, and noting in the comments that the course is optional, but highly recommended and that the 1 hour for the course applies to free electives.
		Accounted for the recent renumbering of CS 241, a core course requirement, to CS 341.
		Included a statement to indicate that students have a new option (CS 211) that satisfies both a core course requirement and the Campus General Education Advanced Composition Requirement.
		Added new and recently approved options to the list of technical electives, and indicated their roles in the Focus Areas.
		Removed mention of a course that was prematurely added to the list of technical electives, but which has not been offered as a permanently numbered course, and is not planned to be offered in the foreseeable future.
		Cleaned up program of study table for clarity.
		d proposals/revisions and their keys. <i>Example: This BS proposal (key 567) is related to the posal (key 145) and the Concentration B proposal (key 203).</i>

Program Justification

Why are these changes necessary?

After careful analysis of programs of studies, various requirements, and course selection for students in The Grainger College of Engineering, we have decided to provide additional flexibility to all engineering undergraduate students by increasing the number of free elective hours in all engineering programs. While the actual number of credit hours for free electives varies by program, within the college-8 programs currently provide only 6 credit hours for free electives while an additional 2 have less than 10-only 4 programs have more than 10 free elective credits. This lack of free elective credit hours limits students' abilities to efficiently pursue minors, certificates, and other educational opportunities and potentially limits those opportunities only to students coming in with significant AP credit or similar.

The additional free elective credit hours added to the program of study are obtained through the removal of The Grainger College of Engineering's Liberal Education requirement, which required engineering students to take an additional 6 credit hours above-and-beyond the campus' General Education requirement from the Humanities & the Arts, Social & Behavioral Sciences, or a college-curated list of courses. Over time, the Liberal Education requirement has been revised within the college, successively relaxing restrictions and providing additional choice to students (i.e., removal of a sequencing requirement in 1999; addition of the college-curated course list in 2010). Simultaneously, the college-curated list of courses continued to expand to include courses from approximately 120 rubrics across campus (including within The Grainger College of Engineering), gradually removing constraints to allow greater flexibility of choice for students to take advantage of the many opportunities the campus has to offer. Still, in its current form, this additional college-level requirement constrains student choice and interferes with their ability to efficiently pursue minors, certificates, and other educational opportunities across campus unless those opportunities intersect with coursework in the Liberal Education requirement.

Simultaneously, the required engineering orientation course, ENG 100, will be granted 1-credit hour. Previously, this course was a 0-credit course. The allocation of 1-credit appropriately recognizes the time and commitment expected of all students who take this course. In the 1-credit version of ENG 100, content will be added to improve teamwork and interpersonal skills, including topics related to diversity, equity, and inclusion (DEI). The engineering accrediting agency, ABET, will soon be adding DEI requirements for accredited programs. This component of ENG 100 is therefore beneficial to all Grainger Engineering programs and students by providing a common framework on which additional DEI topics can build throughout a student's program of study.

Removing CS 100's credit hour from the right column and revising the text makes more transparent the role of the course - not required, but highly recommended and counting toward free electives.

CS 241 has been renumbered to CS 341, and it is a required course in this program. This revision reflects this.

We need to clarify that CS 211 may be simultaneously used to satisfy both the core ethics requirement and the General Education Advance Composition requirement.

Our department continues to grow and expand its selection of technical topics with Computer Science to offer our students. There are an additional 6 courses that have been added at the 400 and 500-level in Computer Science that need to have their roles in the Focus Areas indicated in the POS.

With the last round of revisions to the Focus Areas, an anticipated course, Experimental HCI, listed as CS 566, was added to the Human and Social Impacts Focus Area. While the CS Department was in the process of proposing this class, one of the main instructors of the class unexpectedly retired, and the other instructors were unsure of proceeding without a replacement for him. As a result, the course proposal has been put on indefinite hold, and we are now removing it from the Focus Area listing until such time as we feel we are prepared to complete the process of proposing the course.

Where possible, we are moving footnotes to comments and making other small adjustments in wording in the POS table to improve readability.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

Yes

Required courses

Explain how the inclusion or removal of the courses/subjects listed above impacts the offering departments.

The current Liberal Education requirement is satisfied by a student completing 6 credit hours beyond those required by campus' General Education requirement from Humanities & the Arts, Social & Behavioral Sciences, or a college-curated list of courses (containing courses from over 120 rubrics across campus). An analysis of student course selection in the Liberal Education category indicates 25% of courses are taken in the College of Liberal Arts & Sciences, 20% from the College of Applied Health Sciences, 18% from Gies College of Business, 11% from the College of Agricultural, Consumer and Environmental Sciences, 11% from the College of Fine and Applied Arts, and 9% from The Grainger College of Engineering. Less than 2% of credits are taken in each of the remaining colleges and units across campus.

Although it might stand to reason that removal of the Liberal Education requirement would reduce the amount of credits Grainger Engineering students take outside of their home college, the data do not support that assertion. Specifically, despite the current Liberal Education requirement being set at 6 credit hours, the average number of credit hours completed from the Liberal Education course list upon graduation is 11.9. Through discussions with departmental and college advisors as well as students, students are making course selections not because the course satisfies the Liberal Education requirement, but because they are interested in the coursework offered outside of their home college, are pursing minors and other educational opportunities, and are looking to balance course loads between technical and nontechnical courses. Taken together, the data and evidence from advisors and students suggest that students will continue to take the types of courses represented on the Liberal Education course list, even if not specifically required to do so. acknowledgement from other departments.

Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

The BS in Computer Science program's learning objectives are in two categories: Program Educational Objectives and Student Outcomes. Each of these are described in the following two sections.

CS PROGRAM EDUCATIONAL OBJECTIVES REVIEW AND UPDATE PROCESS In this section, we describe the current Program Educational Objectives for the BS in CS degree, together with the process used by the Department of Computer Science for their periodic review and update. This process is managed by the Undergraduate Studies Committee, under the direction of the Director of Undergraduate Programs. The University of Illinois Computer Science Undergraduate Program Educational Objectives are to prepare graduates who:

1. For years after graduation are highly sought-after by employers and accepted at top graduate schools, obtain positions in industry, government, not-for-profits and academia.

2. Pursue education through lifelong learning either through self-directed study or in leading graduate programs.

3. Emerge as leaders in the field through the creation of new knowledge and systems in the rapidly changing world.

4. Provide leadership with their high ethical and technical standards.

The Program Educational Objectives (PEOs) are reviewed roughly every three years by the Undergraduate Studies Committee to decide whether revision is appropriate based on trends in the field, informal input from alumni and other program constituents, and data from student attainment of relevant job positions and entrance into graduate school.

At the beginning of each round of review and revision, input is collected from sources such as informal surveys of our program constituents, reports on employment outcomes for our recent graduates and feedback on success rates for our students applying to graduate school. Information indicating that the PEOs should be revised, or that they are not being highly attained is incorporated into the assessment of the program and the courses therein.

When a revision of the PEOs is deemed appropriate, the revised PEOs are put before the Advisory Board and their approval is solicited. The Advisory Board contains representatives from our alumni and from industry partners who are potential employers of our graduates. If the Advisory Board suggests revisions, these revisions are reviewed by the Undergraduate Studies Committees and new PEOs are generated consistent with these revisions, and then the PEOs are again put to the Advisory Board for their approval.

