New Proposal

Date Submitted: 04/29/22 10:34 am

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

Last edit: 08/12/22 9:09 am

Changes proposed by: Elaine Schulte

In Workflow

1. **U Program Review**
2. **1244 Head**
3. **1434 Head**
4. **KP Committee Chair**
5. **KP Dean**
6. **KP Committee Chair**
7. **KP Dean**
8. **University Librarian**
9. **Provost**
10. **Senate EPC**
11. Senate
12. U Senate Conf
13. Board of Trustees
14. IBHE
15. HLC
16. DMI

Approval Path

1. 04/29/22 11:03 am
   Deb Forgacs (dforgacs): Approved for U Program Review
2. 04/29/22 11:34 am
   Yann Chemla (ychemla): Approved for 1244 Head
3. 04/29/22 11:58 am
   Elsa Gunter (egunter): Approved for 1434 Head
4. 07/12/22 1:35 pm
   Keri Pipkins (kcp):

Approved for KP Committee Chair
5. 07/12/22 1:53 pm Cindy Pruitt (cpruitt): Approved for KP Dean
6. 07/12/22 1:54 pm Keri Pipkins (kcp): Approved for KP Committee Chair
7. 07/12/22 2:13 pm Trish Ohlsson (pohlsson): Approved for KP Dean
8. 07/12/22 2:33 pm John Wilkin (jpwilkin): Approved for University Librarian
9. 08/16/22 11:03 am Brooke Newell (bsnewell): Approved for Provost

Proposal Type

Proposal Type:
Major (ex. Special Education)

Administration Details

Official Program Name	Computer Science + Physics, BS		
Diploma Title			
Sponsor College	Grainger College of Engineering		
Sponsor Department	Physics		
Sponsor Name	Yann Chemla, Associate Head of Undergraduate Programs		
Sponsor Email	ychemla@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; Elaine Schulte, PHYS; 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 a new major in Computer Science + Physics for the Bachelor of Science in the Department of Physics 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.

The Department of Physics and the Department of Computer Science propose a new major that is a combination of Physics and Computer Science. This proposed new curriculum is in response to the growing need for computation both throughout physics research and the industrial positions in which physics majors most often work. Computation is the third branch of physics complementing both experiment and analytic theory, but has historically been de-emphasized at the undergraduate level. Physicists regularly work in areas which fall into the intersection of physics and computing including quantum computing and modeling of physical systems (i.e. climate, materials, fluid dynamics), among others. Quantitative modeling in general is a large growth area in many of these fields, and computational thinking is a core proficiency needed for addressing today's most challenging scientific problems. The Physics Department has a core of about ten faculty who conduct research in various computational areas including computational condensed matter, computational astrophysics, computational biophysics, quantum computing, and lattice quantum chromodynamics (QCD). Students who have these interests are not well-served by the standard Physics or CS degrees, and would benefit greatly from a blend.

The CS + Physics degree will provide students with a strong foundation of physics and computational science, which will enable them to explore diverse applications such as computational science, quantum computing, numerical methods, and machine learning. Through cooperation between Computer Science and Physics, we plan to provide an innovative program for students who are interested in the intersection between computing and physics. The proposed curriculum follows the precedent already established through other CS + X programs, as well as other degrees involving computer science blended with other majors, such as Mathematics. The program combines the domain expertise in physics including computational aspects with the broad-based expertise in computing allowing students to bridge these two areas.

The CS + Physics program is rigorous and will be selective. The proposed curriculum is challenging so students will need to perform at a high academic level to be successful. This program is for undergraduate students who plan to pursue careers which blend the fundamental analytical tools presented in physics with computer-based implementations. This degree will prepare students for advanced study at a graduate level, as well as immediate entry into the workforce. We believe students trained in this degree will have career opportunities in four areas: (1) quantum information science, (2) computational physics in industry, (3) graduate school in computational physics, scientific computing, or computer science, and (4) traditional computer science/information technology.

