NEW YORK CITY COLLEGE OF TECHNOLOGY
OF
THE CITY UNIVERSITY OF NEW YORK

PROPOSAL TO ESTABLISH A PROGRAM IN COMPUTER SCIENCE TEACHING EDUCATION LEADING TO THE BACHELOR OF SCIENCE in EDUCATION DEGREE

EFFECTIVE FALL 2026

SPONSORED BY THE DEPARTMENT OF CAREER AND TECHNOLOGY TEACHER EDUCATION

APPROVED BY
NEW YORK CITY COLLEGE OF TECHNOLOGY COLLEGE COUNCIL,
MONTH DAY, YEAR

College Representative:	Pamela Brown, Provost and VP of Academic Affairs
Contact:	
Telephone:	(718) 260-5560
Fax:	(718) 260-5542
Email:	PBrown@citytech.cuny.edu

Provost's Signature:
Provost's Name: _____ _____

TABLE OF CONTENTS

CURRICULUM MODIFICATION PROPOSAL FORM

Title of Proposal	**Bachelor of Science in Education in Computer Science Teacher Education**
Date	**9/9/2024**
Major or Minor	**Major**
Proposer's Name	**Euisuk Sung**
Department	**Career and Technology Teacher Education**
Date of Departmental Meeting in which proposal was approved	**1/29/2024; 9/3/2024**
Department Chair Name	**Dr. Euisuk Sung**
Department Chair Signature and Date	Euisuk Sung Digitally signed by Euisuk Sung Date: 2024.09.10 17:58:06 -04'00'
Academic Dean Name	**Dr. Maureen Archer**
Academic Dean Signature and Date	Dr. Maureen Archer-Festa Digitally signed by Dr. Maureen Archer-Festa Date: 2024.09.11 20:50:54 -04'00'
Brief Description of Proposal (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body.	The Department of Career and Technology Teacher Education (CTTE) at the School of Professional Studies, New York city College of Technology (NYCCT/CityTech) propose a Bachelor of Science in Education (BSEd) in Computer Science Teacher Education. Our program is designed to prepare preservice teachers for computer knowledge, computer literacy skills, teaching and lesson plan skills based on pedagogical theories, and lifelong education skills based on general education required for K-12 computer science teachers. The proposed curriculum includes general education, pedagogical core, and content core required by CUNY. Our proposal also includes four new EDU classes and leverages courses from the Computer Systems Technology (CST) Department and existing Technology Teacher Education programs.
Brief Rationale for Proposal (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body).	The rapid pace of technological advancements in recent years, such as artificial intelligence, media technology, and the integration of information and technology, underscores the importance of K-12 computer science education. Computing-related jobs are more than half of all projected new jobs in Science, Technology, Engineering, and Mathematics (STEM). In response to the need for computer science education, the Board of Regents adopted regulations in March 2018 to create a classroom teaching certificate in computer science and developed the New York State K12 Computer Science and Digital Fluency Learning Standards. As K-12 CS programs rapidly expand nationwide, the Department of Education now considers Computer Science a "high need" field and has included it in the list of subjects

	eligible for TEACH grants (Federal Student Aid Office, n.d.). While the need for computer science education is growing, it is important to note that New York City has a shortage of computer science teachers. This newly proposed program aims to fulfill the needs for computer science educators in New York state.
Proposal History (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list).	This is a new proposal.

ALL PROPOSAL CHECK LIST

Completed CURRICULUM MODIFICATION FORM including:	
• Brief description of proposal	V
• Rationale for proposal	V
• Date of department meeting approving the modification	V
• Chair's Signature	V
• Dean's Signature	V
Evidence of consultation with affected departments List of the programs that use this course as required or elective, and courses that use this as a prerequisite.	V
Documentation of Advisory Commission views (if applicable).	
Completed Chancellor's Report Form.	

EXISTING PROGRAM MODIFICATION PROPOSALS

Documentation indicating core curriculum requirements have been met for new programs/options or program changes.	V
Detailed rationale for each modification (this includes minor modifications)	V

I. Purpose and Goals

The Bachelor of Science in Computer Science Teacher Education Program aims to equip New York City College of Technology graduates with the essential skills and knowledge base to teach computer science education to future students using a strong foundation in computing literacy and professional knowledge, including current relevant topics. Since the invention of computers, their usage has been steadily increasing, and in modern society, they are widely used in all areas of life including education, production, industry, finance, and medicine (U.S. Department of Education, 2016). From a job perspective, having the ability to understand and use computers properly is becoming a necessity rather than an option. People with computing skills have more opportunities to secure better jobs and earn higher salaries.