Once the PEO's have been approved by the Undergraduate Studies Committees and the Advisory Board, they are brought before the faculty of the Department of Computer Science for their discussion and acceptance. If the faculty recommend substantive changes to the PEOs, then the results are sent back to the Undergraduate Studies Committee and the Advisory Board for re-approval. If the recommendations are minor and non-substantive, they are made by the Director of Undergraduate Programs. The website maintained by the Department of Computer Science for publishing the PEOs is updated with the final revision.

CS STUDENT OUTCOMES ASSESSMENT PROCESS

This section describes the expected student outcomes of the BS in CS program. It details the process for monitoring them --including how data is collected -- and for assessing when and what revisions to courses and the program seem desirable to better meet the student outcomes. The BS in CS program prepares students to achieve the following student outcomes by the completion of their degree:

Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

Communicate effectively in a variety of professional contexts.

Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

Apply computer science theory and software development fundamentals to produce computing-based solutions.

In order to track student progress in achieving the student outcomes of the BS in CS program, the Department of Computer Science has identified a set of "core courses" that ensure student outcomes are being reached. These include the following courses that all students must take:

CS 128, CS 173, CS 210, CS 225, CS 222, CS 233, CS <u>341</u>, 241, CS 357, CS 361, CS 374, and CS 421.

All students must also select at least one team project course from among these: CS 427/8/9, CS 465, CS 467, CS 493/4, CS 497, and CS498VR.CS 417, CS 427/8/9, CS 437, CS 465, CS 467, CS 493/4, CS 497

These courses (and others) are under continuous assessment and revision informally by instructors teaching the course. More formally though, roughly every three years (the semester prior to the ABET review cycle, and midway between cycles) assessment data and course revision information is collected for each core course, and stored by the academic office.

Each course in CS has a specific list of learning goals. Courses typically have 8 to 12 learning goals each. This list of learning goals is reviewed by the instructors of the course every one to three years. For each class, assessment instruments are identified that assess each learning goal. The assessment instruments include at least one summative assessment, but preferably also at least one formative assessment. They are typically chosen from homework assignments and exams, but for some learning goals, project write up or team presentations are more appropriate. For each assessment instrument, the minimum score required to achieve satisfactory attainment of the learning goal is recorded, along with the percentage of students in the program attaining the learning goal and statistics indicating the range of performance of the students on the learning goal. For most courses in the core, satisfactory attainment of the learning goals translates to receiving a score of 70% or more on the assessment instruments measuring that learning goal. For a few of our most difficult courses, satisfactory attainment is considered achieved with a score of 60%. The rate of attainment is considered very high if at least 85% of the students are achieving satisfactory attainment of the learning goal, and the average score of the BS in CS students in the class is at least 80%.

The rate of attainment for each learning goal is reviewed by the instructors teaching the course and the course coordinator and when found to be less than very high, the student work is reviewed more thoroughly and suggestions are recorded for ways in oraclic more to remember more chorologing and baggeodono are recorded for mayo in

which improvement might be made to attain a higher rate of attainment of the learning goals. The suggested improvements typically involve either changes within a course, or changes between neighboring courses in the prerequisite chain. Typical changes within a course would include shifting emphasis, or reorganizing topics to clarify the flow of the material related to the learning goal in question. Changes to the relation between courses may involve possibly shifting topics across course boundaries to allow for more time in one course for greater emphasis for a needed prerequisite topic or bring part of the coverage of a prerequisite topic closer to the place where it is used by the topic covering the learning goal on which less than very high attainment was achieved. Once weaknesses have been identified and suggested improvements have been recorded for a learning goal, the suggestions are reviewed by the course coordinators and regular instructors of the courses involved in the suggested revisions. Where possible within the current course structure, a plan is made for how to implement the suggested improvements. If the current course structure for the courses involved does not adequately support the suggested improvements, then the difficulty is brought to the attention of the Undergraduate Studies Committee for a discussion of course revisions. After implementation of the suggested course revisions, at the next program review period for improvement, the learning goals affected are examined in comparison to the previous performance for improvement.

In addition to reviewing the learning goals of the individual courses, the pattern of attainment of learning goals covering the major student outcomes is reviewed. If more than a third of the courses supporting a student outcome fail to achieve very high attainment of the learning goals covering the student outcomes, then the Director of Undergraduate Programs will meet with the course coordinators and regular instructors of the various courses failing to achieve very high attainment of the learning goals covering the student outcome in question to discuss what underlying weaknesses exist contributing to this systemic failure to strongly cover the relevant student outcome. The Director of Undergraduate Programs will deliver a summary of the findings from these discussions to the Undergraduate Studies Committee. The Undergraduate Studies Committee will then review the findings of repeated weakness in learning goals covering the student outcome in question and the findings of potential underlying causes of that weaknesses. The Undergraduate Studies Committee will determine if additional courses or other revisions to the BS in CS program are likely needed to address the identified weaknesses in student outcome attainment.

In addition to revisions of the program driven by the study of course learning goals, once each three years, the Director of Undergraduate Programs will review whether the program is topically in compliance with the latest requirements from the ABET accreditation process. The Director of Undergraduate Programs will present to the Undergraduate Studies Committee any ways in which the program is potentially found to be not in compliance with the topics required to be covered by ABET. The Undergraduate Studies Committee will devise a plan, either through course revision or curriculum revision to bring the program back into topical compliance with ABET.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

"Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses" (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor's degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

Revised programs <u>Computer Science, BS Side by Side.xlsx</u> Attach a side-by-side comparison with the existing program AND, if the revision references or adds "chose-from" lists of courses students can select from to fulfill requirements, a listing of these courses, including the course rubric, number, title, and number of credit hours.

Catalog Page Text - Overview Tab

Text for Overview tab on the Catalog Page. This is not official content, it is used to help build the new catalog page for the program. Can be edited in the catalog by the college or department.

Statement for Programs of Study Catalog

Graduation Requirements

Minimum Technical GPA: 2.0

TGPA is required for CS and Math courses. See **<u>Technical GPA</u>** to clarify requirements.