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

RHET 105 - Writing and Research
MATH 220 - Calculus
MATH 221 - Calculus I
MATH 231 - Calculus II
MATH 241 - Calculus III
MATH 257 - Linear Algebra w Computat Appl
MATH 285 - Intro Differential Equations
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 361 - Prob & Stat for Computer Sci
CS 374 - Intro to Algs & Models of Comp
PHYS 211 - University Physics: Mechanics
PHYS 212 - University Physics: Elec & Mag
PHYS 213 - Univ Physics: Thermal Physics
PHYS 214 - Univ Physics: Quantum Physics
PHYS 225 - Relativity & Math Applications
PHYS 246 - Intro to Computational Physics
PHYS 325 - Classical Mechanics I
PHYS 435 - Electromagnetic Fields I
PHYS 446 - Modern Computational Physics
PHYS 485 - Atomic Phys & Quantum Theory
PHYS 486 - Quantum Physics I

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

CS + PHYS support letter.pdf
CS + Letter of support- Engineering.pdf
Physics_letter_Phys+CS.pdf

other impacted units as appropriate.

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.

The Department of Physics Undergraduate Studies Office—together with guidance from the Physics Undergraduate Studies Committee—will work to collect, compile, evaluate, and report on the learning outcomes for its courses. This work will include, but not be limited to:

1. Informal Early Feedback:
Students in each major-specific course will be invited to participate in a survey to help the department and instructors evaluate the students' understanding of the course learning objectives, outcomes, and course goals. Summary reports will be made available to instructors and the department leadership.

2. Evaluation of Direct Student Learning and Other Summative Learning Assessments:
Final examinations (i.e., questions and student work) will be collected for evaluation of learning outcomes. This will include evaluation of the assessments' usefulness in evaluation of learning outcomes, as well as the mastery of the outcomes by students. Anonymized student work will be used for the evaluation. Summary reports will be made available to instructors and the Department leadership.
Additionally, CS will follow its standard student outcomes assessment process for the core CS courses, in the same manner as it uses for continuous assessment of the CS BS program.

3. Indirect Evaluation of Student Learning:
Indirect measures of student learning will include current enrollment, including demographic information.

4. Degree completion rates, including information regarding:
Semesters to completion
Degree program requirements
Semesters to complete specified intra-degree program requirements
Choke-points in degree completion progression
Course updates and revisions
Desirable new courses
Demographic trends

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+Physics_GCoE_POS-29-APR-22 (1).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, Math, and Physics 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
PHYS 110	Physics Careers	0
Highly recommended, optional 1 credit hour course, CS 100 Computer Science Orientation. Credit hour counts toward free electives.		
Total Hours		1

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
MATH 257	Linear Algebra with Computational Applications	3-4
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
CS 361	Probability & Statistics for Computer Science	3-4
or STAT 400	Statistics and Probability I	
Total Hours		32-34

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 450	Numerical Analysis	

Code	Title	Hours
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

Physics Core

Course List

Code	Title	Hours
PHYS 225	Relativity & Math Applications	2
PHYS 246	Physics on the Silicon Prairie: An Introduction to Modern Computational Physics	2
PHYS 325	Classical Mechanics I	3
PHYS 435	Electromagnetic Fields I	3
PHYS 486	Quantum Physics I	3-4
or PHYS 485	Atomic Phys & Quantum Theory	
PHYS 446	Modern Computational Physics	3
PHYS technical elective: Choose from CS or PHYS 300- or 400- level courses		14
Total Hours		30-31

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 - 17
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

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 to Computer Science+Physics until a uniform policy for internal transfer into all undergraduate Computer Science 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:

A cohort of 25 students/year is not expected to require additional staffing.

If the program grows beyond 25 students/year, Physics will need to increase staffing to meet the needs of the increased number of majors. We anticipate needing specialized sections for CS + Physics students in the required upper division Physics courses, geared toward training in computational approaches. Specialized teaching faculty will be hired to teach these sections. In addition, we anticipate hiring a senior academic advisor to advise CS + Physics students separately from Physics.

Additional Budget Information

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

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

Attach File(s)

Financial Resources

How does the unit intend to financially support this proposal?

Any additional needs will be financed through revenues generated within the IVCB budget model based on major and engineering surcharge attributable to Computer Science+Physics enrollment. Both Physics and CS will use funds from this revenue to accommodate increases in advising or teaching loads. Following the IVCB Appendix II, and the GCoE decision to extend this to the department level, the departments of Physics and CS have agreed to evenly split the revenues generated from the enrollment in this program.

