New Proposal

Date Submitted: 04/12/22 6:31 am

Viewing: **: Computer Science + Bioengineering, BS**

Last edit: 08/12/22 9:08 am

Changes proposed by: Maddie Darling

In Workflow

1. **U Program Review**
2. **1343 Head**
3. **1434 Head**
4. **KP Committee Chair**
5. **KP Dean**
6. **University Librarian**
7. **Provost**
8. **Senate EPC**
9. Senate
10. U Senate Conf
11. Board of Trustees
12. IBHE
13. HLC
14. DMI

Approval Path

1. 04/12/22 8:18 am
Emily Stuby
(eastuby):
Approved for U
Program Review
2. 04/12/22 8:52 am
Mark Anastasio
(maa): Approved
for 1343 Head
3. 04/14/22 1:49 pm
Elsa Gunter
(egunter):
Approved for 1434
Head
4. 04/26/22 1:17 pm
Brooke Newell
(bsnewell):
Approved for KP
Committee Chair
5. 04/26/22 1:24 pm
Candy Deaville
(candyd):
Approved for KP

Dean
6. 04/28/22 11:08 am
John Wilkin (jpwilkin): Approved for University Librarian
7. 08/16/22 11:03 am
Brooke Newell (bsnewell): Approved for Provost
8. 09/12/22 2:29 pm
Barbara Lehman (bjlehman): Approved for Senate EPC
9. 09/12/22 2:47 pm
Barbara Lehman (bjlehman): Rollback to Senate EPC for Senate

Proposal Type

Proposal Type:
  Major (ex. Special Education)

Administration Details

Official Program Name	Computer Science + Bioengineering, BS
Diploma Title	
Sponsor College	Grainger College of Engineering
Sponsor Department	Bioengineering
Sponsor Name	Mark Anastasio and Maddie Darling
Sponsor Email	maa@illinois.edu and darling4@illinois.edu

College Contact	Jonathan Makela	College Contact Email	jmakela@illinois.edu
College Budget Officer	Tessa Hile		

| College Budget Officer Email | tmhile@illinois.edu |

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.

Brooke Newell, GCOE; Maddie Darling, BIOE; Elsa Gunter, CS; Steve Herzog, CS.

Does this program have inter-departmental administration?

Yes

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

Please describe the oversight/governance for this program, e.g., traditional departmental/college governance. Inclusion of/roles of elected faculty committees? Inclusion of/roles of any advisory committees.

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 |

Is there an additional department involved in governance?

No

Proposal Title

| Effective Catalog Term | Fall 2023 |

Proposal Title (either Establish/Revise/Eliminate the Degree Name in Program Name in the College of XXXX, i.e., Establish the Bachelor of Science in Entomology in the College of Liberals Art and Sciences, include the Graduate College for Grad Programs)

Establish the Bachelor of Science in Computer Science + Bioengineering in the Grainger College of Engineering

Does this proposal have any related proposals that will also be revised during the next 6 weeks? Consider Majors, Minors, Concentrations & Joint Programs in your department. Please know that this information is used administratively to move related proposals through workflow efficiently. Example: If you are revising the BS proposal and one related concentration within the next 6 weeks, "This BS proposal (key 567) is related to the Concentration A proposal (key 145)."

Program Justification

Provide a brief 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.

An integrative understanding of computational and bioengineering principles is needed to analyze biomedical data, to construct models for understanding and engineering biological systems, and to design and implement advanced diagnostic and therapeutic techniques to improve human health. Beginning with the early adoption of computers for health care informatics and electronic records in the 1980's, to the genomic revolution of the 1990's, to the modern pervasive application of artificial intelligence throughout medical data analysis, biology and medicine have become increasingly inseparable from computation and driven by advances in computation. The immense growth and impact of computational technologies on healthcare and life science fields has led to a high demand for professionals who can understand the languages, tools, and techniques of both biology and computational science. BioE is the most appropriate academic discipline to facilitate the integration between these fields as the home of interdisciplinary coursework on the application of quantitative approaches to problems in the life sciences and medicine. However, current BioE and CS degree programs do not adequately address the need for interdisciplinary training at the intersection between BioE and CS. At UIUC, opportunities only exist for undergraduate BioE students to complete a 5-course track in Computational and Systems Bioengineering or a 6 course minor in CS, whereas CS students only have opportunities to pursue a minor in BioE. Across the nation, aside from rare undergraduate programs in bioinformatics and computational biology, the disciplines are likewise largely disjointed. There is now a growing need for bioengineers to have opportunities to receive rigorous training in computational skills to prepare them to lead the next generations of computational advances, to maximize their career potential, and to address student interest at the intersection between two of the most popular majors with strong projected job growth. Here at UIUC, we are ideally positioned to assume leadership on this topic and provide world-class educational opportunities that meet the growing demand for interdisciplinary training in BioE and CS. This has prompted the BioE and CS departments to create the proposed CS+BioE major.

The objective of the proposed CS+BioE major is to provide world class training in biomedical computation that involves the purposeful integration of foundational BioE and CS principles. The designed curriculum will provide students with a solid foundation in scientific computing practices as well as training in the application of computation to solve problems in medicine and the life sciences. Technical and free electives available to students facilitate the study of the intersecting principles across a diversity of important modern problems in healthcare and the life sciences so that students are prepared to address new problems throughout their careers. The CS+BioE major will create a new generation of professionals with complementary cross-disciplinary skills who will be in high demand in industry and research institutions. Graduates of the program will find career opportunities in fields that include medical imaging, genomics, medical devices, healthcare informatics and software, and drug discovery. Graduates will also be prepared to immediately pursue graduate studies in bioengineering, computer science, and related fields.

