: COMPUTER SCIENCE + EDUCATION, BS

In Workflow
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Approval Path
1. Thu, 25 Feb 2021 19:18:33 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
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3. Thu, 25 Feb 2021 19:47:35 GMT
   Sarah McCarthey (mccarthe): Approved for 1613 Head
4. Thu, 25 Feb 2021 21:38:58 GMT
   Elsa Gunter (egunter): Approved for 1434 Head
5. Tue, 02 Mar 2021 20:03:41 GMT
   Brooke Newell (bsnewell): Approved for KP Committee Chair
6. Tue, 02 Mar 2021 20:15:40 GMT
   Candy Deaville (candyd): Approved for KP Dean
7. Wed, 03 Mar 2021 20:34:31 GMT
   K Peter Kuchinke (kuchinke): Approved for KN Committee Chair
8. Wed, 03 Mar 2021 20:47:30 GMT
   Lisa Monda-Amaya (lmonda): Approved for KN Dean
9. Wed, 03 Mar 2021 20:48:04 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
10. Thu, 18 Mar 2021 22:34:40 GMT
    Brenda Clevenger (bmclvngr): Rollback to 1613 Head for COTE Programs
11. Fri, 19 Mar 2021 22:02:54 GMT
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12. Tue, 23 Mar 2021 15:47:50 GMT
    Elsa Gunter (egunter): Approved for 1434 Head
13. Tue, 23 Mar 2021 16:46:58 GMT
    Brooke Newell (bsnewell): Approved for KP Committee Chair
14. Tue, 23 Mar 2021 17:21:15 GMT
    Candy Deaville (candyd): Approved for KP Dean
15. Wed, 24 Mar 2021 13:53:03 GMT
    K Peter Kuchinke (kuchinke): Approved for KN Committee Chair
16. Wed, 24 Mar 2021 15:16:15 GMT
    Christopher Span (cspan): Approved for KN Dean

17. Wed, 24 Mar 2021 15:48:33 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
18. Wed, 24 Mar 2021 16:25:38 GMT
   Brenda Clevenger (bmclvngr): Approved for COTE Programs
19. Mon, 29 Mar 2021 14:47:11 GMT
   Kathy Martensen (kmartens): Approved for Provost

New Proposal

Date Submitted:Thu, 25 Feb 2021 17:50:57 GMT

Viewing:: Computer Science + Education, BS

Changes proposed by: Robb Lindgren

Proposal Type

Proposal Type:

Major (ex. Special Education)

Proposal Title:

If this proposal is one piece of a multi-element change please include the other impacted programs here.*example: A BS revision with multiple concentration revisions*

Proposal to Establish the Bachelor of Science in Computer Science + Education within the Department of Curriculum and Instruction in the College of Education. This major is linked to two concentration proposals for Computer Science + Education: Secondary Education (1029) and Computer Science + Education: Learning Sciences (1028) which are being proposed at the same time.

EP Control Number

EP.21.104

Official Program Name

Computer Science + Education, BS

Effective Catalog Term

Fall 2021

Sponsor College

Education

Sponsor Department

Curriculum and Instruction

Sponsor Name

Sarah McCarthey

Sponsor Email

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College Contact

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kstalter@illinois.edu; robblind@illinois.edu; lpaq@illinois.edu

Program Description and Justification

Provide a *abrief* **description and justification of the program, including highlights of the program objectives, and the careers, occupations, or further educational opportunities for which the program will prepare graduates, when appropriate.**

The major in Computer Science + Education (CS+Ed) is a flexible program for undergraduate students to develop computational skills that can be used to either create more effective and equitable educational environments or provide more equitable access to computer science education. Two guiding realities motivate the development of this program. First, there is increasing demand for computer scientists who understand the unique challenges of creating hardware and software for a range of learning contexts from classrooms to museums. This includes taking what we already know about how to effectively teach and expanding the reach of those strategies with networked technologies and online learning platforms.

The types of skills that will be critical for developing technology-enhanced educational applications include, but are not limited to: developing new algorithms for recognizing speech, gesture, and sketching in educational contexts; designing online learning platforms that leverage social networking technologies and allow for meaningful interaction and collaboration at a distance; employing educational data mining and learning analytics on a range of educational activities to effectively assess their impact or provide real-time diagnostics; designing games and simulations that are both engaging and educational; building pedagogical agents and other applications of artificial intelligence in education; developing accessible and assistive technologies for struggling learners and students with disabilities; creating immersive worlds, virtual and augmented realities that transform students' identities and cultivate their interests; critical problem solving around the digital divide and other issues of access and equity. The CS+Ed degree will prepare students for advanced study at the graduate level, as well as immediate entry into the workforce at educational institutions, research centers, non-profits, and technology companies.

Second, there is an increasing recognition of the importance of computational thinking and computer science education in K-12. Skills learned while studying computation and computer science, such as general problem-solving, are useful beyond the context of CS education. In addition, computing occupations are one of the most important sources of new wages in the United States. Training teachers who are well qualified to teaching CS in K-12 will contribute to reducing inequalities by increasing access to CS courses and CS related jobs.

The proposed degree in Computer Science + Education (CS+Ed) will be a Bachelor of Science that shares the core structure of existing CS+X programs. In addition to general education requirements, students in CS+Ed will take the same sequence of Computer Science courses that are required for existing CS+X degrees. What makes this program different from other CS+X degrees is the "X" portion. In this case, Education is not, nor will it be, an existing undergraduate major; rather, the set of courses that will comprise the Education portion have been selected specifically for pairing with the CS courses. The proposed program will be administratively housed in the Department of Curriculum and Instruction at the College of Education.