Minimum Overall GPA: 2.0

Minimum hours required for graduation: 128 hours

General education: <u>Students must complete the</u> <u>Campus General Education</u> <u>requirements including the campus general education language requirement. If the</u> <u>option of CS 211 is chosen, it will satisfy a core course requirement and the Campus</u> <u>General Education Advanced Composition requirement.</u>

Orientation and Professional Development

	Course List	
Code	Title	Hours
CS 100	Freshman Orientation (optional course highly recommended may be used to help meet free electi	ve1
	requirements)	
<u>ENG 10</u>	0 Grainger Engineering Orientation Seminar (External transfer students take ENG 300)	1
Highly r	ecommended, optional 1 credit hour course, CS 100 Freshman Orientation. Credit hour counts towa	<u>ırd</u>
free elec	<u>ctives.</u>	
<u>CS 210</u>	Ethical & Professional Issues	2 or
		3
or <u>CS 2</u>	11 Ethical and Professional Conduct	
Total Ho	urs	3-4
Foun	dational Mathematics and Science	
	Course List	
Code	Title	Hours
Total Ho	ours chosen from the following:	25
<u>MATH 2</u>	221 Calculus I (MATH 220 may be substituted. MATH 220 is appropriatefor students with no	4
	background in calculus. 4 of 5 credit hours count towards degree)	

Code	Title	Hours
<u>MATH 231</u>	Calculus II	3
<u>MATH 241</u>	Calculus III	4
MATH 415	Applied Linear Algebra	3
or MATH 257	Linear Algebra with Computational Applications	
or MATH 416	Abstract Linear Algebra	
<u>MATH 257</u>	Linear Algebra with Computational Applications	<u>3</u>
<u>or MATH 415</u>	Applied Linear Algebra	
<u>or MATH 416</u>	Abstract Linear Algebra	
<u>PHYS 211</u>	University Physics: Mechanics	4
<u>PHYS 212</u>	University Physics: Elec & Mag	4
One Science e	lective course:	3

Students must take one course from the Natural Science & Technology (NST) list, in addition to those taken as part of the General Education requirements. The course must be a course that is allowed for credit by the Grainger College of Engineering.

Exceptions to the list are: <u>ASTR 100</u>, <u>PHYS 101</u> and <u>PHYS 102</u>, and <u>CHEM 101</u>.

Students who select either <u>ASTR 121</u>, <u>ASTR 122</u>, or <u>ASTR 150</u> to satisfy the Science Elective requirement will not be allowed to take <u>ASTR 131</u> and <u>ASTR 132</u> as free elective (maximum of 4 credit hours of <u>ASTR 100</u>-level can count towards graduation requirements for all Grainger College of Engineering Undergraduates)

Computer Science Technical Core

Course List	
Code Title	Hours
CS 124 Introduction to Computer Science I	3
CS 128 Introduction to Computer Science II	3
CS 173 Discrete Structures	3
CS 222Software Design Lab	1
CS 225 Data Structures	4
CS 233 Computer Architecture	4
CS 241 Course CS 241 Not Found	4
CS 341 System Programming	<u>4</u>
CS 357 Numerical Methods I	3
CS 361 Probability & Statistics for Computer Science	3
CS 374 Introduction to Algorithms & Models of Computatio	n4
CS 421 Programming Languages & Compilers	3
Total Hours	35
Technical Electives	

Technical Electives

Course List

Code Title

Students must take a minimum of (6) six additional technical electives with at least eighteen (18) cumulative 18 credit hours and chosen from <u>CS 397</u> and the <u>CS 400</u>-level courses, not including <u>CS 400</u>, <u>CS 401</u>, <u>CS 402</u>, <u>CS 403</u> or <u>CS 491</u>. <u>CS 500</u>-level courses may be used as technical electives, but only with special permission from the CS Academic Office. <u>CS 397</u> and <u>CS 499</u> may be used with a cumulative maximum of six (6) credits from them counting as technical electives. One "CS-like" course in another department (e.g., ECE) may also be counted as a <u>CS 400</u>-level course with permission of the CS Academic Office. Non-CS tech electives will not be considered in focus areas.

At least one (1) of the CS courses used for technical electives must be chosen from the list below of CS courses satisfying the team project requirement.

Team Project Course List:

<u>CS 417</u>	Virtual Reality
<u>CS 427</u>	Software Engineering I

Hours

Code	Title	Hours
<u>CS 428</u>	Software Engineering II	3 or
		4
<u>CS 429</u>	Software Engineering II, ACP	3
<u>CS 437</u>	Topics in Internet of Things	3
<u>CS 465</u>	User Interface Design	4
<u>CS 467</u>	Social Visualization	3 or
		4
<u>CS 493</u>	Senior Project II, ACP	3
<u>CS 494</u>	Senior Project II	3
<u>CS 497</u>	CS Team Project	1 to
		3

At least three (3) of the CS courses used for technical electives must be chosen from a single focus area, from among the list of focus areas listed below. The team project course may be used as one of them. <u>CS 498</u> Special Topics and <u>CS 598</u> Special Topics classes may be included in a focus area by department approval.

Software Fou	indations.	
<u>CS 407</u>	Cryptography	3 or
<u>C3 407</u>	Cryptography	3 01 4
<u>CS 409</u>	The Art of Web Programming	3
<u>CS 422</u>	Programming Language Design	3 or
00 122		4
<u>CS 426</u>	Compiler Construction	3 or
		4
<u>CS 427</u>	Software Engineering I	3 or
		4
<u>CS 428</u>	Software Engineering II	3 or
		4
<u>CS 429</u>	Software Engineering II, ACP	3
<u>CS 474</u>	Logic in Computer Science	3 or
		4
<u>CS 476</u>	Program Verification	3 or
		4
<u>CS 477</u>	Formal Software Development Methods	3 or
		4
<u>CS 492</u>	Senior Project I	3
<u>CS 493</u>	Senior Project II, ACP	<u>3</u> <u>3</u>
<u>CS 494</u>	Senior Project II	
<u>CS 521</u>	Advanced Topics in Programming Systems	4
<u>CS 522</u>	Programming Language Semantics	4
<u>CS 524</u>	Concurrent Progrmg Languages	4
<u>CS 526</u>	Advanced Compiler Construction	4
<u>CS 527</u>	Topics in Software Engineering	4
<u>CS 528</u>	Obj-Oriented Program & Design	4
<u>CS 576</u>	Topics in Automated Deduction	2 to
Algorithms	nd Models of Computation:	4
CS 407	Cryptography	3 or
<u>C3 407</u>	Стурюдтарну	3 01 4
<u>CS 413</u>	Intro to Combinatorics	- 3 or
<u>03 413</u>		4
<u>CS 473</u>	Algorithms	4

Code	Title	Hours
<u>CS 474</u>	Logic in Computer Science	3 or
		4
<u>CS 475</u>	Formal Models of Computation	3 or
		4
<u>CS 476</u>	Program Verification	3 or
	5	4
<u>CS 477</u>	Formal Software Development Methods	3 or
<u> </u>		4
<u>CS 481</u>	Advanced Topics in Stochastic Processes & Applications	3 or
		4
<u>CS 482</u>	Simulation	3 or
<u>C5 102</u>		4
<u>CS 571</u>	Combinatorial Mathematics	4
<u>CS 572</u>	Extremal Graph Theory	4
<u>CS 573</u>	Algorithms	4
<u>CS 574</u>	Randomized Algorithms	
	Methods of Combinatorics	4 4
<u>CS 575</u>		
<u>CS 576</u>	Topics in Automated Deduction	2 to
CC 570		4
<u>CS 579</u>	Computational Complexity	4
<u>CS 580</u>	Topics in Algorithmic Game Theory	4
<u>CS 581</u>	Algorithmic Genomic Biology	<u>4</u>
<u>CS 583</u>	Approximation Algorithms	4
<u>CS 584</u>	Embedded System Verification	4
<u>CS 586</u>	Combinatorial Optimization	<u>4</u>
Intelligence a		
<u>CS 410</u>	Text Information Systems	3 or
		4
<u>CS 411</u>	Database Systems	3 or
		4
<u>CS 412</u>	Introduction to Data Mining	3 or
		4
<u>CS 414</u>	Multimedia Systems	3 or
		4
<u>CS 416</u>	Data Visualization	3 or
		4
<u>CS 440</u>	Artificial Intelligence	3 or
		4
<u>CS 441</u>	Applied Machine Learning	3 or
		4
<u>CS 442</u>	Trustworthy Machine Learning	<u>3 or</u>
		<u>4</u>
<u>CS 444</u>	Deep Learning for Computer Vision	<u>3 or</u>
		4
<u>CS 445</u>	Computational Photography	3 or
		4
<u>CS 446</u>	Machine Learning	3 or
		4
<u>CS 447</u>	Natural Language Processing	3 or
		4