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 this new program/proposed change result in the replacement of another program?

No

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

Yes

Courses outside of the sponsoring department/interdisciplinary departments

MATH 221 - Calculus I
MATH 231 - Calculus II
MATH 241 - Calculus III
MATH 257 - Linear Algebra w Computat Appl
MATH 285 - Intro Differential Equations
PHYS 211 - University Physics: Mechanics
PHYS 212 - University Physics: Elec & Mag
CHEM 102 - General Chemistry I
CHEM 103 - General Chemistry Lab I
MCB 150 - Molec & Cellular Basis of Life
RHET 105 - Writing and Research
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 340 - Intro to Computer Systems
CS 341 - System Programming
CS 357 - Numerical Methods I
CS 374 - Intro to Algs & Models of Comp
CS 421 - Progrmg Languages & Compilers

Please attach any letters of support/acknowledgement for any Instructional Resources consider faculty, students, and/or

LOS - CHBE2.pdf
Physics-Support-Degree_in_CS+BIOE-9-22-2021.pdf
LOS - CHEM.pdf
LOS- STAT.pdf
LOS- MCB.pdf
LOS from ABE.pdf
LOS - RHET.pdf
LOS-Neuroscience_Gillette FIN 13Jan20221.pdf

| other impacted units as appropriate. | CS+BIOE LOS Math2.pdf |

Program Regulation and Assessment

Plan to Assess and Improve Student Learning

Illinois Administrative Code: 1050.30(b)(1)(D) Provision is made for guidance and counseling of students, evaluations of student performance, continuous monitoring of progress of students toward their degree objectives and appropriate academic record keeping.

List the program's student learning outcomes. Each outcome should identify what students are expected to know and/or be able to do upon completing this program.

Computational methods and bioengineering practices are continuously advancing in the context of a rapidly changing world, so it will be necessary to adapt course materials and content to match the rapid pace of the field. This will be facilitated by an Undergraduate Curriculum Committee (UGCC), modeled after the successful practices of the UGCC that monitors the BioE B.S. degree program. Both departments also undergo regular evaluation by external advisory boards who will be consulted for feedback. Keeping abreast of the most current instructional modalities is also a forte of the program faculty already, including leading recent efforts to migrate courses to modular, adaptive, and fully online offerings. For these efforts, the BioE and CS faculty are regularly recognized with competitive distinctions, such as the Grainger Award for Innovation in Teaching and awards from the American Society for Engineering Education. Notably in the event that accreditation is deemed to be of value to the program in the future, faculty of the sponsoring departments include program evaluators and commissioners of the Accreditation Board for Engineering and Technology (ABET) which leads worldwide efforts to evaluate educational success of engineering and computer science degree programs.

Describe how, when, and where these learning outcomes will be assessed.

Describe here:

Identify faculty expectations for students' achievement of each of the stated student learning outcomes. What score, rating, or level of expertise will signify that students have met each outcome? Provide rating rubrics as necessary.

Explain the process that will be implemented to ensure that assessment results are used to improve student learning.

Program Description and Requirements
Attach Documents

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.

Attach Program of Study-related information such as sample sequences (for undergraduate programs) or college-level forms.	[CS + BIOE BS Program of Study Side by Side Final.xlsx](#)

Catalog Page Text - Overview Tab

Description of program for 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, BIOE, 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

Course List

Code	Title	Hours
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
BIOE 100	Bioengineering Seminar	1
BIOE 120	Introduction to Bioengineering	1
Highly recommended, optional 1 credit hour course, CS 100 Freshman Orientation. Credit hour counts toward free electives.		
Total Hours		3

Foundational Mathematics and Science

Course List

Code	Title	Hours
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4

Code	Title	Hours
MATH 257	Linear Algebra with Computational Applications	3
or BIOE 210	Linear Algebra for Biomedical Data Science	
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
Choose one of the following:		4
CHEM 102	General Chemistry I	
& CHEM 103	and General Chemistry Lab I	
OR		
MCB 150	Molec & Cellular Basis of Life	
BIOE 310	Computational Tools for Biological Data	3
Total Hours		32

Computer Science 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 222	Software Design Lab	1
CS 225	Data Structures	4
Choose one of the following options:		8-9
CS 233	Computer Architecture	
& CS 341	and System Programming	
OR		
CS 340	Introduction to Computer Systems	
& Two CS 400-level courses	Any two (2) 400-level CS courses above CS 403, excluding CS 491 and distinct from any 400-level courses taken to satisfy other requirements. If either or both of the courses are chosen for 4 credits, the extra credit hours will count towards free electives.	
CS 374	Introduction to Algorithms & Models of Computation	4
CS 357	Numerical Methods I	3
or CS 421	Programming Languages & Compilers	
CS Technical Elective	Any 400-level CS course above CS 403, excluding CS 491 and distinct from any 400-level courses taken to satisfy other requirements.	3
Total Hours		32-33

Bioengineering Core

Course List

Code	Title	Hours
BIOE 205	Signals & Systems in Bioengrg	3
BIOE 206	Cellular Bioengineering	3
or BIOE 302	Modeling Human Physiology	
BIOE 404	CS+BIOE Senior Design (CS + BIOE Senior Design)	4
Total Hours		10