CS+Ed students will select from one of two concentrations, both situated within Curriculum & Instruction. The 'Learning Sciences' concentration will provide students with the knowledge and skills necessary to become designers and creators of innovative learning technologies. The education course sequence for the Learning Sciences concentration is aligned with the course sequence in the DELTA (Digital Environments for Learning, Teaching, and Agency) concentration in the Learning and Educational Studies BS. The Secondary Education concentration provides the coursework and field experience for students to be licensed to teach computer sciences in grades 9-12. The education course sequence for the Secondary Education concentration is aligned with the course sequences for teacher education programs in Secondary School Teaching.

A CS+Ed degree will enhance the reputation of Illinois by being one of the first institutions to introduce an explicit cross-disciplinary curriculum in these two fields at the undergraduate level. Although there are degree programs in educational technology and the learning sciences, these programs typically do not expect that students will be able to design and develop their own technology applications or to make intellectual contributions to the computational sciences. Existing educational technology degree programs are not cross-disciplinary and there is limited opportunity for developing skills in computer science. In addition, the Secondary Education concentration of the CS+Ed program would be the first undergraduate program leading to a teaching licensure in CS in the state of Illinois. To the best of our knowledge, no education department or computer science department

offers an explicit cross-discipline curriculum for undergraduate students. Illinois is the perfect place to do so and establish an example of a successful program.

Finally, the new major will advance the goals of both departments:

• The College of Education aims to become a resource and leader in the fast-evolving technology and education research of the future as well as a leader of CS education in the state of Illinois. Teaching and educational research have shifted dramatically in recent decades, and the use of digital spaces for learning has increased significantly in and out of school. In the current digital world, having knowledge only about education is too limiting. It is important to have an understanding of the uses, roles, and context of educational technology, and to have computing skills to develop and maintain them (programming, data mining, network security, interface design, etc.). Graduates of the Learning Sciences concentration will be in demand in the job market since they will have the solid theoretical and critical understanding of educational developments and socio-cultural influences on learning along with ability to create new software, analyze complex data, and develop algorithms that make use of such data in innovative and impactful ways. In addition, graduates of the Secondary Education concentration will be well positioned to equip the future Illinois workforce with increasingly in-demand computational thinking and computer science skills.

• The CS Department is committed to spreading the understanding and application of computational methods widely and emphasizing the societal relevance of computing. This new major is modeled on, and will nicely complement, existing "CS+X" degree programs, which pair foundational study of computer science with application disciplines in several other departments on campus. Education is a natural direction for CS in which CS is already partially engaged, because of the applicability of data mining algorithms, big data analytics and gaming in education, the relationships with numerous areas such as algorithmic game theory, security, and privacy, to name a few, and the increasing importance of K-12 CS education. Partnership with the College of Education over this joint program only stands to deepen and enrich the interest and commitment already present in the Computer Science Department.

Corresponding Degree

BS Bachelor of Science

Is this program interdisciplinary?

Yes

Interdisciplinary Colleges and Departments (list other colleges/departments which are involved other than the sponsor chose above)

Computer Science Department; This program will adopt the governance structure of existing CS+X programs where both units have input on course requirements, advising, etc.

College

Grainger College of Engineering

Department

Computer Science

Do you need to add an additional interdisciplinary relationship?

No

Academic Level

Undergraduate

Will you admit to the concentration directly?

Yes

Is a concentration required for graduation?

Yes

CIP Code

11.0199 - 11.0199

Is This a Teacher Certification Program?

Yes

Will specialized accreditation be sought for this program?

Yes

Describe the plans for seeking specialized accreditation:

We will seek accreditation from the Illinois State Board of Education (ISBE) for the Secondary Education concentration. There is no need for additional accreditation for the Learning Sciences concentration.

Institutional Context

University of Illinois at Urbana-Champaign

Describe the historical and university context of the program's development. Include a short summary of any existing program(s) upon which this program will be built.

Explain the nature and degree of overlap with existing programs and, if such overlap exists, document consultation with the impacted program's home department(s).

This program builds on both a longstanding community of collaboration between the College of the Education and the Computer Science Department, as well as a set of numerous CS+X degree programs. The addition of CS+Education is prudent given the increased focus on developing effective educational technologies and the high need for CS teachers at the K12 level.

The two concentrations of the CS+Education Degree, the Learning Sciences track and the Secondary Education track, do not have any significant overlap with existing programs. There is a undergraduate concentration of the Learning and Educational Studies (LES) program in the College of Education called DELTA that focused on educational technology, but this program does not require students acquire "hard" computational skills and is targeted at different career trajectories. There is currently no CS Education Licensure program at UofI.

University of Illinois

Briefly describe how this program will support the University's mission, focus and/or current priorities. Demonstrate the program's consistency with and centrality to that mission.

Through its Learning Sciences concentration, this new program provides an opportunity for the University of Illinois to become a leader in increasing undergraduate students' expertise in creating, designing and researching learning technologies that are critical to educational equity, access, and efficacy. Offering one of the first integrated CS+Education undergraduate programs that embraces this vision will highlight the mission of the University and reach new heights of accomplishment.

Through its Secondary Education concentration, this new program will position the University of Illinois as leader in CS education in the state of Illinois, by offering the first CS teaching license program. Training new CS teachers through this program will improve access to CS courses in high schools across the state.

