

## **Proposal to the Senate Educational Policy Committee**

- **PROPOSAL TITLE:** Proposal to revise the BSLAS in Computer Science and a Liberal Arts and Sciences Discipline (CS+X) in the College of Liberal Arts and Sciences
- **SPONSOR:** Lenny Pitt, Professor and Director of Undergraduate Programs, Department of Computer Science, 333-7505, <u>pitt@illinois.edu</u>.
- **COLLEGE CONTACT**: Karen Carney, Associate Dean, College of Liberal Arts and Sciences, 333-6622, <u>kmcarney@illinois.edu</u>.

#### **BRIEF DESCRIPTION:**

Recently, the Department of Computer Science (CS) has proposed significant changes to its undergraduate curriculum in the College of Engineering, mainly focusing on foundational courses. The changes eliminate some dated material, make some important topics accessible to students earlier in the curriculum, and overall provide more opportunity for advanced electives beyond the foundational core. As a consequence to these changes, parallel changes to the CS degrees offered in LAS are also being proposed, as the CS portions of the CS degrees in LAS comprise these CS foundational courses. This proposal is for the CS+X major, which currently includes options in CS+Anthropology, CS+Astronomy, CS+Chemistry, and CS+Linguistics. Revised curricula proposals are simultaneously being submitted for the CS major in Engineering, and the Mathematics and Computer Science major and Statistics and Computer Science major in LAS.

Specific changes to the CS+X major include:

- 1. Replace and discontinue CS 242 with new course CS 126.
- 2. Replace CS 373 + CS 473 requirement with new course CS 374.
- 3. Replace STAT 100 with the choice of STAT 200 *Statistical Analysis*, STAT 212 *Biostatistics*, or CS 361 *Probability & Statistics for Computer Science*, a new course developed by CS.
- 4. Add Math 220 as an option instead of Math 221, for students who have had no calculus.
- 5. Explicitly recommend CS 100 Freshman Orientation (1 hour).

#### JUSTIFICATION:

The CS undergraduate major in the College of Engineering is being revised, and the above changes will bring the foundational CS coursework in the CS+X degree program in LAS in line with that in the CS degree program in ENGR. Specific reasons for the above changes:

- 1. CS 242 is taken too late in the current curriculum to allow students to benefit from the instruction on good coding practice. Also, CS 126 will introduce a number of topics that are currently not covered in the curriculum. Finally, CS 126, placed between software/programming courses CS 125 and CS 225, will engage students in the practice of programming during their second semester, where there is currently a hole in the curriculum resulting in students going eight months or more without programming following their initial exposure.
- 2. CS 373 contained dated material that was of dubious value for current CS students. CS 473 was taken too late in the curriculum for other courses to benefit, because CS 373 was a prerequisite. The new four-hour CS 374 blends together topics from these two computer science theory courses, presenting them in a more unified manner, and accessible earlier in the curriculum. The reduction of two credit hours (from 3+3 to 4) will also allow students to take more technical electives.
- 3. Modern computer science practice increasingly relies on probabilistic and statistical methods to deal with large amounts of data. This is especially true for application areas such as Anthropology, Astronomy, Chemistry, and Linguistics. It has become a sufficiently central topic that it is desirable to introduce this material in the context of CS, with students solving real-world problems with real data via programming statistical and probabilistic methods. STAT 100, which touches on some of these topics only in a cursory manner, does not offer the same opportunities. STAT 200 and STAT 212 are suggested as alternatives to CS 361, as all of these courses include some important topics that STAT 100 does not.
- 4. The fact that Math 220 was not included in the initial proposal was an oversight.
- 5. Students have been advised to take the optional CS 100. We are simply listing this recommendation explicitly in the Program of Study.

#### **BUDGETARY AND STAFF IMPLICATIONS:**

#### 1) Resources

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

The proposal is not for a new program, but for revenue-neutral modification of an existing one, so it will be supported in the future as it has been in the past.

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

There is no net gain in the number of courses required, and teaching resources will be shifted from previously taught discontinued courses to the new ones proposed. No other additional resources are required other than those associated with our natural growth.

c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.