Bioengineering Technical Electives

Course List

Code	Title	Hours

Code	Title	Hours
	Select 15 hours of technical elective credit from the below list:	15
BIOE 303	Quantitative Physiology Lab	2
BIOE 360	Transport & Flow in Bioengrg	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 430	Intro Synthetic Biology	3 or 4
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
BIOE 479	Cancer Nanotechnology	3
BIOE 483	Biomedical Computed Imaging Systems	3 or 4
BIOE 484	Statistical Analysis of Biomedical Images	3 or 4
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
BIOE 486	Applied Deep Learning for Biomedical Imaging	3 or 4
BIOE 487	Stem Cell Bioengineering	3 or 4
BIOE 488	Applied High-Performance Computing for Imaging Science	3
BIOE 489	Regulations, Ethics and Logistics in Biomedical Applications of Machine Learning	3 or 4
BIOE 498	Special Topics (courses as approved by the department)	1 to 4

Upper Division Technical Electives

Course List

Code	Title	Hours
	Students should select 6 hours of 300-400 level general technical elective coursework from the following rubrics: AE, ABE, BIOE, CHBE, CHEM, CS, CEE, ECE, EM, IE, MCB, MATH, ME, NE, NEUR, NPRE, PHYS, SE, STAT.	6
Total Hours		6

Free Electives

Course List

Code	Title	Hours
Additional coursework, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree.		13-14
Total Minimum Hours of Curriculum to Graduate		128

Corresponding Degree	BS Bachelor of Science

Program Features

Academic Level	Undergraduate

Does this major have transcripted concentrations?	No

What is the typical time to completion of this program?
  4 years

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

128

CIP Code	110199 - Computer and Information Sciences, Other.

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   Fall 2024

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.

Application processing at the freshman level will be administered by the Office of Undergraduate Admissions, with requirements commensurate with standards of Grainger Engineering. For more detailed information regarding application requirements and the application process, please visit the University of Illinois Admissions website at: www.admissions.illinois.edu.

Admission Requirements for off-campus Transfer Students
Students will follow the guidelines and application process as outlined by Grainger Engineering Transfer Programs: https://grainger.illinois.edu/admissions/undergraduate /transfer

There will not be any internal transfers into CS+BIOE until a uniform policy for internal transfer in all CS programs in The Grainger College of Engineering is devised and implemented.

Enrollment

Number of Students in Program (estimate)

Year One Estimate	25	5th Year Estimate (or when fully implemented)	100

Estimated Annual Number of Degrees Awarded

| Year One Estimate | 0 | 5th Year Estimate (or when fully implemented) | 25 |

| What is the matriculation term for this program? | Fall |

Budget

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

Yes

Please explain/describe:

Current faculty will initially be sufficient to accommodate the additional 25 students per course this program may include. As the program progresses, faculty hired as part of the recruiting commitment (9 lines) to bioengineering's department head will provide any additional instructional needed support for the program.

While each individual Computer Science program can typically be absorbed with no extra faculty or staff required, as the number of Computer Science programs increases overall, or the enrollment in these programs increases, there will be a commensurate increase in the need for additional faculty, TA support and advising staff.

Additional Budget Information

Instructional units will flow normally per the IVCB model.

Following the IVCB Appendix II, and the GCoE decision to extend this to the department level, revenues generated within the IVBC budget model based on major and engineering surcharge attributable to Computer Science+Bioengineering enrollment will be evenly split between the Department of Computer Science and the Department of Bioengineering.

Additional access to classroom space including access to the large and moderate sized classrooms on campus, and to testing space (CBTF), may be needed as CS program enrollments increase.

Attach File(s)

Financial Resources

How does the unit intend to financially support this proposal?

Following the IVCB Appendix II, and the GCoE decision to extend this to the department level, revenues generated within the IVBC budget model based on major and engineering surcharge attributable to Computer Science+Bioengineering enrollment will be evenly split between the Department of Computer Science and the Department of Bioengineering.

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)

Engineering Differential

Attach File(s)

IBHE

Degree Program Title and Overview

What is the specific title of the proposed degree program as it would be listed in the IBHE Program
Inventory? The name should be what typically is used for similar programs nationally. Provide a short
description of the program, including highlights of the program objectives, and the careers, occupations, or
further educational opportunities for which the program will prepare graduates.

*Illinois Administrative Code: 1050.30(a)(1): A) The objectives of the unit of instruction, research or public service are consistent with the
mission of the college or university; B) The objectives of the unit of instruction, research or public service are consistent with what the
unit title implies.*

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).

The Urbana-Champaign campus is well known for advances in both bioengineering and computer science, however the intersection between the two is not supported by an adequate focused educational program for undergraduate students. Bioengineering currently offers a 5-course track specialization in Computational and Systems Bioengineering for students enrolled in the B.S. program and students may pursue a 6-course minor in CS, however neither option provides suitable flexibility for students to pursue extensive coursework in computation. BioE is also offering a Medicine Certificate program in Artificial Intelligence and in 2022 will enroll its first students in a Biomedical Image Computing M.S. program, both of which are focused on the BioE-CS interface and can utilize more Computer Science coursework than is in either the Computational and Systems Bioengineering track, or the Computer Science minor. Numerous students enrolled in the M.Eng. and Ph.D. programs in BioE focus on computational coursework and research. Computer Science offers an M.S. in bioinformatics and partners with two departments to offer CS+X B.S. programs related to the life sciences (Animal Sciences, Crop Sciences). However no undergraduate B.S. programs are available focused on the intersection of computation and healthcare or biomedical technologies, which will be the unique attribute of CS+BioE.