The university's strategic plan, goal 2 (provide transformative learning experiences), initiative (a), says: " ...Support transformative learning by offering programs and initiatives that aspire to provide integrative co-curricular activities and student support services committed to helping students fulfill their academic promise."

This degree program, sponsored by two departments and colleges, is directly aligned with these initiatives. The field of educational technology is inherently interdisciplinary, and offers learning experiences that span across the humanities (creative expression), the social sciences (education, psychology, sociology), and mathematics and computer and information technologies (problem analysis, algorithms, machine learning, data analytics).

The university's strategic plan, goal 3 (make a significant and visible societal impact), initiative (a), says: "Develop our students to be future leaders with strong communication skills and who are engaged in their communities."

Students graduating from a joint program run by two established and strong departments in their respective fields will be well-situated to take a wide range of positions that include, but is not limited to, research and design, learning technologies software development, teaching and etc. We will measure the success of the program by the number of graduating students (we shall start slowly, but will expect 20-25 graduates per year across the two concentrations once the program ramps up), and by their successful placement in industry, K-12 teaching institutions and in graduate schools.

State of Illinois

Indicate which of the following goals of the Illinois Board of Higher Education's Strategic Initiative are supported by this program: (choose all that apply)

High Quality Credentials to Meet Economic Demand - Increase the number of high-quality post-secondary credentials to meet the demands of the economy and an increasingly global society.
Integration of Educational, Research and Innovation Assets - Better integrate Illinois' educational, research and innovation assets to meet economic needs of the state and its regions.

Describe how the proposed program supports these goals.

The Learning Sciences concentration of the CS+Ed program is motivated by the rapid increase of the educational technology industry. Many of the major tech companies in the US are investing heavily into this sector. This has never been more true following the onset of the COVID-19 public health crisis and the sudden need to shift most educational activities away from face-to-face gatherings to leveraging technologies for remote learning. However, many of the technologies that make their way into classrooms and other public domains are ineffective and often do not align with core principles from education and psychology about how people learn and think with technology. There is a significant need for a degree program aimed at undergraduate students interested specifically in building educational technologies and gaining the necessary background in education. Recognition of this need is growing; for example, the Institute of Electrical and Electronics Engineers (IEEE) has backed emerging standards for "learning engineering" (https://www.ieeeicicle.org/).

Many students develop a passion for improving our systems of education and want to create better and more equitable tools and environments for helping learners of all ages, but these students often lack the foundational knowledge in the computational sciences to develop innovative technological solutions to the problems. Likewise, students with aptitude and experience in computer science often lack the foundational knowledge of how people learn and how to create experiences that are authentic, transformative, and meet the needs of a diverse audience. The Learning Sciences concentration of the CS+Ed program is aimed at students who want to learn the fundamental and generalizable skills of a traditional computer science degree, but anticipate that they will be applying these skills to educational contexts where it will be critical that they understand the unique constraints and affordances of those contexts.

The Secondary Education concentration of the CS+Ed program is motivated by the importance of computational thinking and computer science in training the next generation of professionals with economic impact. Computing occupations are the number one source of new wages in the United States and 58% of new STEM jobs are in computing. According to the Illinois Task Force on Computer Science Education, "21,627 open computing jobs exist in Illinois alone (four times the annual demand rate for jobs in Illinois)". Beyond computing jobs, skills learned in CS courses are invaluable across the modern workforce. Teaching students computational thinking skills provides a new way to approach problem solving. Students are taught how to break down problems into sub-problems and then formulate creative solutions. These skills are not just useful for those who would go on to jobs in STEM fields, but give students the opportunity to analyze problems and their solutions across many fields in a new way. There is increasing pressure from parents, students, and communities to implement K-12 CS programs. According to Code.org, the leading advocacy organization for K-12 CS, 93% of parents across the United States want their child's school to teach CS, but currently only 40% schools do so nationally. A survey by Google/Gallup found that 65% of Illinois principals surveyed think CS is just as or more important than required core classes. 51% of those principals

cite a lack of teachers trained in CS as the greatest barrier to offering CS education courses. Despite the increasing recognition of the importance of CS education in K-12, the state of Illinois is behind many other states, including surrounding Midwestern states in its support of CS education. Currently, only some 15% of the over 1000 high schools in Illinois offer AP CS courses. This represents less than a quarter of the Illinois schools with AP programs. Training future CS teachers through the Secondary Education concentration of the CS+Ed program will contribute to an increase in access to CS courses for high school students across the state of Illinois. This will contribute to reducing this inequality by increasing access to CS courses for students who have traditionally been underserved, including Black, Hispanic and rural students.

Admission Requirements

Desired Effective Admissions Term

Fall 2021

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.

Applications will be submitted to the College of Education, consistent with other CS+X programs. A committee of faculty/representatives from Education will determine whether students are admitted to the program, though input may be sought from advisors in Computer Science. Transfer applications will be handled in the same way, two times per academic year. We recommend that students with fewer than two years remaining towards their degree not be allowed to transfer into the major, unless they are currently Education or Computer Science majors.

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

CS will provide advising to CS+Education students on all matters of CS and some general matters throughout the program. Each student will be assigned a specific CS advisor for monitoring of progress and advice. As students complete their foundational CS coursework they will also consult with advisors in the College of Education in selection of their education core courses. This additional advising will not be a burden to the College of Education advising staff, nor will they need additional training. The students in this major will be enrolling in the same core curriculum as other education majors.