For many decades, computer science education was conducted either through informal classes or by teachers who have a special interest in computers, demonstrating the need for a standard education in this critical area. It is essential to provide up-to-date knowledge of computer advancement and standardization in K-12 computer science education to create equal access to social justice and equity and to provide a skill set and knowledge essential in this society (Ryoo, Tanksley, & Estrada, 2020; Vakil, 2020). According to the state report, about 48% of high schools in New York State offer introductory computer science courses, and 58% of districts offer computer science electives (Code.org, 2023). As a result, "computer education for all" has become a popular goal, and efforts to teach computers in schools are rapidly increasing due to the growing importance of computers. New York State is committed to ensuring that all students receive a high-quality computer education. To achieve this, the state released Computer Science and Digital Fluency Learning Standards (2020). Additionally, the state has adopted the new teacher regulation that enforces only qualified computer science teachers to instruct computer subjects. As the demand for qualified computer science teachers continues to rise, there is an increasing need for educators with advanced skills and understanding in this field.

This proposal introduces a new Bachelor of Science in Education (BSEd) program. The program aims to equip K-12 educators with comprehensive knowledge, skills, values, and experience to teach computer science effectively. The focus is on integrating computing as a fundamental literacy across disciplines and imparting problem-solving skills through computational thinking. The curriculum has been designed to ensure a solid understanding of the New York Computer Science and Digital Fluency Standards, including programming languages, data structures, computer systems, networking, and algorithms.

II. Need and Justification

The biggest driving force that has changed our lives in the past half century has been computer-related technologies - personal computers, mobile phones, smartphones, social networking, and artificial intelligence, to name a few. Computing-related jobs are more than half of all projected new jobs in Science, Technology, Engineering, and Mathematics (STEM). According to a Google & Gallup survey (2020), 69% of all parents say it is important or very important for their child to learn computer science at school, but only 53% of schools offer stand-alone courses in Computer Science. In contrast, in New York State, where computer and information-based industries such as banking, finance, advertising, media, educational technology, and IT, are key industries, only 3.4 % of high school students are enrolled in a Computer Science course, with percentages for students of color and multilingual learners falling far below the percentages of their white, monolingual peers. (code.org, 2022). The data is only beginning to emerge for elementary and middle schools, which have not traditionally offered computer science instruction.

In response to the need for computer science education, the Board of Regents adopted regulations in March 2018 to create a classroom teaching certificate in computer science. To ensure the quality of teaching computer science in schools, New York State developed the New York State K12 Computer Science and Digital Fluency Learning Standards as a result of a two-year collaborative effort between teachers, researchers, and the state education department. It was approved by the Board of Regents in 2020. Also, the New York State Education Department announced a plan to strengthen computer science teacher qualifications, so beginning in September of 2024, teachers will be required to either hold a certification in computer science education or to apply for a Statement of Continued Eligibility (SCE) (NYSED, 2023). The New York City Department of Education remains dedicated to advancing its Computer Science for All initiative citywide and is committed to pursuing not just access but also justice-centered practices (EECS). This means that thousands of teaching jobs will be opening up within the next decade in New York State.

NYSED also recognizes that Career and Technical Education teachers in the Information Technology (IT) pathway may teach CS. NYSED is currently considering a rule change to add a new Computer Science CTE pathway. While many Technology Education teachers also teach CS, this certification area is not approved to teach CS by NYSED, and Technology Education teachers will need to apply for the Computer Science Statement of Continued Eligibility (SOCE) or earn a supplemental certification in order to continue to teach CS. (Data from csforny.org and NYSED)

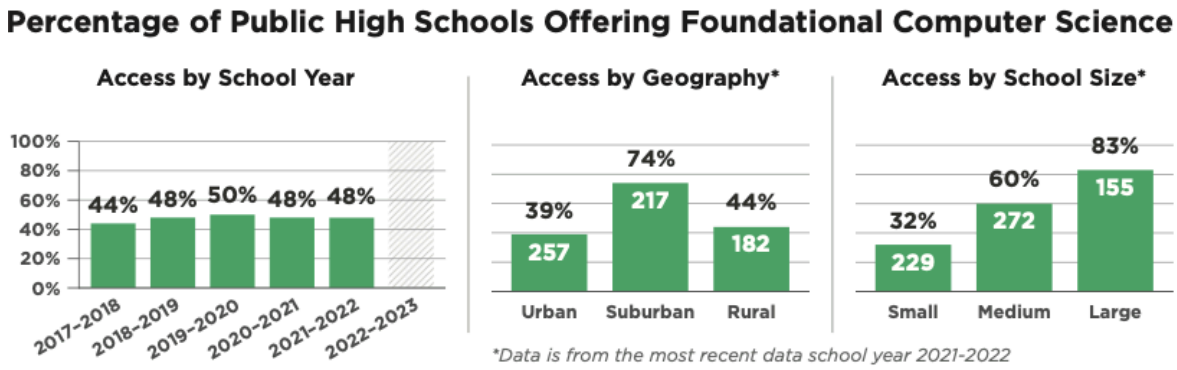
The value of Computer Science in teacher preparation has been affirmed through significant investments at the local and national levels. The City University of New York has committed to a transformation in our teacher education programs that will ensure that all CUNY education