The CS+BioE program will be built as a fusion between the existing BioE major and the CS major. Twelve CS faculty focus on bioinformatics and computational biology, and eight BioE faculty focus on computational and systems biology, so the expertise to offer this program is present. Students will take current courses from both programs to complete the new degree program. A single new course will be developed (CS+BioE Senior Design) which will be scaled with the current BioE Senior Design course, which is currently offered in a scaled version integrating project-based coursework in our M.Eng. capstone course and in IDEA projects in the Carle Illinois College of Medicine. Leveraging courses in this manner will facilitate efficient scaling with minimal need to replicate resources.

The intersection between computation and bioengineering is an area that is aligned with many current priorities of Grainger Engineering and the university. Directly relevant campus or college initiatives that are expected to benefit and provide further opportunities to consolidate resources include:
a) The Carle Illinois College of Medicine
b) Health Care Engineering Systems Center
c) Mayo Clinic & Illinois Alliance
d) Interdisciplinary Health Science Institute
e) Discovery Partners Institute
f) Cancer Center at Illinois

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.

The university continually examines its educational programs to respond to emerging student demand, societal need, and economic opportunity. Biomedical computing has rapidly emerged as a field for which there is broad-based demand across many areas of economic activity and across many fields of scholarship. The university recognized this in its 2018 Strategic Plan The Next 150, which called to "Invest in core infrastructure, including seed funding for health-related programs.." and "..expand our computing strengths and resources, advance the frontiers of quantum information and new computing paradigms, and bolster our strength in information sciences, data science, data analytics, health analytics, and machine learning."

We anticipate that the program will increase total enrollment in the GCOE and will draw new applicants who would not have otherwise applied to UIUC due to the uniqueness of the program. We further anticipate that the demographics of these students will reflect the current demographics of the BIOE-BS and CS-BS programs. The fraction of applicants to BIOE-BS and CS-BS programs who were female (55% and 47%) or black (4.6% and 5.2%) greatly exceeded that of GCOE overall (30.4% and 2.6% respectively). We therefore expect that the offering of the CS+BIOE program will lead to a greater representation of females and black students in our community who are currently underrepresented in GCOE. We believe this program will open another avenue for women in STEM to pursue biomedical computing and computation, in alignment with A Thriving Illinois: Strategy #2, Establish and implement institution-level equity plans, practices to close access, progression, completion and attainment gaps.

Discuss projected future employment and/or additional educational opportunities for graduates of this program. Compare estimated demand with the estimated supply of graduates from this program and existing similar programs in the state. Where appropriate, provide documentation by citing data from such sources as employer surveys, current labor market analyses, and future workforce projections. (Whenever possible, use state and national labor data, such as that from the Illinois Department of Employment Security at http://lmi.ides.state.il.us/ and/or the U.S. Bureau for Labor Statistics at http://www.bls.gov/).

> The demand for computational scientists who have strong domain knowledge and can work collaboratively on biological and healthcare related problems is ever increasing, from the industries of healthcare informatics, bioinformatics, and pharma, to educational institutions and major state-supported research centers (e.g., Discovery Partners Institute). Students graduating with the proposed CS+BioE degree would possess the skills that make them very competitive in the job market, with potential employers including big tech companies such as Google, Amazon, and Microsoft (all making significant investments in bio- and healthcare informatics) as well as a myriad of startups in the region and the whole nation (e.g., TEMPUS, SymBioSys, and PathAI).
>
> Related degree programs in the state include the BS in Bioinformatics at Loyola University of Chicago (https://www.luc.edu/bioinformatics/bsinbioinformatics/) and Illinois Institute of Technology (https://www.iit.edu/academics/programs/bioinformatics-bs). These programs focus on training in modeling microscopic biological systems, e.g., computational genomics, cell and molecular data. Our program includes at least 32 hours of computer science courses and a deep rooting in engineering fundamentals, preparing students to solve problems at the macroscopic as well as microscopic scales, e.g., image computing, healthcare informatics, physiological data related to organ systems, and even population health. This is leveraging our broad BIOE research and education profiles that these other two institutions cannot offer.

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

> Engineering Career Services will provide career advising and support to students enrolled in this program. The CS department also has special career events which the students in the CS+BIOE degree program can benefit greatly from (e.g., the Corporate Connection program and Corporate days). All students in Computer Science+BIOE who have advanced sufficiently will be able to apply for the Engineering City Scholars Program, which allows students to intern at a company in Chicago while completing a semester of coursework at UIUC.

If letters of support are available attach them here:

Comparable Programs in Illinois

Illinois Administrative Code: 1050.30(a)(6): B) The unit of instruction, research or public service meets a need that is not currently met by existing institutions and units of instruction, research or public service. For additional information about similar programs, check the Degree Program Inventory on the IBHE website (https://www.ibhe.org/ProgInv_Prog.aspx) and review the Notice of Intent website for programs being planned (http://legacy.ibhe.org/ODA/tracking/NOI/NOISearch.asp).

Identify similar programs and sponsoring institutions in the state, at both public and private colleges and universities. Compare the proposed program with these programs, and discuss its potential impact upon them. Provide complete responses, do not reference website links.

Comparable
Programs in
Illinois Attach
Documents

A Thriving Illinois: Higher Education Paths to Equity, Sustainability, and Growth

IBHE is charged to develop a strategic plan to address the present and future aims and needs and requirements of higher education in Illinois (110 ILCS 205/6) (from Ch. 144, par. 186) Sec. 6). Illinois Administrative Code:

1050.30(a)(6): A) The unit of instruction, research or public service is educationally and economically justified based on the educational priorities and needs of the citizens of Illinois Respond to the following questions about how the proposed program will support the three goals of A Thriving Illinois: Higher Education Paths to Equity, Sustainability, and Growth Strategic Plan.