Enrollment

Number of Students in Program (estimate)

Year One Estimate

5

5th Year Estimate (or when fully implemented)

20

Estimated Annual Number of Degrees Awarded

Year One Estimate

0

5th Year Estimate (or when fully implemented)

20

What is the matriculation term for this program?

Fall

What is the typical time to completion of this program?

4 years

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

120

Delivery Method

This program is available:

On Campus

Budget

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?

Yes

Please explain/describe:

The Secondary Education concentration will require the hiring of new Faculty with expertise in Computer Science teacher education. They will be responsible for the development and teaching of the content relevant to computer science teaching method in CI 401, CI 403, and CI 404).

Additional Budget Information

Any additional needs will be financed through tuition differentials that Engineering students incur. Students in the CS+Education major will follow the current arrangement for CS+X: students will be coded under ENG for tuition assessment. Following the IVCB Appendix II, Education and ENG have agreed to evenly split the tuition for CS+Educ. Both Education and CS will use funds from the differential tuition to accommodate any increase in advising or teaching loads and they have agreed to split both the tuition differentials and the major fees that is reimbursed on a per-major basis for CS+Education students.

Attach File(s)

College Budgetary Letter.pdf

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.

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.

The CS and Education courses required for majors have capacity or can be expanded through the use of differential tuition. The College of Engineering does not believe that there would be a challenge to CS advising resources assuming 20-25 majors/year. We think that the major will be limited to approximately this many students but if demand far exceeds this, we plan to re-evaluate the admission and advising process. If this is the case, there will be more tuition revenue to support additional course sections and advising loads.

New sections of the teaching methods courses will be staffed through the hiring of Faculty with expertise in Computer Science Teacher Education.

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.

As both CS and Education degrees already exist, there should be no additional resources needed for the library.

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

CS 124 - Intro to Computer Science I
CS 128 - Intro to Computer Science II
CS 173 - Discrete Structures
CS 222 - Software Design Lab
CS 225 - Data Structures
CS 233 - Computer Architecture
CS 241 - System Programming
CS 240 - Intro to Computer Systems
CS 374 - Intro to Algs & Models of Comp
CS 357 - Numerical Methods I
CS 421 - Progrmg Languages & Compilers
MATH 220 - Calculus
MATH 221 - Calculus I
MATH 225 - Introductory Matrix Theory
MATH 257 - Linear Algebra w Computat Appl
CS 361 - Prob & Stat for Computer Sci
MATH 231 - Calculus II
MATH 227 - Linear Algebra for Data Sci

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

Letters of support from contributing departments attached. There were not deemed to be any significant negative impacts.

Attach letters of support from other departments.

EPOL Support of CS+Education.pdf
Math support.pdf
CS+ED letter of support.pdf

Financial Resources

How does the unit intend to financially support this proposal?

Any additional needs will be financed through tuition differentials that Engineering students incur. Students in the CS+Education major will follow the current arrangement for CS+X: students will be coded under ENG for tuition assessment. Following the IVCB Appendix II, Education and ENG have agreed to evenly split the tuition for CS+Educ. Both Education and CS will use funds from the differential tuition to accommodate any increase in advising or teaching loads and they have agreed to split both the tuition differentials and the major fees that is reimbursed on a per-major basis for CS +Education students.

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

No

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

Yes

If yes, please enter your college budget office contact information and have them contact provostbudget@illinois.edu for next steps.

College of Education Business Operations: busoperations@education.illinois.edu

Market Demand

What market indicators are driving this proposal? If similar programs exist in the state, describe how this program offers a unique opportunity for students:

Both concentrations of the CS + Education program are unique in the State of IL. We are not aware of another program that aims to train students in both core computer science skills and educational design. This would also be the first licensure program for CS Education in the State.

What type of employment outlook should these graduates expect? Explain how the program will meet the needs of regional and state employers, including any state agencies, industries, research centers, or other educational institutions that expressly encourage the program's development.

Students graduating from the Learning Sciences concentration of the CS+Ed program, with strong computational skills whose knowledge sits in the intersection of computer science and education, will have much wider job prospects open to them. They will be able to find jobs in big companies like Google, Microsoft and Gates Foundation or in smaller but impactful institutions that work with technology and educational research.

There is also an increased need for qualified CS teachers in the state of Illinois. The Chicago Public School systems has instituted a graduation requirement that every student take at least one CS course. Similarly, there is expectation that similar mandates will be implemented throughout the state. A bill was proposed at the Illinois General Assembly (HB2170) which includes the goal of offering computer science courses in every high school in the sate of Illinois. Students graduating from the Secondary Education concentration of the CS+Ed program will be well positioned to join schools throughout the state and lead efforts in teaching and developing CS curriculum for K-12 students.

What resources will be provided to assist students with job placement?

Students in the CS+Education program will have access to the full career services available to both CS and Education students.

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).

Our identified learning outcomes will be measured through the following assessments:

1. Learning Outcome 1: Students will acquire deep knowledge of computer science as it relates to the field of Education

Student lesson plans and observations of student teaching (for Secondary Education concentration), written and oral assignments in university courses, design and research projects (for Learning Sciences concentration).

2. Learning Outcome 2 (Secondary Education concentration only): Students will effectively plan and implement relevant, responsive instruction for high school students.

Student lesson plans, observations of student teaching.

3. Learning Outcome 3 (Licensure concentration only): Students will use assessment data to drive decisions and solve problems in and out of the classroom.

Student lesson plans, written and oral assignments in university courses.