Code	Title	Hours
<u>CS 448</u>	Audio Computing Laboratory	3 or
		4
<u>CS 464</u>	Topics in Societal and Ethical Impacts of Computer Technology	3
<u>CS 466</u>	Introduction to Bioinformatics	3 or
		4
<u>CS 467</u>	Social Visualization	3 or
I		4
<u>CS 469</u>	Computational Advertising Infrastructure	3
<u>CS 470</u>	Social and Information Networks	<u>3</u>
<u>CS 510</u>	Advanced Information Retrieval	4
<u>CS 511</u>	Advanced Data Management	4
<u>CS 512</u> <u>CS 514</u>	Data Mining Principles	4
	Advanced Topics in Network Science	4
<u>CS 540</u> <u>CS 542</u>	Deep Learning Theory Statistical Reinforcement Learning	4
<u>CS 542</u> <u>CS 543</u>	Computer Vision	4
<u>CS 545</u> <u>CS 544</u>	Optimiz in Computer Vision	4
<u>CS 545</u>	Machine Learning for Signal Processing	4
<u>CS 545</u> <u>CS 546</u>	Advanced Topics in Natural Language Processing	4
<u>CS 548</u>	Models of Cognitive Processes	4
<u>CS 562</u>	Advanced Topics in Security, Privacy, and Machine Learning	4
<u>CS 567</u>	Social Signals and Social Media	4
<u>CS 576</u>	Topics in Automated Deduction	2 to
<u> </u>		4
<u>CS 582</u>	Machine Learning for Bioinformatics	<u>4</u>
	Ind Social Impact:	=
<u>CS 409</u>	The Art of Web Programming	3 or
		4
<u>CS 416</u>	Data Visualization	3 or
		4
<u>CS 417</u>	Virtual Reality	3 or
		4
<u>CS 441</u>	Applied Machine Learning	3 or
		4
<u>CS 442</u>	Trustworthy Machine Learning	<u>3 or</u>
		<u>4</u>
<u>CS 460</u>	Security Laboratory	3 or
		4
<u>CS 461</u>	Computer Security I	4
<u>CS 463</u>	Computer Security II	3 or
	Testes in Castella ed Filipitel Incende of Castella Technolog	4
<u>CS 464</u>	Topics in Societal and Ethical Impacts of Computer Technology	3
<u>CS 465</u>	User Interface Design	4
<u>CS 467</u>	Social Visualization	3 or
CC 160	Tech and Adverticing Compaigne	4
<u>CS 468</u>	Tech and Advertising Campaigns	3
<u>CS 469</u> <u>CS 470</u>	Computational Advertising Infrastructure Social and Information Networks	
<u>CS 500</u>	Current Topics in Computing Education Research	<u>3</u> 4
<u>CS 500</u> <u>CS 514</u>	Advanced Topics in Network Science	4
<u>CS 514</u> <u>CS 562</u>	Advanced Topics in Network Science Advanced Topics in Security, Privacy, and Machine Learning	4
00 002	Advanced ropies in Security, i macy, and machine Learning	4

Code	Title	Hours
<u>CS 563</u>	Advanced Computer Security	4
<u>CS 565</u>	Human-Computer Interaction	4
CS 566	Course CS 566 Not Found (Experimental HCI)	4
<u>CS 567</u>	Social Signals and Social Media	4
Media:		
<u>CS 409</u>	The Art of Web Programming	3 or
		4
<u>CS 414</u>	Multimedia Systems	3 or
66.416	Dete Viewelizetien	4
<u>CS 416</u>	Data Visualization	<u>3 or</u>
<u>CS 417</u>	Virtual Reality	<u>4</u> 3 or
<u>C5 417</u>	Virtual Reality	4
<u>CS 418</u>	Interactive Computer Graphics	
<u>C5 410</u>		4
<u>CS 419</u>	Production Computer Graphics	3 or
		4
<u>CS 445</u>	Computational Photography	3 or
		4
<u>CS 448</u>	Audio Computing Laboratory	3 or
		4
<u>CS 465</u>	User Interface Design	4
<u>CS 467</u>	Social Visualization	3 or
		4
<u>CS 468</u>	Tech and Advertising Campaigns	3
<u>CS 469</u>	Computational Advertising Infrastructure	3 or
		4
<u>CS 519</u>	Scientific Visualization	4
<u>CS 545</u>	Machine Learning for Signal Processing	4
<u>CS 565</u> <u>CS 567</u>	Human-Computer Interaction	4
•	Social Signals and Social Media Parallel, and High Perfomance Computing:	4
<u>CS 419</u>	Production Computer Graphics	3 or
<u>C5 415</u>	rioduction computer oraphics	4
<u>CS 435</u>	Cloud Networking	3 or
		4
<u>CS 450</u>	Numerical Analysis	3 or
		4
<u>CS 457</u>	Numerical Methods II	3
<u>CS 466</u>	Introduction to Bioinformatics	3 or
		4
<u>CS 482</u>	Simulation	3 or
		4
<u>CS 483</u>	Applied Parallel Programming	4
<u>CS 484</u>	Parallel Programming	3 or
00.510		4
<u>CS 519</u>	Scientific Visualization	4
<u>CS 554</u>	Parallel Numerical Algorithms	4
<u>CS 555</u>	Numerical Methods for PDEs	4
<u>CS 556</u>	Iterative & Multigrid Methods	4
<u>CS 558</u>	Topics in Numerical Analysis	4