Equity

Describe institutional-level plans to close equity gaps in access, progression, completion, and attainment and the implications for the proposed program. More specifically, provide institutional-level plans for attracting, recruiting, retaining, and completing a diverse group of students including working adults, students of color, transfer and low-income students and implications for the proposed program. Explain how progress will be monitored. [See Equity Strategy #2]

Describe program and institution-based high-impact practices and wrap-around student support services ensuring equitable access and success for students enrolled in the proposed program.

Explain institutional strategies being implemented to increase and retain faculty, staff, and administrators of color and the implications for the proposed program. Explain how progress will be monitored.

Sustainability

Describe strategies and initiatives the institution plans to implement that makes the proposed program and college more generally affordable for students and their families, including those who have been historically underserved.

Provide tuition

cost analysis for comparable programs and institutions in Illinois.

Growth

Provide a supply and demand analysis for the proposed program that, at minimum, does the following: a) Provides evidence of student interest in the proposed program including any strategies to incentivize students to stay in Illinois. b) Identifies and provides evidence of a high-quality credential with viability for future careers.

Explain how the program engaged with business and industry in its development and how it will spur the state's economy by leveraging partnerships with local, regional, and state industry, business leaders and employers.

Describe how the proposed program will expand access and opportunities for students through high-impact practices including research opportunities, internships, apprenticeships, career pathways, and other field experiences.

Explain how the proposed program will expand its models of teaching and learning, research, and/or public service and outreach that provide opportunity for students to succeed in the work of the future.

Beyond workforce need, describe how the program broadly addresses societal needs (e.g., cultural or liberal arts contribution, lifelong learning of Illinois residents, or civic participation).

A Thriving Illinois: Higher Education Paths to Equity, Sustainability, and Growth - Attach Documents

Program Description and Requirements

Illinois Administrative Code:

1050.30(b)(1) A) The caliber and content to the curriculum assure that the objectives of the unit of instruction will be achieved; B) The breadth and depth of the curriculum are consistent with what the title of the unit of instruction implies; C) The admission and graduation requirements for the unit of instruction are consistent with the stated objectives of the unit of instruction.

1050.30(b)(3): Appropriate steps shall be taken to assure that professional accreditation needed for licensure or entry into a profession

as specified in the objectives of the unit of instruction is maintained or will be granted in a reasonable period of time.

1050.50 (a)(2)(C) Requirement for Programs in which State Licensure is Required for Employment in the Field: In the case of a program in which State licensure is required for employment in the field, a program can be found to be in good standing if the institution is able to provide evidence that program graduates are eligible to take the appropriate licensure examination and pass rates are maintained as specified in the objectives of the unit of instruction. If there is no such evidence, the institution shall report the program as flagged for review.

Program Description

Provide a description of the proposed program and its curriculum, including a list of the required core courses and short ("catalog") descriptions of each one. (This list should identify all courses newly developed for the program).

Provide Program Description here:

Attach Program
Description Files if
needed

Graduation Requirements

Provide a brief narrative description of all graduation requirements, including, but not limited to, credit hour requirements, and, where relevant, requirements for internship, practicum, or clinical. For a graduate program, summarize information about the requirements for completion of the thesis or dissertation, including the thesis committees, and the final defense of the thesis or dissertation. If a thesis or dissertation is not required in a graduate program, explain how the functional equivalent is achieved.

Specialized Program Accreditation

Describe the institution's plan for seeking specialized accreditation for this program. Indicate if there is no specialized accreditation for this program or if it is not applicable.

Licensure or Certification for Graduates of the Program

If this program prepares graduates for entry into a career or profession that is regulated by the State of Illinois, describe how it is aligned with or meets licensure, certification, and/or entitlement requirements.

Plan to Evaluate and Improve the Program

Describe the program's evaluation plan.

Plan to Evaluate
and Improve the
Program
Attachments

Budget Narrative

Fiscal and Personnel Resources

Illinois Administrative Code: 1050.30(a)(5): A) The financial commitments to support the unit of instruction, research or public service are sufficient to ensure that the faculty and staff and support services necessary to offer the unit of instruction, research or public service can be acquired and maintained; B) Projections of revenues necessary to support the unit of instruction, research or public service are based on supportable estimates of state appropriations, local tax support, student tuition and fees, private gifts, and/or governmental grants and contracts.

Budget Rationale

Provide financial data that document the university's capacity to implement and sustain the proposed program and describe the program's sources of funding.

Is the unit's (Department, College, School) current budget adequate to support the program when fully implemented? If new resources are to be provided to the unit to support the program, what will be the source(s) of these funds? Is the program requesting new state funds? (During recent years, no new funds have been available from the state (IBHE) to support new degree programs).

Faculty Resources

Will current faculty be adequate to provide instruction for the new program or will additional faculty need to be hired? If additional hires will be made, please elaborate.

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

For BioE, only one new course will be developed for the program (Senior Design). Four current courses that are core components of the BioE B.S. program will experience an increased enrollment (BIOE 205, 210, 310; choice of BIOE 206 or 302) as they are also core courses in the CS+BioE program. These courses have already been scaled from enrollment of approximately 30 up to 100 in recent years, and will only be moderately impacted by the increase to 125. If needed, multiple sections of these courses will be offered. Other elective courses currently offered by the department are expected to experience a modest and reasonable increase in enrollment (from ~25 to ~35) as they serve as BioE elective courses for CS+BioE. There will be no impact on teaching loads for any bioengineering faculty. With with approximately 350 undergraduate students, and an expected addition 140 Neural Engineering major students alongside 100 CS+BioE major students by 2027, we expect to increase faculty by 4 during that span, so that our student:faculty ratio will rise from 22 to 29.