graduates receive instruction in computational literacies embedded in their required education courses (CITE, 2023). Major accreditors, including AAQEP, also emphasized the importance of computational literacies embedded in educator preparation programs (EPP) when they crafted five commitments that make up the EPP Digital Equity and Transformation Pledge (ISTE, n.d.). As K-12 CS programs rapidly expand nationwide, the Department of Education now considers Computer Science a "high need" field and has included it in the list of subjects eligible for TEACH grants (Federal Student Aid Office, n.d.).

1. Employment Opportunities After Graduation

1) Overview of the job market

There is a growing need to mandate computer science for all high school students. According to the Computer Science Teachers Association (CSTA), about 48% of New York state high schools offer foundational computer science courses. As of September 2024, New York State requires teachers who teach computer science to have a valid computer science teaching certificate or Computer Science State of Continued Eligibility (SOCE). So far, there are roughly 2,200 computer teachers with 68% being white, 22% nonwhite, and 10% other. Among them, 54% had a secondary school computer science certification while 25% held a Career and Technical Education certification. Most computer teachers had early or mid-career compared to all other teachers. There is a severe shortage of computer science teachers, while the demand is expected to increase significantly in the future.



2) Job Market Growth

According to the Bureau of Labor (2023), the number of jobs in computer and information-related occupations is expected to increase by about 23% by 2023. It is said that approximately 3,400 new jobs will be created yearly, and most of the jobs are new jobs that replace the existing traditional labor market. The number of computer science teachers teaching computer-related subjects is expected to steadily increase, although it may not match the number of computer jobs. According to the research conducted by Zippia.com, the demand for computer science teachers is expected to increase by 12% between 2018 and 2028. It is predicted that 159,400 new jobs will be created for accountants in the upcoming decade. Currently, there are over 5,164 computer science teachers employed in the United States, and the number of active job openings for computer science teachers in the US is 72,662.

3) Compensation Potential

Graduates will be qualified for certification to teach K-12 Computer Science statewide. In addition to teaching in public and private K-12 schools, graduates could obtain employment in informal education spaces like museums or non-profits, curriculum development, and in other

educational technology sectors. Under the recently approved UFT contract, incoming salaries for teachers with a bachelor's degree start at $62,000 and can go up to as high as $128,000 with experience. Positions other than teaching can range from $50,000 in the non-profit sector to upwards of $120,000 as an educator or curriculum developer in the technology sector.

2. Related Undergraduate and Graduate Programs in the New York area (as of November 5, 2018).

1) Related Programs in CUNY

A. Undergraduate Programs

Currently, there is no specific program within the City University of New York (CUNY) that offers teacher education programs leading to the computer science teaching certificate. Technology Teacher Education and Career and Technica Teacher Education programs are only close subjects to Computer Science as they are clustered in the same CTE umbrella. The CTTE department, which proposes a computer science teacher program, is the only school that provides Technology Education and Career Technical Teacher Education programs in CUNY.

B. Master's Programs

There are three colleges within CUNY that offer programs for computer science teaching certificates. Hunter College offers both a Master's degree and an Advanced Certificate program. Lehman College also offers both Master's degree and Advanced Certificate programs for computer science teacher training. However, to enroll in these programs, applicants must possess a bachelor's degree or a classroom teaching certificate, respectively. Since our proposed bachelor's program for computer science teachers does not have such a requirement, there is no chance of conflict between the two programs.

2) Related Programs Outside of CUNY

As of November 22, 2023, there were no bachelor's degree public schools in New York City that produced computer science teacher qualifications. The closest public university in New York State offering a computer teacher education program was SUNY Potsdam, about 350 miles from New York City, and none yet south of Albany. Eight schools offer computer science teacher certification in New York City and New York State, five of which have master's degree programs and three have bachelor's degree programs.