No additional campus or external resources will be needed due to the revision in program

- d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.
- 2) Resource Implications
  - a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

No additional faculty resources will be needed due to this revision.

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

There may be a slight drop in students taking STAT 100, and a slight increase in STAT 200 and STAT 212, along with students enrolling in the new CS 361. However, the number of CS+X majors is negligible relative to the size of STAT 100. The Statistics Department is aware of these changes.

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

None anticipated

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

None anticipated

#### **DESIRED EFFECTIVE DATE:**

Fall, 2016

#### STATEMENT FOR ACADEMIC CATALOG:

Computer Science and Liberal Arts and Sciences Discipline

The LAS major in Computer Science and an LAS Discipline is a flexible program for students who plan to pursue technical or professional careers in arts and sciences areas requiring a sound grounding in computer science. This major allows students to combine study of computer science with training in a field in Liberal Arts and Sciences to offer students novel perspectives in interdisciplinary work. Students can use the supporting coursework to prepare for employment immediately upon graduation or for pursuing graduate study in a wide variety of fields or to complete a significant body of courses in a single area, such as a double major or minor.

Students are strongly encouraged to get involved in undergraduate research through independent studies and funded research experiences, with the goal of learning from the University of Illinois CS and LAS internationally recognized scholars outside the classroom and participating in the exciting quest for new contributions to the field.

Students interested in Mathematics or Statistics should enroll in the <u>Math/CS</u> or <u>Stat/CS</u> degree

Current approved curricula include:

Computer Science and Anthropology

Computer Science and Astronomy

Computer Science and Chemistry

Computer Science and Linguistics

For the degree of Bachelor of Science in Liberal Arts and Sciences

Major in Sciences and Letters Curriculum

Please see the computer science advisor as well as the advisor in your LAS discipline.

Current approved curricula include:

Computer Science and Anthropology

Computer Science email: <u>academic@cs.illinois.edu</u> Anthropology email: <u>anthro@illinois.edu</u>

Computer Science and Astronomy

Computer Science email: <u>academic@cs.illinois.edu</u> Astronomy email: <u>astronomy@illinois.edu</u>

Computer Science and Chemistry

Computer Science email: <u>academic@cs.illinois.edu</u> Chemistry email: School of Chemical Sciences advising: <u>scs-advising@illinois.edu</u>

#### **Computer Science and Linguistics**

Computer Science email: <u>academic@cs.illinois.edu</u> Linguistics email: <u>lasersoh@illinois.edu</u>

Minimum required major and supporting course work normally equates to 66 hours, including 32 in Computer Science and 24 in the LAS discipline.

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

Twelve hours of 300- and 400-level courses in the major must be taken on this campus.

A Major Plan of Study Form must be completed and submitted to the LAS Student Affairs Office by the beginning of the fifth semester (60-75 hours). Please see the computer science advisor as well as the advisor in your LAS discipline.

#### Minimum hours required for graduation: 120 hours

Required Computer Science Courses:			
<u>CS 100</u>	Freshman Orientation (recommended)* <sup>1</sup>	0-1	
<u>CS 125</u>	Intro to Computer Science	4	
<u>CS 126</u>	Software Design Studio	3	
<u>CS 173</u>	Discrete Structures	3	
<u>CS 225</u>	Data Structures	4	
<u>CS 233</u>	Computer Architecture	4	
<u>CS 241</u>	System Programming	4	
Choose one of the following:			
STAT 200- Statistical Analysis			
STAT 212- Biostatistics			
CS 361- Probability & Statistics for Computer Sciences			
<u>CS 374</u>	Algorithms & Models of Computation	4	
<u>CS 421</u>	Progrmg Languages & Compilers	3	
Mathematics (may also fulfill the General Education Quantitative9-10			
Reasoning I and II requirements)			
<u>MATH 220 or</u>	Calculus	4-5	
<u>MATH 221</u>			
<u>MATH 225</u>	Introductory Matrix Theory	2	
<u>MATH 231</u>	Calculus II	3	
LAS Discipline coursework (Min. of 24 hours)			

<sup>1</sup> CS 100 is an orientation course aimed at first-year students, so students who declare the major after the freshman year are not required to complete it.