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).

Collaboration between the fields of CS and physics is long-standing. Increasingly, progress in physics and private sector occupations that use physics is driven by complex computer calculations, while advances in physics, such as the field of quantum information, have had large effects on the field of computer science. The University of Illinois has prioritized quantum information sciences as a major thrust, and this degree would support that effort. Training in these areas require deep understanding of both fields, beyond that available in a minor in either topic.

The program shares the core of CS in the tradition of the CS programs across campus and shares introductory courses with the Physics program, but provides much greater depth in physics for a unique blend of both fields. Currently, no degree exists that overlaps significantly with CS + Physics. For example, there is no other degree that teaches quantum mechanics to a sufficient depth to understand quantum information science.

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 of Illinois has a strong record of evaluating its educational programs and responding to emerging needs. In its 2018 Strategic Plan The Next 150, the University recognized the need to "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." The proposed CS + Physics program will support this thrust by training the next generation of physicists in computation—particularly in emerging areas such as quantum information science—for which there is broad-based demand in the private sector and in academia.

The CS + Physics program will also support the University's goal to improve representation of female and URM students in STEM areas. First, CS + Physics will draw applicants from a pool of students who would traditionally have applied to the CS program. Thus, the demographics of applicants to CS + Physics is expected to more closely reflect those of CS, for which the percentage of female students (47%) greatly exceeds that of GCOE overall (30%) and Physics specifically (23%). The percentage of URM students in CS (13%) also improves upon those in GCOE and Physics (11% and 5%, respectively).

Second, a long-standing barrier to URM students applying to the Physics BS program is the perceived limited career options, in particular high-paying industry positions that are often a high priority for these students. CS + Physics combines the job prospects of computer science with the techniques and principles of physics to create a clear and compelling prospect for jobs after graduation. This message will be communicated in recruiting applicants to the CS + Physics program. Recruiting efforts will leverage the Illinois Physics and Secondary School (IPASS) program, an ongoing partnership between the physics department and Illinois high schools, including those with high proportions of underrepresented students. It is thus anticipate that the CS + Physics program will increase the diversity of the GCOE student body.

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/).

We have identified four main classes of students that we believe will benefit from this degree: those interested in (1) quantum information science, (2) computational physics in industry, including materials calculations, financial modeling, including data science applications, (3) graduate school in computational physics, scientific computing, or computer science, and (4) computer science/information technology career, using the advanced mathematical and modeling techniques they acquire in a physics degree.

We will briefly describe the job prospects for each of those classes:

1. Quantum information science: While this field is currently small (~4,500 jobs on indeed.com at the time of this writing), the students from this program would be uniquely qualified for QIS jobs, and we believe would have a particular competitive advantage. Employers would include companies such as Microsoft, IBM, and Google, all of which are investing heavily in quantum information.

2. Computational physics: Companies such as IBM, Honeywell, and Intel have historically used computational modeling based on physics to design their products. Currently there is no degree program that addresses both the programming and scientific sides of this career path. Similarly, investment companies such as Goldman Sachs, JPMorgan Chase, and Morgan Stanley model financial markets using stochastic processes similar to those found in physical systems, and commonly hire computational physicists.

3. Graduate school: Computational physics is a common area of research at the postgraduate level, and the students trained in this program would be competitive applicants for the top level programs in physics and computer science.

4. Traditional computer science/information technology: The market for traditional computer science experts is very large, and we imagine that some students will take this path after graduating. The Physics addition could in some cases distinguish the student as having passed a very rigorous program.

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

For job placement, the students will have access to academic advising from the Physics and Computer Science departments, as well as Engineering Career Services. There is an Engineering Career Fair every year in which students can interact with many companies who would be interested in hiring them or giving them an internship.

The Computer Science department also has special career events from which the students in the Computer Science + Physics degree program can benefit (e.g., the Corporate Connection program and Corporate days). All students in Computer Science + Physics 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.

The CS and Physics courses required for majors already exist and 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 or Physics 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.