Code	Title Systems, Networking, and Security:	Hours
CS 407	Cryptography	3 or
<u>CS 423</u>	Operating Systems Design	4 3 or
<u>CS 424</u>	Real-Time Systems	4 3 or
<u>CS 425</u>	Distributed Systems	4 3 or
<u>CS 431</u>	Embedded Systems	4 3 or
<u>CS 435</u>	Cloud Networking	4 3 or
<u>CS 436</u>	Computer Networking Laboratory	4 3 or
<u>CS 437</u>	Topics in Internet of Things	4 3 or
<u>CS 438</u>	Communication Networks	4 3 or
<u>CS 439</u>	Wireless Networks	4 3 or
<u>CS 460</u>	Security Laboratory	4 3 or
<u>CS 461</u>	Computer Security I	4 4
<u>CS 463</u>	Computer Security II	3 or 4
<u>CS 483</u> <u>CS 484</u>	Applied Parallel Programming Parallel Programming	4 3 or
<u>CS 523</u>	Advanced Operating Systems	4 4
<u>CS 524</u>	Concurrent Progrmg Languages	4
<u>CS 525</u>	Advanced Distributed Systems	4
<u>CS 537</u>	Advanced Topics in Internet of Things (IoT)	4
<u>CS 538</u> <u>CS 562</u>	Advanced Computer Networks	4
<u>CS 563</u>	Advanced Topics in Security, Privacy, and Machine Learning Advanced Computer Security	4 4
Machines:		·
<u>CS 423</u>	Operating Systems Design	3 or
		4
<u>CS 424</u>	Real-Time Systems	3 or
<u>CS 426</u>	Compiler Construction	4 3 or
00 120		4
<u>CS 431</u>	Embedded Systems	3 or 4
<u>CS 433</u>	Computer System Organization	3 or 4
<u>CS 437</u>	Topics in Internet of Things	<u>3 or</u> <u>4</u>
<u>CS 484</u>	Parallel Programming	4 3 or 4

Code	Title	Hours
<u>CS 523</u>	Advanced Operating Systems	4
<u>CS 526</u>	Advanced Compiler Construction	4
<u>CS 533</u>	Parallel Computer Architecture	4
<u>CS 534</u>	Advanced Topics in Computer Architecture	4
<u>CS 536</u>	Fault-Tolerant Dig Syst Design	4
<u>CS 541</u>	Computer Systems Analysis	4
<u>CS 584</u>	Embedded System Verification	4
<u>CS 588</u>	Autonomous Vehicle System Engineering	<u>4</u>
Compute	ar Science Advanced Flectives	

Computer Science Advanced Electives

Course List Title

Hours

Students must take for a letter grade a minimum of two (2) advanced elective courses comprising at least six 6 (6) credit hours. These advanced elective courses must be distinct from courses used to satisfy the technical electives. They may be chosen from <u>CS 397</u> Individual Study and the 400-level coursework offered for letter grade in ANY area offered at the University of Illinois at Urbana-Champaign. It is expected that students will select these additional advanced courses in a way that best augments their program of study. Consultation with a faculty mentors is highly encouraged. A maximum of six (6) credit hours of <u>CS 397</u> may be used in the combination of technical electives and advanced electives.

Free Electives

Code

Course List	
Code Title	Hours
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus	6
General Education lists for Social and Behavioral Sciences or Humanities and the Arts 3	
Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so	18
that there are at least 128 credit hours earned toward the degree. 4	
Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that	<u>24-25</u>
there are at least 128 credit hours earned toward the degree.	
Total Hours of Curriculum to Graduate	128
12	
MATH 220%7C may be substituted, with four of the five credit hours applying toward the degree. MATH 220%	67C is
appropriate for students with no background in calculus.	
3	
The Grainger College of Engineering approved liberal education course list can be found here. Note that these	e
credit hours could carry the required cultural studies decignation required for campus general education	

credit hours could carry the required cultural studies designation required for campus general education requirements.

4The Grainger College of Engineering restrictions to free electives can be found here.

Corresponding BS Bachelor of Science Degree

Program Features

Academic Level Undergraduate

Does this major No have transcripted concentrations?

What is the typical time to completion of this program?

 What are the minimum Total Credit Hours required for this program?

 CIP Code
 110701 - Computer Science.

 Is This a Teacher Certification Program?

 No

 Will specialized accreditation be sought for this program?

 No

Delivery Method

This program is available: On Campus - Students are required to be on campus, they may take some online courses.

Admission Requirements

Desired Effective Admissions Term

Provide a brief narrative description of the admission requirements for this program. Where relevant, include information about licensure requirements, student background checks, GRE and TOEFL scores, and admission requirements for transfer students.

Describe how critical academic functions such as admissions and student advising are managed.

Enrollment

Describe how this revision will impact enrollment and degrees awarded. These changes will not impact enrollment.

Estimated Annual Number of Degrees Awarded

Year One Estimate

5th Year Estimate (or when fully implemented)

What is the Fall matriculation term for this program?

Budget

Are there No budgetary implications for this revision? Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available? No Additional Budget Information Attach File(s)

Financial Resources

How does the unit intend to financially support this proposal?

Will the unit need to seek campus or other external resources?

No

Attach letters of support

What tuition rate do you expect to charge for this program? e.g, Undergraduate Base Tuition, or Engineering Differential, or Social Work Online (no dollar amounts necessary)

Are you seeking a change in the tuition rate or differential for this program?

No

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities? No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/acknowledgement from faculty, students, and/or other impacted units as appropriate.

Attach File(s)

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

These changes will not impact our faculty resources.

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

There is no impact to the use of the Library collections, resources, and services.

EP Documentation

EP Control Number	EP.22.088		
Attach Rollback/Approval Notices	ep22088_response from sponsor_2022021	<u>4.pdf</u>	
This proposal requires HLC inquiry	No		
DMI Document	ation		
Attach Final Approval Notices			
Banner/Codebook Name	BS:Computer Science -UIUC		
Program Code:	10KP0112BS		
Minor Code 0112	Conc Code	Degree Code	BS
Senate Approval Date			
Senate Conference Approval Date			
BOT Approval Date			
IBHE Approval Date			
HLC Approval Date			
Effective Date:			
Attached Document Justification for this request			
Due evene Deviewer	Breaks Newell (herewell) (01/06/22)	(

Program Reviewer	Brooke Newell (bsnewell) (01/06/22 6:23 am): Rollback: per request
Comments	Brooke Newell (bsnewell) (01/06/22 4:44 pm): Rollback: per discussion

Major Code

From: Hanley-Maxwell, Cheryl D <<u>cherylhm@illinois.edu</u>>
Sent: Monday, February 14, 2022 3:57 PM
To: Miller, Nolan H <<u>nmiller@illinois.edu</u>>
Subject: RE: Senate Ed Pol - Re: change to Grainger Liberal Education requirement

That's fine. Thanks for asking

CHERYL D HANLEY-MAXWELL

Dean

University of Illinois at Urbana-Champaign College of Applied Health Sciences 108 Huff Hall 1206 S Fourth | M/C 586 Champaign, IL 61820 217.333.2131 | <u>cherylhm@illinois.edu</u> www.ahs.illinois.edu (217) 333-0404 (FAX)

Human kindness has never weakened the stamina or softened the fiber of a free people. A nation does not have to be cruel to be tough. -- President Franklin D. Roosevelt



Under the Illinois Freedom of Information Act any written communication to or from university employees regarding university business is a public record and may be subject to public disclosure.

From: Miller, Nolan H <<u>nmiller@illinois.edu</u>>
Sent: Monday, February 14, 2022 1:49 PM
To: Hanley-Maxwell, Cheryl D <<u>cherylhm@illinois.edu</u>>
Subject: RE: Senate Ed Pol - Re: change to Grainger Liberal Education requirement

Dear Cheryl,

Thanks again for talking with me about the changes to the Grainger BS programs. I read the statement you sent to the committee today. The Chair would like to include it in the record that is forwarded to the Senate. Is it ok to include the email you sent below?