Table 1 Registered Computer Science Education Programs Outside of CUNY (As of September 09 2024)

College	Program Title	Degree Type	Location
Adelphi University	STEAM Computer Science	Master	Manhattan, Brooklyn
Clarkson University	Adolescence Education 7-12	Master	Potsdam
Manhattan Ville College	Computer Science Education (All Grades),	Master	Purchase
New York University	Computer Science Education	Minor Master	Manhattan, Brooklyn
Siena College	Computer Science	Bachelor, Certification	Loudonville
St. Joseph's University	Computer Science Teacher Certification	Bachelor, Certification	Brooklyn
SUNY Potsdam	Computer Science Education	Bachelor of Science	Potsdam

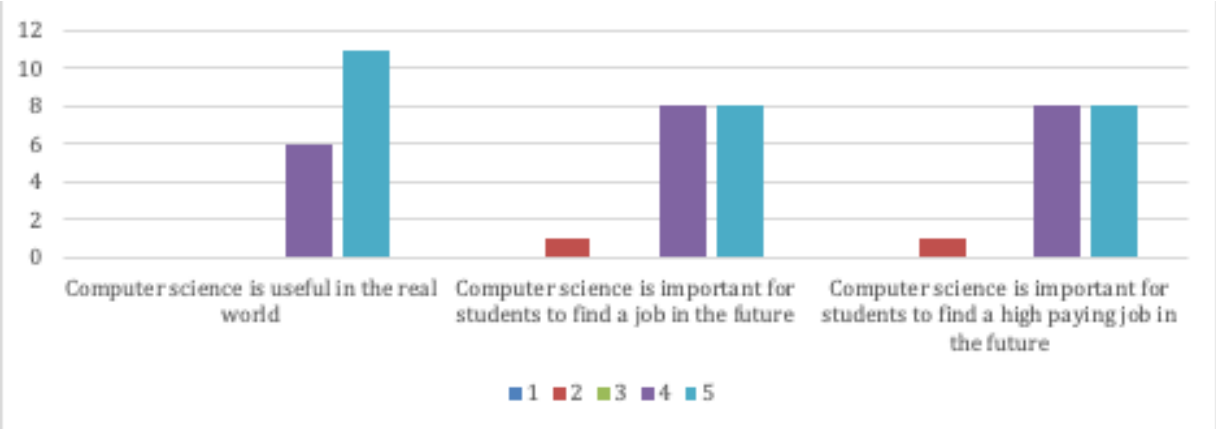
III. Student Interest and Anticipated Enrollment

1. Student Interest:

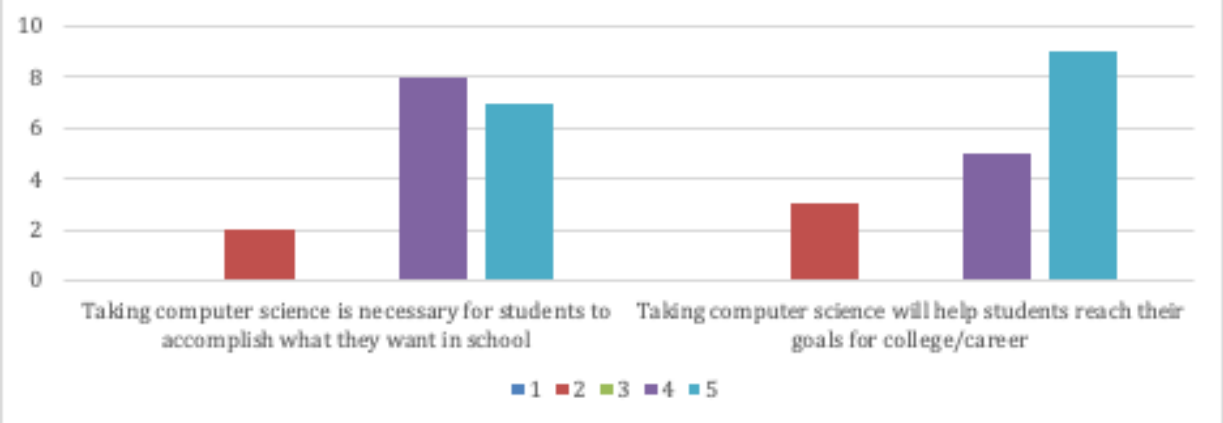
Between October and November 2023, a survey was conducted among students in the CTTE department to gauge their interest in the computer science teacher program. A total of 17 students participated in the survey, which included 10 items divided into two areas, perceived relevance to own future and intrinsic motivation. The survey is based on the "Assessing Student Interest in Computer Science" questionnaire developed by LEADCS.org. The survey used a five-point Likert scale to measure the students' responses.