An additional 24 hours of coursework in one of the following Liberal Arts and Sciences disciplines: Anthropology, Astronomy, Chemistry, or Linguistics. Coursework must be chosen in consultation with an advisor and approved by the LAS department. Must include at least 12 hours at the 300or 400-level. **Total Hours** 65-67

#### **CLEARANCES:**

Signatures:

Karen M Carney

College Representative:

4-13-16

Date:

Current Requirements:	Current Hours	Proposed Requirements:	Revised Hours
CS Requirements	31	CS Requirements	32-33
		CS 100 (recommended)	0-1
CS 125	4	CS 125	4
		CS 126	3
CS 173	3	CS 173	3
CS 225	4	CS 225	4
CS 233	4	CS 233	4
CS 241	4	CS 241	4
CS 242	3		
		STAT 200, STAT 212, or CS 361	3
CS 421	3	CS 421	3
CS 373	3	CS 374	4
CS 473	3		
Math Requirements	9	Math Requirements	9-10
MATH 221	4	MATH 220 or 221	4-5
MATH 231	3	MATH 231	3
MATH 225	2	MATH 225	2
Statistics Requirement STAT 100	3	(replaced by CS 361, STAT 200, or STAT 212)	
LAS discipline	24	LAS discipline	24
Coursework must be		Coursework must be	
chosen in consultation		chosen in consultation	
with an advisor and		with an advisor and	
approved by the LAS		approved by the LAS	
department. Must include		department. Must	
at least 12 hours at the		include at least 12 hours	
300- or 400-level.		at the 300- or 400-level.	
ELECTIVES*	53		53-55

# Appendix A: (Proposed Curriculum Revisions)

-----Original Message-----From: Brunner, Robert J Sent: Tuesday, January 19, 2016 3:55 PM To: Carney, Karen M Cc: Wong, Tony Subject: Re: CS+X revision--please respond

Karen,

On a first review, Astronomy is supportive of these changes (although I trust this will not be a regular occurrence). If either Tony or I have any additional comments, we will let you know ASAP.

Robert

> On Jan 19, 2016, at 1:02 PM, Carney, Karen M <kmcarney@illinois.edu> wrote:

>

> Dear colleagues:

>

> I'm writing to you about a revision of the Computer Science and Liberal Arts and Sciences Discipline (CS + X) major. This major includes options for CS + Anthropology, CS + Astrononomy, CS + Chemistry, and CS + Linguistics.

>

> Due to a parallel revision of the Computer Science undergraduate major and several CS course changes, we need to revise the Computer Science and Mathematics core within the CS + X major.

>

> The proposed changes will:

>

> --Discontinue CS 242, Programming Studio (3 hours), and replace it with CS 126, Software Design Studio (3 hours);

> --Discontinue CS 373, Theory of Computation (3 hours) and CS 473, Fundamental Algorithms (3 hours), and replace both courses with the new CS 374, Algorithms & Models of Computation (4 hours);

> --List MATH 220 (5 hours) as another Calculus I option along with MATH 221 (4 hours)

> --Recommend students take CS 100, Freshman Orientation (1 hour)

> --Eliminate STAT 100 (3 hours) as a separate Statistics requirement, and replace it with CS 361, Probability & Statistics for Computer Science, or STAT 200 (both 3 hours).

>

> These changes will result in an increase in the CS core from 30 hours to 32-33. The number of hours required for the LAS Discipline is not affected.

>

> Can you respond to this email to let me know that your unit is supportive of these changes?

>

> Thank you, and please let me know if you have any questions.