Thanks,

Nolan



NOLAN H MILLER

Daniel and Cynthia Mah Helle Professor in Finance | Department of Finance Director, Center for Business and Public Policy Gies College of Business | University of Illinois at Urbana-Champaign 217.244.2847 | nmiller@illinois.edu | http://www.business.illinois.edu/nmiller

Under the Illinois Freedom of Information Act any written communication to or from university employees regarding university business is a public record and may be subject to public disclosure.

From: Hanley-Maxwell, Cheryl D <<u>cherylhm@illinois.edu</u>>
Sent: Thursday, February 10, 2022 1:49 PM
To: Miller, Nolan H <<u>nmiller@illinois.edu</u>>
Subject: RE: Senate Ed Pol - Re: change to Grainger Liberal Education requirement

Hi Nolan –

I appreciate what Ed Pol does in juggling the interests and concerns of the various programs across the campus, while keeping the students in mind. I served on a committee like this at my previous institution and know that it all boils down to what is best for the students' learning. Thanks for reminding me of that.

Here is a statement: While the Grainger proposal has the potential to financially affect AHS, we want to affirm another college's right to control their program requirements and student experiences, ensuring the best possible outcomes for their students. As a result, AHS supports this proposal and hopes that Grainger advisors will recognize the valuable contribution AHS classes make to the education of their students and continue to encourage them to consider relevant and/or high interest classes in AHS.

Hope this works!

Cheryl

CHERYL D HANLEY-MAXWELL, PHD Dean

University of Illinois at Urbana-Champaign College of Applied Health Sciences 108 Huff Hall 1206 S Fourth | M/C 586 Champaign, IL 61820 217.333.2131 | <u>cherylhm@illinois.edu</u> www.ahs.illinois.edu (217) 333-0404 (FAX)

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Under the Illinois Freedom of Information Act any written communication to or from university employees regarding university business is a public record and may be subject to public disclosure.

KEY EEN HIGHLIGHT = Course addition or requirement replaceme D HIGHLIGHT = Course to be removed from listed requirement

Current Program of Study

Graduation Requirements

Minimum Technical G SPA: 2.0 CS and Math courses. See Technical GPA to clarify requirements.

Minimum Overall GPA: 2.0 Minimum hours required for graduation: 128 hours

General education: Students must complete the Campus General Education requirements including the campus general

education language requirement.

Orientation and Professional Development

be used to help meet free elective requirements) CS 210 Ethical & Professional Issues CS 211 Ethical and Professional Conduct ENG 100 Engineering Orientation ¹ Total Hours Total Hours	3-4
CS 210 Ethical & Professional Issues	
be used to help meet free elective requirements)	2 or 3
CS 100 Freshman Orientation (optional course highly recommended may	1

oundational Mathematics and Science

	Calculus I ²
MATH 221	
MATH 231	Calculus II
MATH 241	Calculus III
MATH 415	Applied Linear Algebra
or MATH 257	Linear Algebra with Computational Applications
or MATH 416	Abstract Linear Algebra
PHYS 211	University Physics: Mechanics
PHYS 212	University Physics: Elec & Mag
One Science elective	e course:

Students must take one course from the Natural Science & Technology (NST) list, in addition to those taken as part of the General Education requirements. The course must be a course that is allowed for credit by the Grainger College of Engineering.

ceptions to the list are: ASTR 100, PHYS 101 and PHYS 102, and CHEM 101.

Students who select either ASTR 121, ASTR 122, or ASTR 150 to satisfy the Science Elective requirement will not be allowed to take ASTR 131 and ASTR 132 as free elective (maximum of 4 credit hours of ASTR 103-evel can count towards graduation requirements for all Grainger College of Engineering Undergraduates)

Computer So	cience Technical Core	Co	mputer Scie	ence Technical Core	
CS 124	Introduction to Computer Science I	3 CS 1	124	Introduction to Computer Science I	
CS 128	Introduction to Computer Science II	3 CS 1	128	Introduction to Computer Science II	
CS 173	Discrete Structures	3 CS 1	173	Discrete Structures	
CS 222	Software Design Lab	1 CS 2	222	Software Design Lab	
CS 225	Data Structures	4 CS 2	225	Data Structures	
CS 233	Computer Architecture	4 CS 2	233	Computer Architecture	
CS 241	System Programming	4 CS 3	341	System Programming	
CS 361	Probability & Statistics for Computer Science	3 CS 3	357	Numerical Methods I	
CS 357	Numerical Methods I	3 CS 3	361	Probability & Statistics for Computer Science	
CS 374	Introduction to Algorithms & Models of Computation	4 CS 3	374	Introduction to Algorithms & Models of Computation	
CS 421	Programming Languages & Compilers	3 CS 4	421	Programming Languages & Compilers	
Total Hours		ar Tota	al Hours		

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Technical Electives

Technical Electives

Students must take a minimum of (6) six additional technical electives with at least eighteen (18) cumulative credit hours and chosen from CS 397 and the CS 400-level courses, not including CS 400, CS 401, CS 402, CS 400, CS 400, CS 600-level courses may be used as technical electives, but only with special permission from the CS Academic Office. CS 397 and CS 499 may be used with a cumulative maximum of axis (6) credits from them counting as technical electives. One "CS-Lille" course in another department (e.g., ECE) may also be counted as LS 400-level course with permission of the CS Academic Office. Non-CS tech electives will not be considered in focus areas.

At least one (1) of the CS courses used for technical electives must be chosen from the list below of CS courses satisfying the team project requirement

Team Project Co	urse List:	
CS 417	Virtual Reality	
CS 427	Software Engineering I	
CS 428	Software Engineering II	
CS 429	Software Engineering II, ACP	
CS 437	Topics in Internet of Things	
CS 465	User Interface Design	
CS 467	Social Visualization	
CS 493	Senior Project II, ACP	
CS 494	Senior Project II	
CS 497	CS Team Project	

At least three (3) of the CS courses used for technical electives must be chosen from a single focus area, from among the list of focus areas listed below. The team project course may be used as one of them.

CS 498 Special Topics and CS 598 Special Topics classes may be included in a focus area by
department approval

department ap	proval
	Software Foundations:
CS 407	Cryptography
CS 409	The Art of Web Programming
CS 422	Programming Language Design
CS 426	Compiler Construction
CS 427	Software Engineering I
CS 428	Software Engineering II
CS 429	Software Engineering II, ACP
CS 474	Logic in Computer Science
CS 476	Program Verification
CS 477	Formal Software Development Methods
CS 492	Senior Project I
CS 521	Advanced Topics in Programming Systems
CS 522	Programming Language Semantics
CS 524	Concurrent Progrmg Languages
CS 526	Advanced Compiler Construction
CS 527	Topics in Software Engineering
CS 528	Obj-Oriented Progrmg & Design
CS 576	Topics in Automated Deduction
	Algorithms and Models of Computation:
CS 407	Cryptography
CS 413	Intro to Combinatorics
CS 473	Algorithms
CS 474	Logic in Computer Science
CS 475	Formal Models of Computation
CS 476	Program Verification
CS 477	Formal Software Development Methods
CS 481	Advanced Topics in Stochastic Processes & Applications

New Program of Study

Graduation Requirements

Minimum Technical GPA: 2.0 TGPA is required for CS and Math courses. See Technical GPA to clarify requirements. Minimum Overall GPA: 2.0

Minimum hours required for graduation: 128 hours

General education: Students must complete the Campus General Education requirements including the campus general education language requirement. If the option of CS 211 is forsen, it will satisfy a core course requirement and the Campus General Education Advanced Composition requirement.