2. Perceived Relevance to Own Future

We conducted a study on students' perceptions of the value and relevance of computer science in their future. All the students who participated in the study acknowledged that computer science has real-world applications, and 16 out of 17 students agreed that it is crucial in securing high-paying jobs.

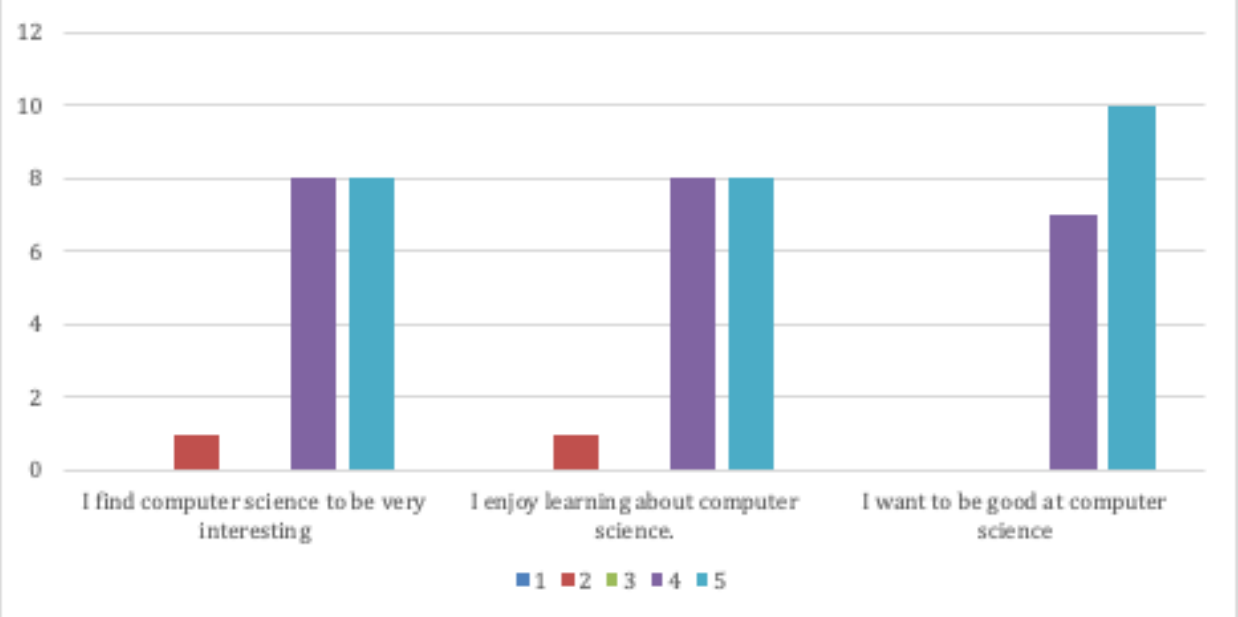


82% of students believe learning computer science is essential for college and career goals.