4. Learning Outcome 4: Students will display the expectations of professionalism related to success in the field of education and beyond (Fairness, commitment to collaboration, community, reflective practice, and attention to 21st century skills and practices).

Observations of student teaching (Licensure concentration), design and research projects (for Learning Sciences concentration).

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.

For new programs, attach Program of Study

CS+Educ Program of Study 031921.pdf

Catalog Page Text

Catalog Page Text: Description of program for the catalog page. This is not official content, it is used to help build the catalog pages for the program. Can be edited in the catalog by the college or department.

department office: Curriculum & Instruction
311 Education Building
1310 South Sixth
Champaign, IL 61820
phone: (217) 244-8286
department website: https://education.illinois.edu/ci
department faculty: Curriculum & Instruction Faculty

overview of college admissions & requirements: College of Education
college website: https://education.illinois.edu/

Curriculum in Computer Science and Education
www.cs.illinois.edu or https://education.illinois.edu/

This major is sponsored jointly by the Department of Computer Science and the Department of Curriculum & Instruction. The major in Computer Science and Education is a flexible program for undergraduate students who plan to pursue careers in either field and offers two foci of concentration.

The Learning Sciences concentration focuses on how technology can be designed and developed to further education. Social media, virtual and augmented reality, data analytics, mobile and wearable devices have created an opportunity to transform teaching and learning in both formal and informal contexts. This degree will prepare students for advanced study at the graduate level, as well as immediate entry into the workforce at software companies, publishers, school districts, game design companies, and research non-profits.

The Secondary Education concentration provides the coursework and field experience for students to be licensed to teach computer science in grade 9-12. The degree will prepare students to join the workforce as a teacher in high school institutions in the state of Illinois, providing them with the knowledge necessary to teach and develop computer science curricula.

To graduate from the Computer Science and Education curriculum, a student must complete all courses with a traditional letter grade.

In order to be recommended for licensure, candidates are required to maintain University of Illinois at Urbana-Champaign, cumulative, content area, and professional education grade point averages of 2.5 (A=4.0). Candidates in teaching licensure programs must maintain a C or better in ALL content and professional education coursework. Candidates should consult their adviser or the Council on Teacher Education for the list of courses used to compute these grade point averages. For teacher education licensure requirements applicable to all curricula, see the Council on Teacher Education.

Licensure requirements are subject to change without notice as a result of new mandates from the Illinois State Board of Education or the Illinois General Assembly.

Statement for Programs of Study Catalog

Degree Requirements

Code	Title	Hours
Orientation Seminar		
EDUC 101	Education Orientation Seminar	1

Code	Title	Hours
Composition[1]		
Composition I		4-6
Advanced Composition		3-4
Quantitative Reasoning		
See Computer Science Core and Mathematical Foundations for specific requirement.		
Natural Sciences and Technology[1]		
Natural Sciences and Technology		6
Humanities and the Arts[1]		
Humanities and the Arts		6
Social and Behavioral Sciences[1]		
Social and Behavioral Sciences		6
Cultural Studies[1]		
Western Culture(s)		3
U.S. Minority Culture(s)		3
Non-Western Culture(s)		3
Language other than English		
Three years of one language other than English in high school or competion of the third semester of college-level language		0-12
Computer Science Core Requirements (fulfills Quantitative Reasoning)		
CS 124	Introduction to Computer Science I (Introduction to Computer Science I)	3
CS 128	Introduction to Computer Science II (Introduction to Computer Science II)	3
CS 173	Discrete Structures	3
CS 222	Software Design Lab (Software Design Lab)	1
CS 225	Data Structures	4
CS 374	Introduction to Algorithms & Models of Computation	4
Choose 1 from:		8-9
CS 233 & CS 241	Computer Architecture and System Programming	
OR		
CS 240 & Two CS 4XX	Introduction to Computer Systems Any two (2) 400-level CS courses	
Choose 1 from:		3
CS 357	Numerical Methods I	
CS 421	Programming Languages & Compilers	
Mathematical Foundations (fulfills Quantitative Reasoning)		
CS 361	Probability & Statistics for Computer Science	3
MATH 220	Calculus	4-5
or MATH 221	Calculus I	
MATH 231	Calculus II	3
Choose 1 from:		2-3
MATH 225	Introductory Matrix Theory	

MATH 227	Linear Algebra for Data Science	
MATH 257	Linear Algebra with Computational Applications	
Concentration		
Students must complete 36-39 credit hours within one of the following areas of concentration: 1) Learning Science or 2) Secondary Education.		36-39
Electives		
Electives		0-8
Total Hours		**120**

1   General Education Requirement. Courses must be selected from the CampusGeneral Education Approved Course List (https:// courses.illinois.edu/).

EP Documentation

Attach Rollback/Approval Notices

CS + Education - Learning Science - Plan of Study (002).pdf
RE_ EP 21104_ Proposal to Create a New CS+ Program.pdf
CS + Education - Secondary Education - Plan of Study (002).pdf

DMI Documentation

Program Reviewer Comments

Deb Forgacs (dforgacs) (Tue, 01 Dec 2020 15:32:50 GMT): Rollback: requested.
Deb Forgacs (dforgacs) (Thu, 03 Dec 2020 17:30:37 GMT): Rollback: requested.
Brenda Clevenger (bmclvngr) (Thu, 18 Mar 2021 22:34:40 GMT): Rollback: Rolling back per Sarah's request
Kathy Martensen (kmartens) (Wed, 31 Mar 2021 21:19:32 GMT): Edits to wording in Additional Budget Information and Financial Resources sections made at the request of Provost's Budget and Resource Planning Office.