ENG 100	Engineering Orientation (External transfer students take ENG	1
	300.)	
Highly recommended, o	pptional 1 credit hour course, CS 100 Freshman Orientation. Credit hour counts toward free	
CS 210	Ethical & Professional Issues	2 or 3
or CS 211	Ethical and Professional Conduct	
Total Hours		3-4
Foundational Math	ematics and Science	
Total Hours chosen from	the following:	25
	Calculus I (MATH 220 may be substituted. MATH 220 is	
	appropriate for students with no background in calculus. 4 of 5	4
MATH 221	credit hours count toward degree.)	
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
or MATH 415	Applied Linear Algebra	
or MATH 416	Abstract Linear Algebra	
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
One Science elective cour	se:	3

2 University Physics: Mechanics 2 University Physics: Elec & Mag nce elective course:

tudents must take one course from the Natural Science & Technology (NST) list, in addition to hose taken as part of the General Education requirements. The course must be a course that allowed for credit by the Grainger College of Engineering.

ceptions to the list are: ASTR 100, PHYS 101 and PHYS 102, and CHEM 101.

tudents who select either ASTR 121, ASTR 122, or ASTR 150 to satisfy the Science Elective equirement will not be allowed to take ASTR 131 and ASTR 132 as free elective (maximum of 4 realth hours of ASTR 100-level can conclust thowards graduation requirements for all Grainger College of Engineering Undergraduates)

Computer Science Technical Core	
CS 124	Introduction to Computer Science I
CS 128	Introduction to Computer Science II
CS 173	Discrete Structures
CS 222	Software Design Lab
CS 225	Data Structures
CS 233	Computer Architecture
CS 341	System Programming
CS 357	Numerical Methods I
CS 361	Probability & Statistics for Computer Science
CS 374	Introduction to Algorithms & Models of Computation
CC 101	

(18) cumulative cm including CS 400, C technical electives CS 499 may be use technical electives counted as a CS 40	e a minimum of (6) six additional technical electives with at least eighteen edithours and chosen from C 337 and the C 5400-level courses, not S401, C 5402, C 5403 or C 5403. C 5 900-level courses may be used as but only with special permission from the C 5 Academic Office. C 337 and d with a cumulative maximum of six (6) credits from them counting as 0.00° C Silie [®] course in another department, (e.g., ECB may also be 06-level course with permission of the CS Academic Office. Non-CS tech e considered in focus areas.	
below of CS course	the CS courses used for technical electives must be chosen from the list as satisfying the team project requirement	
Team Project Cour		
CS 417	Virtual Reality	
CS 427 CS 428	Software Engineering I	
CS 428 CS 429	Software Engineering II Software Engineering II, ACP	
CS 429 CS 437	Topics in Internet of Things	
CS 437 CS 465	User Interface Design	
CS 467	Social Visualization	
CS 493	Senior Project II, ACP	
CS 494	Senior Project II	
CS 497	CS Team Project	
	ics and CS 598 Special Topics classes may be included in a focus area by	
department appro	val Software Foundations:	
department appro	val Software Foundations: Cryptography	
department appro	val Software Foundations: Cryptography The Art of Web Programming	
department appro CS 407 CS 409 CS 422	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design	
department appro	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction	
department appro CS 407 CS 409 CS 422 CS 426	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design	
department appro CS 407 CS 409 CS 422 CS 422 CS 426 CS 427	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction Software Engineering I	
department appro CS 407 CS 409 CS 422 CS 426 CS 426 CS 427 CS 428 CS 428 CS 429 CS 429 CS 474	val Software Foundations: Cryptography The Art of Web Programming Programmig Language Design Compalier Construction Software Engineering I Software Engineering II	
department appro	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction Software Engineering I Software Engineering II, ACP Logic in Computer Science Program Verification	
department appro CS 407 CS 409 CS 422 CS 426 CS 427 CS 427 CS 428 CS 429 CS 474 CS 476 CS 476 CS 477	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction Software Engineering I Software Engineering II Software Engineering II, ACP Lage in Computer Science Program Verification Formal Software Development Methods	
department appro	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction Software Engineering II Software Engineering II, ACP Logic in Computer Science Program Verification Formal Software Development Methods Senior Project I	
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department appro (S 407 (S 409 (S 422 (S 422 (S 422 (S 424 (S 427 (S 428 (S 427 (S 428 (S 427 (S 429 (S 427 (S 429 (S 477 (S 492 (S 477 (S 492 (S 494 (S 522) (S 522	val Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction Software Engineering I Software Engineering II, ACP Logic in Computer Science Program Verification Formal Software Development Methods Senior Project I Senior Project I Advanced Topics In Programming Systems Programming Language Semantics	
department appro CS 407 CS 409 CS 402 CS 422 CS 422 CS 426 CS 427 CS 428 CS 429 CS 474 CS 477 CS 477 CS 497 CS 492 CS 492 CS 522 CS 522 CS 524 CS 525 CS 527 CS 5	val Software Foundations: Cryptogramby The hot of Neb Pogramming Programming Language Design Conselic Construction Software Engineering II Software Engineering II Software Engineering II Software Development Methods Senior Project II Senior Project II, ACP Senior Project II, ACP Advancet Complete Construction Topics: Doftware Engineering	
department appro CS 407 CS 409 CS 409 CS 422 CS 422 CS 426 CS 427 CS 428 CS 429 CS 429 CS 474 CS 477 CS 492 CS 493 CS 494 CS 521 CS 522 CS 526 CS 527 CS 528	vol Software Foundations: Cryptography The Art of Web Programming Programming Language Design Compiler Construction Software Engineering I Software Engineering II, ACP Logic in Computer Science Program Verification Formal Software Dewelopment Methods Senior Project I Senior Project I, ACP Senior Project I, ACP Senior Project I, ACP Senior Project I Advanced Topics In Programming Systems Programming Language Senantics Concurrent Program Languages Advanced Compiler Construction Topics in Software Engineering Obj-Oriented Tropics Besign	
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Advanced Topics in Stochastic Processes & Applications