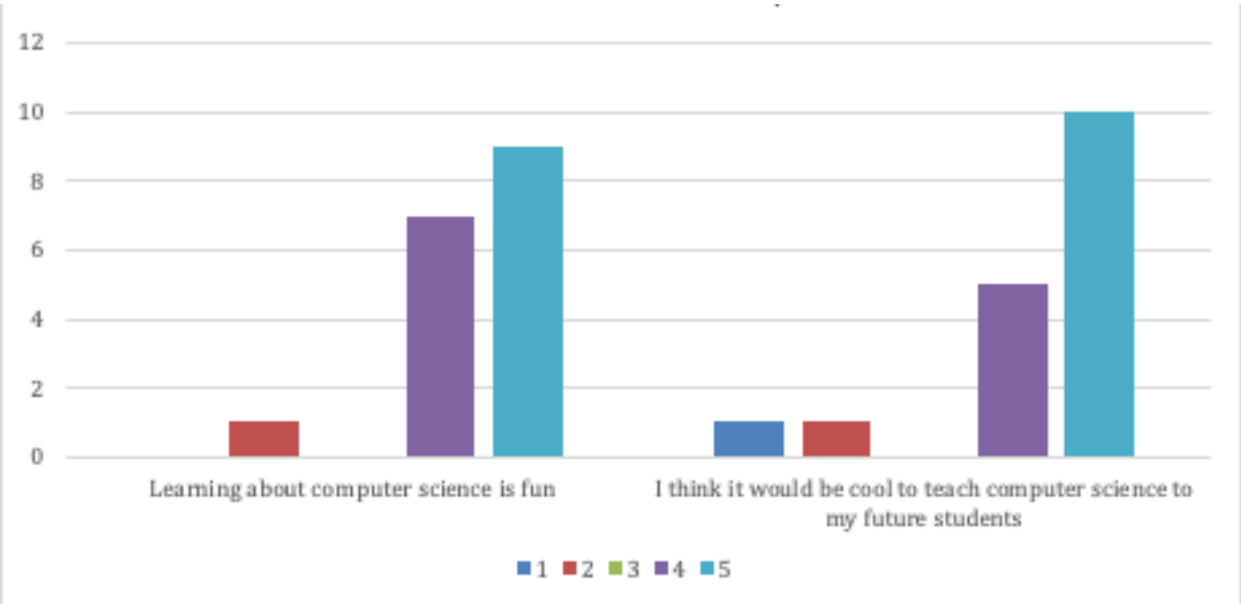


3. Intrinsic Motivation

Students expressed a strong interest in computer science and a unanimous desire to develop their skills in the field.



16 out of 17 students reported that they found learning about computer science enjoyable. Additionally, 15 students expressed a desire to teach computer science to future students.



4. Enrollment Outlook:

Although recent data across CUNY demonstrate decreasing numbers of students in teacher education, we are optimistic that NYSED enforcement of the new K-12 Computer Science Education licensure area and NYC DOE's CSforAll initiative, will increase demand for teacher certification in this area. We anticipate that the enrollment in our program will grow significantly.

There is no exact report on the demand for computer teachers in New York City, but the need for computer education is growing. The New York State Education Department classifies Computer Science as part of the Career and Technical Education (CTE) cluster, and all middle school students are required to take 1 ¾ units in CTE. However, it is important to note that New York City has a shortage of computer science teachers. With 710 middle and 571 high schools, there is a potential demand for around 3,000 new computer science teaching positions, assuming each school needs to hire about 2 to 3 computer science teachers.

5. Potential Students:

With the significant increase in demand for computer science teachers, our potential student includes high school students from NYC and the surrounding areas, transfer students from CUNY and other nearby community colleges, as well as individuals seeking a career change with backgrounds in informal education or the technology industry.

6. Admissions Requirements

Students may enter the bachelor of science in education (BSEd) degree program as freshmen if they meet the general College criteria for baccalaureate admissions. They may transfer in from one of the City Tech AAS, AA or AS programs before or after completing the associate degree. Students may transfer from other colleges if they meet College criteria for transfer admissions. Applicants with questions are advised to consult the Office of Admissions. It is not necessary to have earned an associate degree before transfer into the program. Transcripts of entering students will be evaluated to determine the courses they must complete for the degree. A minimum grade point average of 3.0 is required for transfer into the program. Applicants with a grade point average of above 2.5 may be considered.

Regardless of the mode of admission, prospective students must meet CUNY proficiency requirements. To be admitted to teacher education, all applicants must write an essay and must be interviewed by program faculty to determine their eligibility for state certification and potential for success in the program.

IV. Overview of the Courses in the Curriculum

1. Overview of the Courses in the Curriculum

The Bachelor of Science in Education (BSEd) in Computer Sciences Teacher Education program aims to prepare students to teach computer science in grades K-12 after graduation. The program encompasses a total of 123 credits and includes:

- 43 CUNY Pathways credits to develop a solid liberal arts education.
- 19 discipline-specific general arts to meet New York State's education degree requirements and to develop a strong foundation in mathematics and computer fundamentals.
- 28 credits of core pedagogy to develop a foundation of learning theories and proficiency in designing instruction appropriate for their developmental levels and needs; proficiency in designing, planning, implementing, and managing the instructional process in a safe and nurturing environment; and using a variety of methods, assessment techniques, and resources.
- 36 credits of core content to provide students with computer science fundamentals, programming skills, networking, physical computing, and recent topics in computer science.