>

> Best,

- >
- > Karen
- >
- > Karen M. Carney

> Associate Dean

- > College of Liberal Arts and Sciences
- > 2090 Lincoln Hall, MC-448
- > 702 S. Wright St., Urbana IL 61801
- > kmcarney@illinois.edu
- > 217-333-1350
- >

>

- >
- $> <\!\! CS +\! X$ -curriculum-proposal.doc>

-----Original Message-----From: Girju, Corina R Sent: Wednesday, January 20, 2016 1:50 PM To: Carney, Karen M Subject: RE: CS+X revision--please respond

Oh, ok. I did not know who needs to be involved in this decision. In this case we are ok with the changes.

Thanks, Roxana

--

Roxana Girju Associate Professor of Linguistics, Computer Science and Beckman Institute (affiliate) Director of Computer Science + Linguistics Joint Major University of Illinois https://www.linkedin.com/pub/roxana-girju/4/803/40

From: Carney, Karen M Sent: Wednesday, January 20, 2016 1:38 PM To: Girju, Corina R Subject: RE: CS+X revision--please respond

Hi, Roxana. Since some of these course changes have already been approved for FA16, we don't have a lot of choice about whether or not to accept them. But we can hold off on approving the revision of the major until your departmental committee meets--I'm still waiting to hear back from all of the other units affected.

Karen

-----Original Message-----From: Girju, Corina R Sent: Tuesday, January 19, 2016 7:57 PM To: Carney, Karen M Subject: RE: CS+X revision--please respond

Hi Karen,

When do you need to hear from us (Linguistics)? I'm asking this because the CS+Linguistics committee is supposed to meet sometime early this semester - but this will take a while.

Thanks, Roxana

Roxana Girju

Associate Professor of Linguistics,

Computer Science and Beckman Institute (affiliate) Director of Computer Science + Linguistics Joint Major University of Illinois https://www.linkedin.com/pub/roxana-girju/4/803/40

From: Carney, Karen M Sent: Tuesday, January 19, 2016 1:02 PM To: Farnell, Brenda M; Brunner, Robert J; Wong, Tony; Girju, Corina R; Spinner, D Todd Cc: Elli, Amy Lawrence Subject: CS+X revision--please respond

Dear colleagues:

I'm writing to you about a revision of the Computer Science and Liberal Arts and Sciences Discipline (CS + X) major. This major includes options for CS + Anthropology, CS + Astronomy, CS + Chemistry, and CS + Linguistics.

Due to a parallel revision of the Computer Science undergraduate major and several CS course changes, we need to revise the Computer Science and Mathematics core within the CS + X major.

The proposed changes will:

--Discontinue CS 242, Programming Studio (3 hours), and replace it with CS 126, Software Design Studio (3 hours);

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--List MATH 220 (5 hours) as another Calculus I option along with MATH 221 (4 hours)

--Recommend students take CS 100, Freshman Orientation (1 hour)

--Eliminate STAT 100 (3 hours) as a separate Statistics requirement, and replace it with CS 361, Probability & Statistics for Computer Science, or STAT 200 (both 3 hours).

These changes will result in an increase in the CS core from 30 hours to 32-33. The number of hours required for the LAS Discipline is not affected.

Can you respond to this email to let me know that your unit is supportive of these changes?

Thank you, and please let me know if you have any questions.

Best,

Karen

Karen M. Carney Associate Dean College of Liberal Arts and Sciences 2090 Lincoln Hall, MC-448 702 S. Wright St., Urbana IL 61801 kmcarney@illinois.edu 217-333-1350

From:	<u>Silverman, Scott K</u>
To:	<u>Carney, Karen M</u>
Cc:	Spinner, D Todd; Elli, Amy Lawrence
Subject:	RE: CS+X revisionplease respond
Date:	Wednesday, April 13, 2016 1:55:11 PM

Karen, thanks for checking with Chemistry on this. Unless I'm overlooking something, none of the CS-proposed changes directly change any Chemistry requirements. My relatively cursory scan of the detailed proposal didn't raise any flags, and I'm confident that the LAS C & C Cmte did its job well. Therefore, Chemistry has no objections to moving forward with these changes.