Key: 1027

Statement for Programs of Study Catalog

College of Education Foundations		
EPOL 201	Foundations of Education	3-4
or EPOL 202	Foundations of Education-ACP	
Choose 3 from:		9-10
CI 415	Language Varieties, Cultures and Learning	
EPOL 310	Race and Cultural Diversity	
EPSY 201	Educational Psychology	
EPSY 236	Child Development in Education	
EPSY 400	Psychology of Learning in Education	
SPED 117	The Culture of Disability	
Learning Sciences Core		
CI 210	Introduction to Digital Learning Environments	3
CI 489	DELTA Capstone Project	3
Choose 1 from:		3
BCOG 100	Introduction to the Brain and Cognitive Science	
EPSY 408	Learning and Human Development with Educational Technology	
PSYC 224	Cognitive Psych	
PSYC 248	Learning and Memory	
PSYC 414	Brain, Learning, and Memory	
Choose 2 from:		6
CI 424	Child Development & Technology	
CI 482	Social Learning and Multimedia	
EPSY 405	Personality and Soc Dev	
EPSY 407	Adult Learning and Development	
EPSY 490	Developments in Educational Psychology (Learning in Everyday Contexts)	
Choose 3 from:		9
CI 437	Educational Game Design	
CI 438	Computer Programming and the Classroom	
CI 439	Critiques of Educational Technology	
CI 499	Issues and Development in Education (Attention, Learning, and New Technology)	
CI 499	Issues and Development in Education (Designing Learning Spaces)	
Total Hours		**36-38**

Statement for Programs of Study Catalog

CI 401	Introductory Teaching in a Diverse Society	3
CI 404	Teaching and Assessing Secondary School Students	3
CI 473	Disciplinary Literacy	3
CI 403	Teaching a Diverse High School Student Population	3
EDPR 442	Educational Practice in Secondary Education	12
EDUC 201	Identity and Difference in Education	3
EDUC 202	Social Justice, School and Society	3
EPSY 201	Educational Psychology	3
EPSY 485	Assessing Student Performance	3
SPED 405	General Educator's Role in Special Education	3
Total Hours		**39**

ILLINOIS

COLLEGE OF EDUCATION

Department of Education Policy, Organization & Leadership
351 Education Building, MC-708
1310 S. Sixth St.
Champaign, IL 61820

January 12, 2021

Dear Members of the Graduate College and Education Policy Committee:

EPOL is in support of the Department of Curriculum and Instruction's major in Computer Science + Education and its concentration in Learning Sciences. We understand that we will offer the courses EPOL 201, EPOL 202 and EPOL 310 as part of the program on a regular basis.

Sincerely,

Professor and Head
Education Policy, Organization and Leadership
yoonpak@illinois.edu

Dear Sarah,

Thanks for writing. Yes, I can confirm that Math supports these choices.

Best,
Jeremy

From: McCarthey, Sarah Jane <mccarthe@illinois.edu>
Sent: Thursday, February 18, 2021 10:53 AM
To: Tyson, Jeremy <tyson@illinois.edu>
Cc: Paquette, Luc <lpaq@illinois.edu>; Stalter, Kathy L <kstalter@illinois.edu>
Subject: Re: CS + Education

Jeremy,

We now have the correct Math numbers. Could you just confirm in an email that you support these choices for the CS + Education program? We di nit need a new letter!

MATH is in support of the Department of Curriculum and Instruction's major in Computer Science + Education as well as its two concentrations in Learning Sciences and Secondary Education. We understand that, as part of this program, students will be required to take courses offered by the MATH department in order to meet their required course work. Those courses include: a choice between MATH 220 and MATH 221, MATH 231, and a choice between MATH 225, MATH 227 and MATH 257.

Thank you!

Sarah J. McCarthey
Professor & Department Head
Curriculum and Instruction
305 Education
University of Illinois at Urbana-Champaign
1310 S Sixth Street
Champaign, IL 61820
(217) 244 1149
mccarthe@illinois.edu

Date: Tuesday, January 26, 2021 at 6:36 PM
To: McCarthey, Sarah Jane <mccarthe@illinois.edu>
Subject: RE: CS + Education

Dear Sarah,

Attached please find a letter of support on behalf of the Mathematics Department for your new CS+Ed major. Please let me know if you have any questions or concerns.

Best regards,
Jeremy

Jeremy Tyson
Professor and Chair
Department of Mathematics
University of Illinois at Urbana-Champaign

From: McCarthey, Sarah Jane <mccarthe@illinois.edu>
Sent: Wednesday, January 13, 2021 11:03 AM
To: Tyson, Jeremy <tyson@illinois.edu>
Subject: CS + Education

Dear Professor Tyson:

The Department of Curriculum and Instruction is developing this program:

The major in Computer Science + Education (CS+Ed) is a flexible program for undergraduate students to develop computational skills that can be used to either create more effective and equitable educational environments or provide more equitable access to computer science education. Two guiding realities motivate the development of this program. First, there is increasing demand for computer scientists who understand the unique challenges of creating hardware and software for a range of learning contexts from classrooms to museums. This includes taking what we already know about how to effectively teach and expanding the reach of those strategies with networked technologies and online learning platforms.