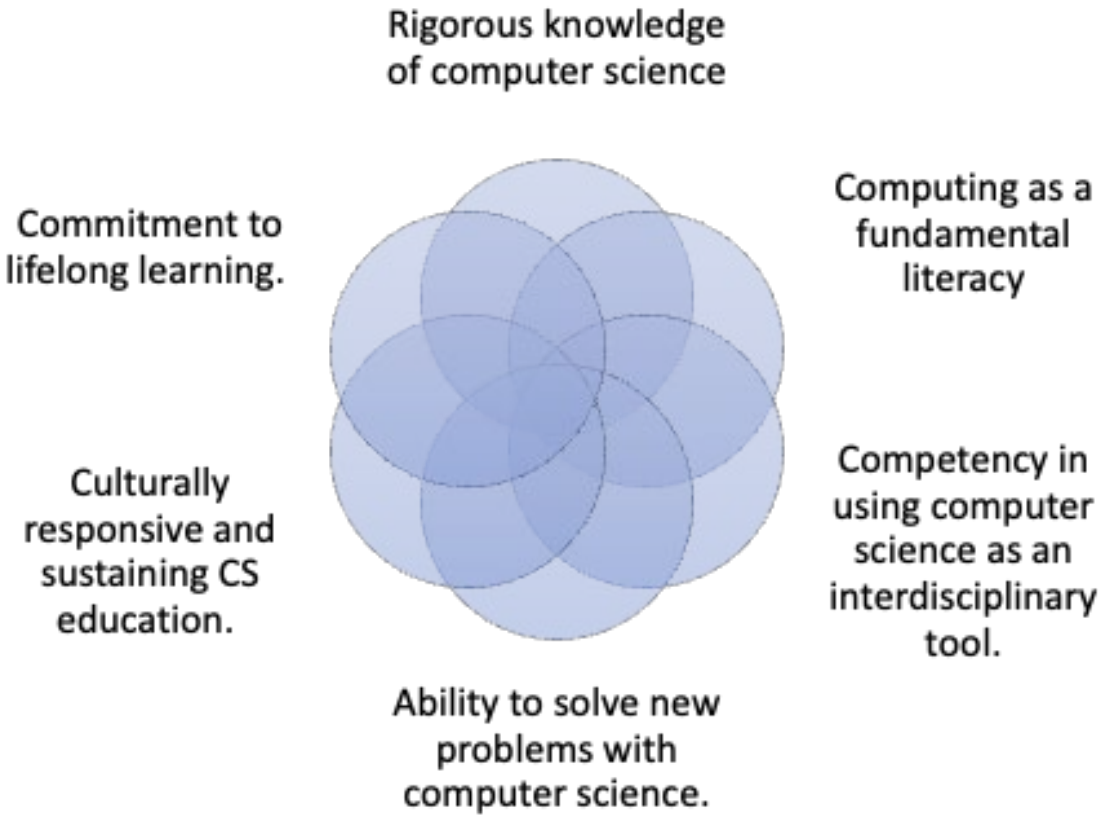
We will incorporate existing courses from our current education programs to ensure that the curriculum meets all state-required standards. We will also require courses from our Computer System Technology (CST) department. Furthermore, we will introduce six new computer science courses specific to the program.

Students must receive a grade of "B" or better in each course taken with an EDU prefix and "C" or better in each the prefix CST course. Any student earning a grade lower than "B" in an EDU course may not progress in the program without repeating the course and earning a minimum grade of "B or better".

2. Anticipated Learning Outcomes

The main objective of Computer Science Teacher Education is not limited to just preparing prospective teachers with programming skills or guiding students towards computing-related career paths. Instead, the goal is to instill the core concepts related to computational thinking, digital literacy, cybersecurity, and to develop the skills necessary to teach computer science in the K-12 classroom in a pedagogically meaningful manner. Furthermore, computer science teachers must be prepared to continuously learn and stay up-to-date with the rapidly evolving field they are teaching. Upon graduation from the computer science education program, every

student will be proficient in general knowledge, computer science competency, instructional competency, technological competency, caring dispositions, sensitivity to diversity, and reflective practice.



The expected learning outcomes of City Tech's computer science teacher education program include:

1) **Rigorous knowledge of computer science**

Our program completers will learn the necessary knowledge, skills, values and experience to teach CS. Our program will collaborate with the Department of Computer System Technology (CST) to offer students an array of courses that prepare them with expertise in the basic principles and applied skills of computer science – an understanding of programming languages, data structure, computer systems, networking, algorithms, and computational thinking.
CS teaching competency in K-12 schools. With a deep understanding of New York State's Computer Science and Digital Fluency Learning Standards (2020), our program completers will successfully deliver CS concepts and principles to K-12 students. Teaching computer science to college students and teaching computer science in K-12 differs greatly in content, instructional approach, and goals. The educational infrastructure of our CTTE Department will equip

preservice teachers with the instructional skills needed to effectively teach computer science to elementary, middle, and high school students.

2) **Computing as a fundamental literacy**

Our program completers will have the competency to teach students to properly use, understand, evaluate, and manage computing in problem-solving in all fields as a literacy. A basic understanding of computing and computational thinking must be a foundational part of all students' education to prepare them to contribute to solutions of future challenges.

3) **Competency in using computer science as an interdisciplinary tool.**

The field of computer science has been integrated into a range of other disciplines, including science, mathematics, social studies, technology and others, rather than just evolving as a stand-alone subject. The ability to integrate computing and computational thinking into these academic domains will enable our program completers to leverage computing and digital literacies in their learning, teaching, and professional lives.