Current staff in the departments of Bioengineering and Computer Science will provide advising for the degree program. Job placement will be facilitated by career fairs organized by the Grainger College of Engineering and Engineering Career Services, as well as more specialized career events in the Department of Computer Science.

Describe how the unit will support student advising, including job placement and/or admission to advanced studies. Will current staff be adequate to implement and maintain the new program or will additional staff be hired? Will current advising staff be adequate to provide student support and advisement, including job placement and or admission to advanced studies? If additional hires will be made, please elaborate.

Are the unit's current facilities adequate to support the program when fully implemented? Will there need to be facility renovation or new construction to house the program?

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.

Current library resources, including collections and services, are sufficient to address the needs of this program.

Summarize information about library resources for the program, including a list of key textbooks, a list of key text and electronic journals that will support this program, and a short summary of general library resources of the University that will be used by the program's faculty, students, and staff.

Are any sources of funding temporary (e.g., grant funding)? If so, how will the program be sustained once these funds are exhausted?

Budget Narrative
Fiscal and
Personnel
Resources
Attachments

Personnel Budget

Please complete all lines below; all fields are required. For fields where there is no anticipated cost or need, enter 0 or NA.

Category	Year One	Year Five	Notes
Faculty (FTE)			
Faculty ($)			
Advising Staff ($)			
Graduate Students ($)			
Other Personnel Costs			

Facilities and Equipment

Illinois Administrative Code: 1050.30(a)(4): A) Facilities, equipment and instructional resources (e.g., laboratory supplies and equipment, instructional materials, computational equipment) necessary to support high quality academic work in the unit of instruction, research or public service are available and maintained;

B) Clinical sites necessary to meet the objectives of the unit of instruction, research or public service;

C) Library holdings and acquisitions, owned or contracted for by the institution, that are necessary to support high quality instruction and scholarship in the unit of instruction, research and public service, are conveniently available and accessible, and can be maintained.

Describe the facilities and equipment that are available, or that will be available, to develop and maintain high quality in this program. Summarize information about buildings, classrooms, office space, laboratories and equipment, and other instructional technologies for the program.

Will the program require new or additional facilities or significant improvements to already existing facilities?
Yes

Facility Need

Facility Need	Year 1 Cost	Year 5 Cost	Facility Notes
Additional space for discussion sections and labs, access to larger classrooms for larger lectures including ones of more than 400 seats, increased access to rooms for trying new methods of teaching at scale while retaining personal contact such as group-work rooms of more than 100 seats, and new or expanded space for tutoring sessions. Also, the CBTF is a critical service for Computer Science courses, as well as for many other courses in The Grainger College of Engineering, and	To be determined by campus.	To be determined by campus.	Considerations need to be made to access existing campus facilities.

Facility Need	Year 1 Cost	Year 5 Cost	Facility Notes
the additional growth brought by this program will increase the need for additional testing space			

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

No

Are there other costs associated with implementing the program?

Facilities and Equipment Attachments

Faculty and Staff

Illinois Administrative Code: 1050.30(a)(3): A) The academic preparation and experience of faculty and staff ensure that the objectives of the unit of instruction, research or public service are met; B) The academic preparation and experience of faculty and staff, as evidenced by level of degrees held, professional experience in the field of study and demonstrated knowledge of the field, ensure that they are able to fulfill their academic responsibilities; C) The involvement of faculty in the unit of instruction, research or public service is sufficient to cover the various fields of knowledge encompassed by the unit, to sustain scholarship appropriate to the unit, and to assure curricular continuity and consistency in student evaluation; D) Support personnel, including but not limited to counselors, administrators, clinical supervisors, and technical staff, which are directly assigned to the unit of instruction, research or public service, have the educational background and experience necessary to carry out their assigned responsibilities.

Describe the personnel resources available to develop and maintain a high quality program, including faculty (full- and part-time, current and new), staff (full- and part-time, current and new), and the administrative structure that will be in place to oversee the program. Also include a description of faculty qualifications, the faculty evaluation and reward structure, and student support services that will be provided by faculty and staff.

Summarize the major accomplishments of each key faculty member, including research/scholarship, publications, grant awards, honors and awards, etc. Include an abbreviated curriculum vitae or a short description.

Faculty and Staff Attachments

HLC Section

Credit Hours

Of the total hours required, what is the:

#/% of credit hours of existing or repackaged curricula

#/% of hours of revised or redesigned curricula

#/% New curricula

Institutional level

Degree or nearest institutional level

Program Instructional Level

Does the unit currently offer programs at the same instructional level as the proposed program?

Institutional 4 digit CIP Code

Does the institution currently offer a program with the same 4-digit CIP as the proposed program?

Institutional 2 digit CIP Code

Does the institution currently offer a program with the same 2-digit CIP code as the proposed program?

Replace CIP Code

Will the proposed program replace a program currently offered with the same CIP code?

New Faculty Required

Will new faculty expertise or new faculty members be needed to launch this program?

Additional Funds

Will the proposed program require a large outlay of additional funds by the institution?