The proposed degree in CS+Ed will be a Bachelor of Science, so that students will spend much of the first two years with general education and computer science courses, achieving a solid preparation in the humanities, social and natural sciences, technology, and mathematics. In the final two years of the major, students will take a set of core courses in both Education and Computer Science.

Students will choose to specialize in one of two educational concentrations. The Learning Sciences concentration provides students with the knowledge and skills necessary to become designers and creators of innovative learning technologies. The Secondary Education concentration provides the coursework and field experience for students to be licensed to teach computer sciences in grades 9-12.

We would like your agreement to allow students in the program seats in the courses. These are already offered in Math. Could you take a look at the enclosed letter and revise accordingly and then sing and send back to me?

Thank you.

Sarah J. McCarthey
Professor & Department Head
Curriculum and Instruction
305 Education
University of Illinois at Urbana-Champaign
1310 S Sixth Street
Champaign, IL 61820
(217) 244 1149
mccarthe@illinois.edu

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

February 25, 2021

Professor Sarah J. McCarthey
Head, Curriculum and Instruction
University of Illinois

Dear Professor McCarthey,

I am pleased to let you know that the Computer Science faculty enthusiastically approved the CS + Education proposal that we have been jointly working on over the last several months, and is in full support of the new program. This approval included approval of each of its two program concentrations, one in Learning Sciences and the other in Secondary Education. This proposal was reviewed and approved by both the CS Undergraduate Studies Committee and the full CS faculty. We are looking forward to expanding the already existing synergy between the Department of Curriculum and Instruction, and more generally the College of Education, and the Department of Computer Science, and particularly with those in the research area Computers and Education. This should provide an excellent opportunity for students in each of the concentrations to learn core CS content to incorporate into their investigations on Education. We are also excited to be a partner in the first undergraduate program leading to a teaching licensure in CS in the state of Illinois. Based on the many overlaps outlined in the proposal we think that this is a very natural fit and an excellent opportunity for both departments, as well as for future students whose interests align with the program.

We have evaluated our current course offerings and how they might be affected by the influx of the anticipated CS+ED majors, and do not anticipate problems in ensuring that they will have access. Students in this program will be given access to the CS courses required by the CS+ED program on an equal basis with the students in the CS program in The Grainger College of Engineering, as well as all the other programs in the collection of blended CS degrees. We anticipate the impact on course enrollments should be minimal, as this new program will represent only a very small fraction relative to the current size of those courses. Finally, the CS Department added twenty-three new faculty (tenure track plus instructional) last year, and the addition of these faculty should allow us to grow our course offerings in the needed areas.

Sincerely,

Elsa L Gunter
Research Professor
Director of Undergraduate Programs
Department of Computer Science

University of Illinois at Urbana – Champaign
Phone: 217-265-6118
Email: egunter@illinois.edu

COLLEGE OF EDUCATION

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

March 3, 2021

Ms. Kathy Martensen
Assistant Provost for Educational Programs
204 Swanlund Administration Building
MC-304

Dear Ms. Martensen:

The College of Education fully supports the Bachelor of Science (B.S.) in Computer Science+Education with Learning Science and Secondary Education concentrations. The College is committed to hiring Computer Science Education faculty to support this program by including position requests in our FY22-FY24 hiring plan submitted to campus.

Students enrolled in the CS + Education program will pay the same differential tuition as current College of Engineering Computer Science students. The College of Education and Computer Science Department have agreed to split tuition income, including differential tuition, for CS+Education per the IVCB model.

We do not anticipate a need for additional campus or external resources that cannot be met by the tuition paid by these students.

Thank you for your consideration of this request.

Sincerely,

Lisa Monda-Amaya
Associate Dean for Undergraduate Programs

STATEMENT FOR PROGRAMS OF STUDY CATALOG:

Department office: Curriculum & Instruction
311 Education Building
1310 South Sixth
Champaign, IL 61820
phone: (217) 244-8286
department website: https://education.illinois.edu/ci
department faculty: Curriculum & Instruction Faculty

overview of college admissions & requirements: College of Education
college website: https://education.illinois.edu/

Curriculum in Computer Science and Education
www.cs.illinois.edu or https://education.illinois.edu/

This major is sponsored jointly by the Department of Computer Science and the Department of Curriculum & Instruction. The major in Computer Science and Education is a flexible program for undergraduate students who plan to pursue careers in either field, and offers two foci of concentration.

The Learning Sciences concentration focuses on how technology can be designed and developed to further education. Social media, virtual and augmented reality, data analytics, mobile and wearable devices have created an opportunity to transform teaching and learning in both formal and informal contexts. This degree will prepare students for advanced study at the graduate level, as well as immediate entry into the workforce at software companies, publishers, school districts, game design companies, and research non-profits.

The Secondary Education concentration provides the coursework and field experience for students to be licensed to teach computer science in grade 9-12. The degree will prepare students to join the workforce as a teacher in high school institutions in the state of Illinois, providing them with the knowledge necessary to teach and develop computer science curricula.

E-mail: gradservices@education.illinois.edu

Degree title: Bachelor of Science in Computer Science + Education

To graduate from the Computer Science and Education curriculum, a student must complete the following courses, all of which must be taken for a traditional letter grade.