If the program grows beyond 25 undergraduates/year, we plan to increase staffing to meet the needs of the increased number of majors. We will create specialized sections for CS + Physics students in the required upper division Physics courses, geared toward training in computational approaches. Specialized teaching faculty will be hired to teach these sections. In addition, we anticipate hiring a senior academic advisor to advise CS + Physics students separately from Physics.

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.

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

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			
Budget Narrative Attachments			

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	To be determined by campus.	To be determined by campus.	Considerations need to be made to access existing

Facility Need	Year 1 Cost	Year 5 Cost	Facility Notes
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, new or expanded space for tutoring sessions, storage space for Physics equipment to hold lecture demonstration material. Also, the CBTF is a critical service for both CS and Physics courses, as well as for many other courses in The Grainger College of Engineering, and the additional growth brought by this program will increase the need for additional testing space.			campus facilities.

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.23.004
Attach Rollback/Approval Notices	
This proposal requires HLC inquiry	Yes

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) (04/27/22 12:51 pm): Rollback: Subcommittee questions

Aaron Brewer (ambrewer) (08/04/22 8:50 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) (09/13/22 8:02 am): EP.23.004

Key: 1122

Graduation Requirements
Minimum Technical GPA: 2.0 TGPA is required for CS, Math and Physics courses. See Technical GPA
Minimum Overall GPA: 2.0
Minimum hours required for graduation: 128 hours.
General education: Students must complete the Campus General Education requirements including

Orientation and Professional Development		
ENG 100	Engineering Orientation (External transfer students take ENG 300)	1
PHYS 110	Physics Careers	0
Highly recommended, optional 1 credit hour course, CS 100 Freshman Orientation.		
Total Hours		**1**
Foundational Mathematics and Science		
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
MATH 257 or MATH 416	Linear Algebra with Computational Applications Abstract Linear Algebra	3 - 4
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
CS 361 or STAT 400	Probability & Statistics for Computer Sciences Statistics and Probability I	3 - 4
Total Hours		**32 - 34**
Computer Science Technical Core		
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 from the following options:		8 - 9
CS 233 & CS 341 OR CS 340 & Two CS 400-level courses	Computer Architecture System Programming Introduction to Computer Systems 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 the course is chosen for 4 credits, the extra credit hour will count towards free electives.	
CS 374	Algorithms & Models of Computation	4
CS 357 OR CS 450	Numerical Methods I Numerical Analysys	3
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**
Physics Core		
PHYS 225	Relativity and Math Applications	2
PHYS 246	Physics on the Silicon Prairie: An Introduction to Modern Computationa	2
PHYS 325	Classical Mechanics I	3
PHYS 435	Electromagnetic Fields I	3
PHYS 486 or PHYS 485	Quantum Physics I Atomic Phys & Quantum Theory	3 - 4
PHYS 446	Modern Computational Physics	3

PHYS Technical Elective	Choose from CS or PHYS 300- or 400- level courses	14
Total Hours		**30 - 31**
Free Electives		**13 - 17**
Additional course work subject to the Grainger College of Engineering restrictions to		
Total Minimum Hours of Curriculum to Graduate		**128**

First Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	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
PHYS 110 - Physics Careers	0	PHYS 211 - University Physics: Mechanics	4
ENG 100 (Exernal transfer students take ENG 300.)	1	CS 128- Intro to Computer Science II	3
CS 124 - Intro to Computer Science I	3	CS 173 - Discrete Structures	3
RHET 105 (if UIN is even) or General Education Elective (if UIN is odd)	4 - 3	General Education Elective (if UIN is even) or RHET 105 (if UIN is odd)	3 - 4
General Education Elective	3		
	15 - 14		**16 - 17**

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	PHYS 213 Univ Physics: Thermal Physics	2
PHYS 225 - Relativity & Math Applications	2	PHYS 214 - Univ Physics: Quantum Physics	2
CS 225 - Data Structures	4	PHYS 246 - Physics on the Silicon Prairie: An Introduction to Modern Computational Physics	2
General Education Elective	3	CS 233 - Computer Architecture or CS 340 - Intro to Computer Systems	4 - 3
		CS 222 - Software Design Lab	1
		General Education Elective	3
	17		**17 - 16**