Institutional Funding

Please explain institutional funding for proposed program:

EP Documentation

EP Control
Number   EP.23.003

Attach
Rollback/Approval
Notices

This proposal   Yes
requires HLC
inquiry

DMI Documentation

Attach Final
Approval Notices

Banner/Codebook
Name

Program Code:

Minor Code	Conc Code	Degree Code	Major Code

Senate Approval
Date

Senate
Conference
Approval Date

BOT Approval
Date

IBHE Approval
Date

HLC Approval
Date

DOE Approval
Date

Effective Date:

Attached
Document
Justification for
this request

Program Reviewer Comments	**Brooke Newell (bsnewell) (04/05/22 10:39 am):** Rollback: per subcommittee questions **Aaron Brewer (ambrewer) (08/04/22 8:49 am):** OR has contacted the requesting unit providing them information that we can provide the space needed with them willing to schedule courses during standard teaching times. We have also asked them to look at current scheduled courses and adjust to standard teaching times if able. We have also asked that if they cannot meet the standard teaching time needs that they look at scheduling 20% of courses outside of peak hours to help us meet the scheduling needs for the increase in enrollments for this proposal. **Barbara Lehman (bjlehman) (09/12/22 2:47 pm):** Rollback: attachments **Barbara Lehman (bjlehman) (09/13/22 7:52 am):** EP.22.003

Key: 1120

First Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	HOURS
ENG 100 (Exernal transfer students take ENG 300.)	1	MATH 231: Calculus II	3
BIOE 100: Freshman Seminar	1	BIOE 120: Introduction to Bioengineering	1
MATH 221: Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4	PHYS 211: University Physics: Mechanics	4
CS 124: Introduction to Computer Science I	3	CS 128: Introduction to Computer Science II	3
RHET 105 (if UIN is even) or Free Elective (if UIN is odd)	4 - 2	CS 173: Discrete Structures	3
CHEM 102: General Chemistry I & CHEM 103: General Chemistry Lab I or MCB 150: Molecular & Cellular Basis of Life	4	Free elective (2) (if UIN is even) or RHET 105 (if UIN is odd)	2-4
	17 - 15		**16 - 18**

Second Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	HOURS
MATH 241: Calculus III	4	MATH 285: Intro Differential Equations	3
PHYS 212: University Physics: Elec & Mag	4	MATH 257: Linear Algebra with Computational Applications or BIOE 210: Linear Algebra for Biomedical Data Science	3
CS 222: Software Design Lab	1	CS 233: Computer Architecture or CS 340: Introduction to Computer Systems	4 - 3
CS 225: Data Structures	4	BIOE 205: Signals & Systems in Bioengrg	3
General Education Elective	3	General Education Elective	3
	16		**16 - 15**

Third Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	HOURS
CS 341: System Programming (if CS 233 is taken) or CS Technical Elective (if CS 340 is taken)	4 - 3	CS 374: Introduction to Algorithms & Models of Computation	4
BIOE 206: Cellular Bioengineering or BIOE 302: Modeling Human Physiology	3	BIOE 310: Comp Tools Bio Data	3
BIOE Technical Elective	3	BIOE Technical Elective	3
Free Elective (6 credit hours if CS 233 is taken or 8 credit hours if CS 340 is taken)	6 - 8	CS Technical Elective	3
		Upper Division Technical Elective	3
	17 - 16		**16**

Fourth Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	HOURS
CS 357 : Numerical Methods I or CS 421 : Programming	3	BIOE 404: CS + BIOE Senior Design or General Education Elective	4 - 3
BIOE Technical Elective	6	BIOE Technical Elective	3
Free Elective	3	Upper Division Technical Elective	3
General Education Elective or BIOE 404: CS + BIOE Senior Design	3 - 4	Free elective (or CS Technical Elective if CS 340 is taken)	3 - 4
		General Education Elective	3
	16 - 17		**15 - 17**

Total Hours 128

January 31, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The Department of Mathematics is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. The department is happy to provide access to the following:

Possible addition of 25 students per cohort to the following:

- MATH 221: Calculus I

- MATH 231: Calculus II

- MATH 241: Calculus III

- MATH 257: Linear Algebra with Computational Applications (optional choice alongside BIOE 210: Linear Algebra for Biomedical Data Science)

- MATH 285: Intro Differential Equations

  An estimated 5 CS+BIOE students per cohort to in our 300 and 400 level coursework in the department of mathematics, subject to capacity and course availability.

Congratulations on your exciting proposal.

Sincerely,
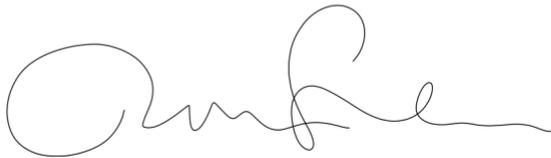
Vera Hur

Professor and Chair, Department of Mathematics

COLLEGE OF LIBERAL ARTS & SCIENCES

Department of Chemical & Biomolecular Engineering
114 Roger Adams Laboratory, MC-712
600 S. Mathews Ave.
Urbana, IL 61801

January 26, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The Department of Chemical and Biomolecular Engineering (CHBE) is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. CHBE is happy to provide access to your estimated 5 CS+BIOE students per term in our 300 and 400 level coursework in the department of chemical and biomolecular engineering, subject to capacity and course availability.

Congratulations on your exciting proposal.

Sincerely,

Paul J. A. Kenis
Elio E. Tarika Endowed Chair and Department Head
Chemical and Biomolecular Engineering

ILLINOIS

January 31, 2022

Professor Mark Anastasio
Head of the Department of Bioengineering
1102G Everitt Laboratory
University of Illinois at Urbana-Champaign
1406 W. Green Str.
Urbana, IL 61801

Dear Professor Anastasio,

I write in response to your request for support from the Department of Physics in establishing a new Bachelor of Science in Computer Science and Bioengineering in the Department of Bioengineering, CS+BIOE.