HOURS	REQUIREMENTS
1 hour	**Orientation Seminar**
	EDUC 101, Education Orientation Seminar (1 hour)

34-49 hours	**General Education Requirements**
	Note: The quantitative reasoning requirements is satisfied through completion of courses from the computer science core and mathematics foundations course lists

Composition I (4-6 hours)

Advanced Composition (3-4 hours) *From approved campus list

Natural Sciences and Technology (6 hours) *From approved campus list

Humanities and the Arts (6 hours) *From approved campus list

Social and Behavioral Sciences[1] (6 hours) *From approved campus list

Culture Studies (9 hours)
   *3 units from Western Culture(s) approved campus list
   *3 units from Minority Culture(s) approved campus list
   *3 units from Non-Western Culture(s) approved campus list

Language Other Than English (0-12 hours)
   *Three years of one language other than English in high school or
   completion of the third semester of college-level language

29-30 hours	**Computer Science Core**

CS 124, Introduction to Computer Science I (3 hours)

CS 128, Introduction to Computer Science II (3 hours)

CS 173, Discrete Structures (3 hours)

CS 222, Software Design Lab (1 hour)

CS 225, Data Structures (4 hours)

Choose from:
   CS 233, Computer Architecture (4 hours)
     And
   CS 241, System Programming (4 hours)
Or
   CS 240, Introduction to Computer Systems (3 hours)
     And
   Two 400-level CS courses (6 hours)

CS 374, Introduction to Algorithms & Models of Computation (4 hours)

Choose 1 from:
   CS 357, Numerical Methods I (3 hours)
     Or
   CS 421, Programming Languages and Compilers (3 hours)

12-14 hours	**Mathematical Foundations** (fulfills the quantitative reasoning I and II requirements

MATH 220 or 221, Calculus I (4-5 hours)

MATH 231, Calculus II (3 hours)

Choose 1 from:
    MATH 225, Introductory Matrix Theory (2 hours)
      Or
    MATH 227, Linear Algebra for Data Science (3 hours)
      Or
    MATH 257 Computation Linear Algebra (3 hours)

CS 361, Probability and Statistics for Computer Science (3 hours)

36-39 hours	**Concentration Courses**
0-8 hours	**Electives**
	Additional courses must be completed to yield a total of 120 hours for graduation
120 hours	**Total hours**[2]

[1] PSYC 100 is a prerequisite for EPSY 201
[2] The total hours required for the degree may be higher for students who have not already completed the language other than English requirement.

Dear Jennie,

Thank you very much for reaching out to us. Here are our answers to the questions:

Q: First, we know that accreditation has not yet come through for the Secondary Education concentration. But there is no need for accreditation for the Learning Science concentration, and thus we assume that you wish to move forward with that concentration at this point and hold the other concentration in abeyance until accreditation comes through. Please let me know if I'm correct.

A: Yes, we would like to move forward with the Learning Science concentration and hold the Secondary Education concentration until accreditation comes through.

Q: Second, we see that faculty will need to be hired in computer science teacher education in the College of Education. Will these hires be approved?

A: The hires are only for the Secondary Education concentration and are not required for the Learning Science concentration. We have had discussions with our dean who is in support of hiring CS education faculty however, those requests have not yet been approved through campus.

Q: Finally, there is no breakout of the courses proposed for the two concentrations. Have the education courses been identified? One member of the subcommittee worries that there may not be enough courses for the required hours.

A: The two concentrations (Learning Science and Secondary Education) have their own separate proposals in CIM (keys 1028 and 1029 respectively). The CS + Education proposal (key 1027) only includes the shared coursework related to the CS part of the program. The education courses are identified in the concentration proposals. I'm also attaching the program of studies for each concentration in a pdf format for references. Those were pulled from the CIM proposals for the concentration.

Please don't hesitate to let us know if you would like more detailed information or if you have any follow-up questions.

Sincerely,
Luc

From: Pahre, Jennifer N <jpahre@illinois.edu>

Dear Professors Lindgren and Paquette,

I should have copied you on the note below pertaining to EP 21.104.

I'm the chair of subcommittee A of the Educational Policy Committee. We have reviewed the proposal noted above, and my committee members have a few questions. I wonder if you might be able to assist? I would like to present the proposal with all questions answered to facilitate its swift approval.

Kind regards,
Jennie

I ILLINOIS
College of Law

Jennifer N. Pahre
Director of Undergraduate Studies
Assistant Teaching Professor
University of Illinois College of Law
504 East Pennsylvania Avenue
Champaign, Illinois 61820

Pronouns: She/her/hers

Dear Professor McCarthey,

I hope your week is going well.

From our prior correspondence, you may recall that I'm currently the head of Subcommittee A of the Senate Educational Policy Committee. Our subcommittee was assigned the task of reviewing EP.21.104, the proposal is to create a new CS + program. The subcommittee is firmly in favor of the proposal, but has a few questions, and as you are the listed sponsor, I'm reaching out for your thoughts.

First, we know that accreditation has not yet come through for the Secondary Education concentration. But there is no need for accreditation for the Learning Science concentration, and thus we assume that you wish to move forward with that concentration at this point and hold the other concentration in abeyance until accreditation comes through. Please let me know if I'm correct.

Second, we see that faculty will need to be hired in computer science teacher education in the College of Education. Will these hires be approved?

Finally, there is no breakout of the courses proposed for the two concentrations. Have the education courses been identified? One member of the subcommittee worries that there may not be enough courses for the required hours.

I look forward to your response and thank you in advance for your kind assistance.

Best regards,

Jennie

_____

ILLINOIS
College of Law
Jennifer N. Pahre
Director of Undergraduate Studies
Assistant Teaching Professor
University of Illinois College of Law
504 East Pennsylvania Avenue
Champaign, Illinois 61820

Pronouns: She/her/hers

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