Thanks, Scott

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-----Original Message-----From: Carney, Karen M Sent: Wednesday, April 13, 2016 1:19 PM To: Silverman, Scott K Cc: Spinner, D Todd; Elli, Amy Lawrence Subject: FW: CS+X revision--please respond

Hi, Scott. Todd Spinner had suggested I check in with you about these changes to the CS + X major, which obviously includes the CS + Chemistry option. Most of these changes were necessitated by course changes in Computer Science. The LAS Courses and Curricula committee has reviewed and approved these changes, but I wanted to make sure all of the participating units saw them before we sent them on to the Senate Educational Policy Committee.

Karen

Karen M. Carney Associate Dean College of Liberal Arts and Sciences 2090 Lincoln Hall, MC-448 702 S. Wright St., Urbana IL 61801 kmcarney@illinois.edu 217-333-1350

-----Original Message-----From: Carney, Karen M Sent: Tuesday, January 19, 2016 1:01 PM To: Brenda Farnell (bfarnell@illinois.edu); Brunner, Robert J; Wong, Tony; Girju, Corina R; Spinner, D Todd Cc: Elli, Amy Lawrence Subject: CS+X revision--please respond

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Can you respond to this email to let me know that your unit is supportive of these changes?

Thank you, and please let me know if you have any questions.

Best,

Karen

Karen M. Carney Associate Dean College of Liberal Arts and Sciences 2090 Lincoln Hall, MC-448 702 S. Wright St., Urbana IL 61801 kmcarney@illinois.edu 217-333-1350 HI Karen:

Yes, these are all changes that affect just the CS part of the degree.

Thanks

Brenda

Brenda Farnell, Ph.D Director of Undergraduate Studies, Department of Anthropology Professor of Anthropology and American Indian Studies University of Illinois at Urbana-Champaign http://www.anthro.illinois.edu/people/bfarnell

Co-Editor, Journal for the Anthropological Study of Human Movement (JASHM) http://jashm.press.illinois.edu/

From: Carney, Karen M Sent: Wednesday, April 13, 2016 1:19 PM To: Farnell, Brenda M Cc: Elli, Amy Lawrence Subject: FW: CS+X revision--please respond

Hi, Brenda--just wanted to check in with you to see if you were OK with these changes as part of the CS + Anthropology major. Let me know if you have any questions.

Karen

-----Original Message-----From: Carney, Karen M Sent: Tuesday, January 19, 2016 1:01 PM To: Brenda Farnell (bfarnell@illinois.edu); Brunner, Robert J; Wong, Tony; Girju, Corina R; Spinner, D Todd Cc: Elli, Amy Lawrence Subject: CS+X revision--please respond

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Thank you, and please let me know if you have any questions.

Best,

Karen

Karen M. Carney Associate Dean College of Liberal Arts and Sciences 2090 Lincoln Hall, MC-448 702 S. Wright St., Urbana IL 61801 kmcarney@illinois.edu 217-333-1350

### 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



April 13, 2016

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

Dear Professor Francis:

Enclosed is a copy of a proposal from the College of Liberal Arts and Sciences to revise the BSLAS in Computer Sciences and a Liberal Arts and Sciences Discipline (CS + X).

Sincerely,

Kathungen & Martinsen

Kathryn A. Martensen Assistant Provost

Enclosures

c: K. Carney A. Elli L. Pitt

## UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

College of Liberal Arts and Sciences Office of the Dean

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



April 14, 2016

Kathryn Martensen Associate Provost Office of the Provost and Vice Chancellor for Academic Affairs 207 Swanlund Administration Building MC-304

Dear Kathy:

The Committee on Courses and Curricula on behalf of the Faculty of the College of Liberal Arts and Sciences has voted to approve the following proposal:

#### Revision of the BSLAS in Computer Science and a Liberal Arts and Sciences Discipline

Please address all correspondence concerning this proposal to me. This proposal is now ready for review by the Senate Educational Policy Committee for proposed implementation in Fall 2016.

Sincerely,

Karen M Carney

Karen M. Carney Associate Dean

enclosure

C: Professor Lenny Pitt Professor Robert Brunner Professor Corina Girju Professor Brenda Farnell Professor Scott Silverman