Physics will be able to support the additional enrollment from students in the new major that you project for our courses: 25 students per cohort for PHYS 211 and 212 and 5 CS+BIOE students per cohort in our 300 and 400 level courses as needed.

Best Wishes for the success of the new degree,

Matthias Grosse Perdekamp
Head, Department of Physics

UNIVERSITY OF ILLINOIS
URBANA-CHAMPAIGN

January 17, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The Department of Chemistry (CHEM) is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. CHEM is happy to provide access to the following:

- CHEM 102: General Chemistry I as a science elective with the possible addition of 25 students per cohort.

- CHEM 103: General Chemistry Lab I as a science elective with the possible addition of 25 students per cohort.

- An estimated 5 CS+BIOE students per cohort in our 300 and 400 level coursework in CHEM, subject to capacity, prerequisite satisfaction and course availability.

In the event that the numbers grow far larger than this for CHEM 102/103, we may ask your Department to sponsor a discussion/laboratory section, as other units do (laboratory or discussion sections usually have 1 teaching assistant per 24 students).

Congratulations on your exciting proposal. If you need more information, please contact me at 333-7680 or at murphycj@illinois.edu.

Best Regards,

Catherine J. Murphy
Head, Department of Chemistry
Larry R. Faulkner Endowed Chair in Chemistry

January 11, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The Department of Statistics (STAT) is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. STAT is happy to provide access to your estimated 5 CS+BIOE students per term in our 300 and 400 level coursework in the department of statistics, subject to capacity and course availability.

Congratulations on your exciting proposal.

Sincerely,

Bo Li
Chair, Department of Statistics

I ILLINOIS

COLLEGE OF LIBERAL ARTS & SCIENCES

School of Molecular & Cellular Biology
MCB Instructional Program
127 Burrill Hall, MC-119
407 S. Goodwin Ave.
Urbana, IL 61801

January 28, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The School of Molecular and Cellular Biology (MCB) is supportive of your proposal for a new undergraduate major in Computer Science + Bioengineering within the Department of Bioengineering. MCB is happy to allow students, in your proposed major, to take MCB 150, in one of the three semesters in which it is offered (FA, SP, and SU online), when seats are available. Unfortunately, we are not able to guarantee 25 seats per cohort at this time, for several reasons.

1. Our review of enrollments in MCB 150 since Fall 2017 shows that we are already serving between 20 and 61 Bioengineering students (BS) in each fall and spring semester.

2. While we have been fortunate to contribute to your degree programs in this way, and we intend to honor our agreement to support the BIOE students, we may not be able to continue to meet the demand in the future. Our new BSLAS in Neuroscience will begin admitting on-campus students this fall and first-year students in the Fall of 2023. We are also developing a proposal for an MCB + Data Science degree program which will hopefully be approved in the next few years. Each of these new degree programs will also require MCB 150 specifically.

In spite of these circumstances, we would like to continue to provide MCB 150 to your students as we are able.

We are in the same situation with your request for 5 seats per cohort distributed across our 300- and 400-level courses. It is always possible that students in the proposed major will be able to gain access to some courses, and we welcome them, but the most popular of our advanced courses already fill to capacity with students in various MCB majors. At the moment, we hope to retain our long-standing posture where we manage enrollment through the official enrollment period, and once all of our students have had an opportunity to enroll, we remove some restrictions so that empty seats can be filled by others. If your students are able to take advantage of any of those seats, we are happy to have them.

We wish you the best of luck with your proposal.

Sincerely,

Melissa Michael
Associate Director for Curriculum & Instruction
School of Molecular & Cellular Biology
mmichae@illinois.edu

cc: Milan Bagchi, Director
    School of Molecular and Cellular Biology

ILLINOIS

**COLLEGE OF AGRICULTURAL, CONSUMER
& ENVIRONMENTAL SCIENCES**

THE GRAINGER COLLEGE OF ENGINEERING

Department of Agricultural & Biological Engineering
338 Agricultural Engineering Sciences Building, MC-644
1304 W. Pennsylvania Ave.
Urbana, IL 61801

January 21, 2022

January 11, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The Department of Agricultural and Biological Engineering (ABE) is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. ABE is happy to provide access to your estimated 5 CS+BIOE students per term in our 300 and 400 level coursework in our department, subject to capacity and course availability.

Congratulations on your exciting proposal.

Sincerely,

Ronaldo G. Maghirang
Professor and Head

ILLINOIS

January 30, 2022

Professor Mark Anastasio, Head
Department of Bioengineering
Grainger College of Engineering
University of Illinois

Dear Professor Anastasio:

The Undergraduate Rhetoric Program (RHET) in the Department of English is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. The Department is happy to have RHET 105: Writing and Research included in the required courses and can provide seats for the expected 25 students per cohort each year.

And our congratulations on your new major.

Sincerely,

Robert Markley
Head and W. D. and Sara E. Trowbridge Professor

January 13, 2022

Professor Mark Anastasio
Head, Department of Bioengineering

Dear Mark,

The Neuroscience Program is supportive of the proposed new major of Bachelor of Science in Computer Science + Bioengineering within the Department of Bioengineering. Neuroscience is happy to provide access to your estimated 5 CS+BIOE students per term in our 300 and 400 level coursework in the neuroscience program, subject to capacity and course availability.

Congratulations on your exciting proposal. We wish you success in this important new educational endeavor.

Sincerely,

Martha U. Gillette
Director, Neuroscience Program