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CS 482	Simulation
CS 571	Combinatorial Mathematics
CS 572	Extremal Graph Theory
CS 573 CS 574	Algorithms Randomized Algorithms
CS 575	Methods of Combinatorics
CS 576	Topics in Automated Deduction
CS 579 CS 580	Computational Complexity
CS 580	Topics in Algorithmic Game Theory
CS 583	Approximation Algorithms
CS 584	Embedded System Verification
	Intelligence and Dis Deter
CS 410	Intelligence and Big Data: Text Information Systems
CS 410	Database Systems
CS 412	Introduction to Data Mining
CS 414 CS 416	Multimedia Systems
CS 416 CS 440	Data Visualization Artificial Intelligence
CS 441	Applied Machine Learning
CS 445	Computational Photography
CS 445	Machine Learning
CS 447	Natural Language Processing
CS 448	Audio Computing Laboratory
CS 464	Topics in Societal and Ethical Impacts of Computer Technology
CS 466	Introduction to Bioinformatics
CS 467	Social Visualization
CS 469	Computational Advertising Infrastructure
CS 510	Advanced Information Retrieval
CS 511	Advanced Data Management
CS 512	Data Mining Principles
CS 514 CS 540	Advanced Topics in Network Science Deep Learning Theory
CS 542	Statistical Reinforcement Learning
CS 543	Computer Vision
CS 544 CS 545	Optimiz in Computer Vision Machine Learning for Signal Processing
CS 546	Advanced Topics in Natural Language Processing
CS 548	Models of Cognitive Processes
CC = C2	Advanced Topics in Security, Privacy, and Machine Learning
CS 562 CS 567	Social Signals and Social Media
CS 576	Topics in Automated Deduction
CS 409	Human and Social Impact: The Art of Web Programming
CS 409 CS 416	Data Visualization
CS 417	Virtual Reality
CS 441	Applied Machine Learning
CS 460	Security Laboratory
CS 460	Computer Security I
CS 463	Computer Security II
CS 464	Topics in Societal and Ethical Impacts of Computer Technology
CS 464 CS 465	User Interface Design
CS 467	Social Visualization
CS 468	Tech and Advertising Campaigns
CS 469	Computational Advertising Infrastructure
CS 500	Current Topics in Computing Education Research
	Advanced Topics in Network Science
CS 514	Advanced Topics in Network Science
CS 514 CS 562 CS 563	Advanced topics in Network Science Advanced Topics in Security, Privacy, and Machine Learning Advanced Computer Security
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CS 526 Ad	dvanced Compiler Construction	4	CS 526	Advanced Compiler Construction	
CS 533 Pa	arallel Computer Architecture	4	CS 533	Parallel Computer Architecture	
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	nbedded System Verification	4	CS 584	Embedded System Verification	
			CS 588	Autonomous Vehicle System Engineering	
Computer Science Adv	anced Electives		Computer Scie	nce Advanced Electives	
Students must take for a letter grade a minimum of two (2) advanced elective courses			Students must tak	e for a letter grade a minimum of two (2) advanced elective courses	
comprising at least six (6) credit hours. These advanced elective courses must be distinct from			comprising at least	six (6) credit hours. These advanced elective courses must be distinct from	
courses used to satisfy the te	chnical electives. They may be chosen from CS 397 Individual	6	courses used to sa	tisfy the technical electives. They may be chosen from CS 397 Individual	
	sework offered for letter grade in ANY area offered at the		Study and the 400-	level coursework offered for letter grade in ANY area offered at the	
	a-Champaign. It is expected that students will select these			s at Urbana-Champaign. It is expected that students will select these	
	in a way that best augments their program of study. Consultation			d courses in a way that best augments their program of study. Consultation	
	ly encouraged. A maximum of six (6) credit hours of CS 397 may			cors is highly encouraged. A maximum of six (6) credit hours of CS 397 may	
	f technical electives and advanced electives.			bination of technical electives and advanced electives.	
Total Hours		6	Total Hours		
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	eering Liberal Education course list, or additional courses from In lists for Social and Behavioral Sciences or Humanities and the	6			
Free electives. Additional unr	estricted course work, subject to certain exceptions as noted by			vork subject to the Grainger College of Engineering restrictions to Free	
the College, so that there are at least 128 credit hours earned toward the degree. ⁴				ere are at least 128 credit hours earned toward the degree.	24-2
ne conege, so that there are	ar least 120 creat nouis cannea toward the degree.		(https://go.grainge	r.illinois.edu/FreeElectives)	

³ MATH 220 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. The Granger College of Engineering approval biend includuation course list can be found here. Note that these credit hours could carry the required cultural studies designation required for campus general education requirements. ⁴ The Granger College of Engineering restrictions to free electives can be found here.



COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

Office of the Dean 227 Mumford Hall, MC-710 1301 W. Gregory Drive Urbana, IL 61801

January 13, 2022

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Germán Bollero, Interim Dean



COLLEGE OF APPLIED HEALTH SCIENCES

Office of the Dean 110 Huff Hall, MC-586 1206 S. Fourth St. Champaign, IL 61820

January 25, 2022

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

While I support the move the give your students more freedom in course selection, it is important to express my concern that discontinuing your Liberal Education requirement may negatively impact my college's finances by reducing the IUs generated from lower enrollments in AHS courses. As you know, the current budget model rewards colleges financially based on the number of registrants in courses. I am hopeful that your students and advisors will continue to view AHS courses as relevant and valuable when they are selecting electives.

Sincerely,

Chery Hanley - Maxwell

Dean



College of Education

Undergraduate Student Academic Affairs Office 110 Education Building, MC-708 1310 S. Sixth St. Champaign, IL 61820

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Assistant Dean for Academic Affairs College of Education | University of Illinois at Urbana-Champaign



College of Fine & Applied Arts

Office of the Dean 100 Architecture Building, MC-622 608 E. Lorado Taft Dr. Champaign, IL 61820

21 December 2021

Rashid Bashir, Dean 306 Engineering Hall 1308 W. Green St. M/C 266 Urbana, IL 61801

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from the College of Fine & Applied Arts. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Kevin Hamiltan

Kevin Hamilton Dean and Professor



2090 Lincoln Hall, MC-448 702 S. Wright St. Urbana, IL 61801

December 20, 2021

Dear Dean Bashir,

Thank you for informing the College of LAS of the proposed removal of the Liberal Education requirement in all undergraduate programs in the Grainger College of Engineering. I understand that this requirement includes an extensive list of courses from which your students could choose some, many of which are from our college. Grainger Engineering students will continue to be welcome to take our courses formerly on your Liberal Education list as free electives after the removal of this requirement from their programs of study.

metrie Rollin

Venetria K. Patton Harry E. Preble Dean



College of Media

Office of the Dean 119 Gregory Hall, MC-462 810 S. Wright St. Urbana, IL 61801

January 13, 2022

Rashid Bashir, Dean The Grainger College of Engineering 306 Engineering Hall 1308 W. Green Street Urbana, IL 61801

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Shary huk

Tracy Sulkin Dean, College of Media



December 13th, 2021

Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from Gies College of Business. Students from Grainger will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Jeffrey R. Brown Dean, Gies College of Business



501 E. Daniel St., MC-493 Champaign, IL 61820-6211

February 3, 2022

Dean Rashid Bashir 306 Engineering Hall 1308 West Green Street Urbana, IL 61801

Dear Rashid,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in the Grainger College of Engineering. I understand that this requirement included an extensive list of courses that Grainger Engineering students could choose from, including some from the iSchool. This letter acknowledges that Grainger Engineering students will continue to be able to enroll in courses as articulated and constrained in Course Explorer and formerly on your Liberal Education list as Free Electives, after the removal of this requirement.

Eunice Santos

Eunice Santos Professor and Dean