Third Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	HOURS
MATH 257 Linear Algebra with Computational Applications (preferred) (MATH 416 may be substituted.)	3	CS 357 - Numerical Methods I or CS 450 - Numerical Analysys	3
PHYS 325 - Classical Mechanics I	3	PHYS 435 - Electromagnetic Fields I	3
CS 361 - Probability & Statistics for Computer Science (STAT 400 may be substituted)	3	CS Technical elective	3
PHYS Technical Elective	3	PHYS Technical Elective	3
Free Elective	3	Free Elective (3 hours if CS233 is taken or 5 hours if CS340 is taken)	3 - 5
	15		**15 - 17**

Fourth Year

FIRST SEMESTER	HOURS	SECOND SEMESTER	HOURS
PHYS 485 - Atomic Phys & Quantum Theory (PHYS 486 - Quantum Physics I may be substituted)	3	PHYS 446 - Modern Computational Physics	3
CS 374 - Intro to Algorithms & Models of Computation	4	PHYS Technical Elective	4
Free elective (if CS 233 is taken) or CS Technical Elective (if CS 340 is taken)	3	PHYS Technical Elective	4
Free Elective	3	CS 341 - System Programming (if CS 233 is taken) or CS Technical Elective (if CS 340 is taken)	4 - 3
Free Elective	3	Free Elective	2
	16		**17 - 16**

Total Hours 128

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Mathematics

273 Altgeld Hall, MC-382
1409 West Green Street
Urbana, IL 61801

Re: Support for CS+PHYS proposal

Dear Professor Yann Chemla, Associate Head,

The Department of Mathematics supports the proposed new major of Bachelor of Science in Computer Science + Physics (CS+PHYS) within the Department of Physics in the Grainger College of Engineering.

The Mathematics department is able and willing to provide access to the following courses to students in this new major, corresponding to the possible addition of up to 25 students per cohort:

MATH 221, 231, 241 – Calculus I, II, and III

MATH 257 – Linear algebra with computational applications (preferred), or MATH 416 – Applied linear algebra

MATH 285 – Introduction to differential equations

Congratulations on your new proposed degree.

Sincerely

Randy McCarthy

Randy McCarthy
Professor of Mathematics
Dir of Undergraduate Studies in Math
rmccrthy@illinois.edu

telephone 217-333-3350 • *fax* 217-333-9576
email office@math.uiuc.edu • *url* http://www.math.uiuc.edu/

ILLINOIS

COLLEGE OF LIBERAL ARTS & SCIENCES
Department of English
608 S. Wright St., MC-718
Urbana, IL 61801-3633

Feb. 2, 2022

Professor Yann Chemla
Associate Head for Undergraduate Programs
Department of Physics
University of Illinois, Urbana-Champaign

Dear Yann,

The Undergraduate Rhetoric Program (RHET) in the Department of English is happy to support the proposed new major of Bachelor of Science in Computer Science + Physics (CS+PHYS) within the Department of Physics in the Grainger College of Engineering.

The Department has the capacity to have RHET 105: Writing and Research included in the required courses for the new major and can provide seats for the expected 25 students per cohort each year. I'm cc'ing Kristi McDuffie, the Director of Rhetoric, on this letter, and she or I should be able to answer any questions you might have going forward.

Congratulations on your exciting proposal.

Sincerely,

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

cc: Kristi McDuffie

UNIVERSITY OF ILLINOIS

AT URBANA–CHAMPAIGN

Department of Statistics
101 Illini Hall
725 South Wright Street
Champaign, IL 61820

January 28, 2022

Professor Yann Chemla
Associate Head for Undergraduate Programs, Department of Physics

Dear Yann,

The Department of Statistics (STAT) is supportive of the proposed new major of Bachelor of Science in Computer Science + PHYS (CS+PHYS) within the Department of Physics in the Grainger College of Engineering.

STAT is happy to provide access to the following courses to students in this new major, corresponding to the possible addition of up to 25 students per cohort:

- STAT 400 – Statistics and Probability I

Congratulations on your exciting proposal.

Sincerely,

Bo Li

Department Chair, Department of Statistics

telephone 217-333-2167 • *fax* 217-244-7190