4) **Ability to solve new problems with computer science.**

While newer ideas around CS, like data science, artificial intelligence (AI), machine learning, deep learning are at different levels of adoption, each will change what it means to apply computing to our daily lives. Our program completers will have pedagogical skills to instruct project-based, engineering design and design thinking to provide students with ways to use computing to solve new problems. Our program completers will have the ability to effectively teach young students how to solve problems based on their understanding of these methodologies.

5) **Culturally responsive and sustaining CS education.**

Culturally responsive-sustaining computer science pedagogy ensures that students' interests, identities, and cultures are embraced and validated. Our program completers will have knowledge of computing content and its utility in the world while engaging in larger socio-political critiques about technology's purpose, potential, and impact. Our program will adopt the culturally responsive-sustaining CS education framework presented by Kapor Center (2021) to ensure that our program completers can create inclusive and equitable classroom cultures

6) **Commitment to lifelong learning.**

Computing technology is rapidly evolving and will continue to do so. Our program completers will be prepared to engage in communities of practice and will take a proactive role in their own professional development. They will model life-long learning for their students and have the skills necessary to seek and integrate evolving content and pedagogies into their CS teaching practice.

3. Courses Required to Complete the Program

The proposed curriculum for the Bachelor of Science in Education in Computer Science Teacher Education is detailed below. The curriculum reflects City Tech's General Education requirements:

General Education Common Core	43
Program Specific General Education	19
Pedagogy Core	18
Internship/Student Teaching	10
Content Core	33
Total	123

4. NYCCT's Computer Science Teacher Education B.S.Ed. Course Listing

Our program is a bachelor's degree program and consists of general education and program major subjects. The general education consists of General Education Core and Program Specific-General Education Core. Both cores meet the CUNY's bachelor's degree requirements.

1) General Education Requirement Common Core Courses

The general education course consists of 62 credits and is divided into the General Education Core, Flexible Core, College Option, and Program-Specific General Education Core. The General Education Core is aligned with CUNY's bachelor's degree program requirements.

Course No	Course Title	Credits	Notes
General Education Core (13 crs):			
ENG 1101/ENG 101 CO	English Comp 1	3	
ENG 1121	English Comp 2	3	
MAT 1275/MAT 1275CO	College Algebra and Trigonometry or higher	4	
Any	Life & Physical Science (LPS)	3	
Flexible Core (18 crs):			
Any	World Culture and Global Issues (WCGI)	3	
Any	US Experience and Diversity (USED)	3	
Any	Creative Expression (CE)	3	
PSY 1101	Individual and Society (IS)	3	
Any	Scientific World (SW)	3	
SOC 1101	Additional Flexible Common Core	3	
College Option (12 crs):			
COM 1330 or higher	Speech/Oral Communication	3	
Any	Interdisciplinary Course	3	
ANY ARB, ASL, CHN, FREN, SPA	Elementary Language I	3	
	Liberal Arts Elective	3	
Sub-Total		**43**	
Program Specific-General Education Required:			
PSY 2510/EDU 2610	Child & Adolescent Development	3	
CST 1100	Introduction to Computer Systems	3	
MAT 1375	Pre-calculus	4	

SOC 2380	Sociology of Education	3	
LIB 1201	Research and Doc. In the Information Age	3	
MAT 2440	Discrete Structures and Algorithms I (LibArt, WI)	3	
Sub-Total		**19**	
General Education Total		**62**	

2) Major Core Requirements

The major core of the Bachelor of Science in Education in Computer Science Teacher Education program consists of a pedagogical core, a clinical core, and a content core. The pedagogy core is to acquire the basic knowledge, professionalism, and skills that computer science teachers must have. It is operated in the same curriculum as of the Technology Teacher Education and Career and Technical Education of the CTTE Department. The clinical core consists of internships, professional development seminars, and supervised student teaching. The clinical core meets the teaching certificate requirements set by the New York State Department of Education. Lastly, the content core delivers core knowledge and skills of computer science. It consists of 4 courses from the CST department, 3 computer-related courses from the CTTE's Technology Teacher Education, and 4 newly developed courses.

Pedagogy Core:			
EDU 2362	Methods of Teaching in Career and Technology Education I	3	
EDU 2455	Methods and Materials for Special Needs	3	WI
EDU 3430	Foundations and Curriculum Development for Computer Science	3	New
EDU 3630	Assessing Student Learning Outcomes	3	
EDU 3640	Computers in Education	3	

EDU 3670	Methods of Literacy Instruction	3	WI
Sub-Total		**18**	
Internship/Student Teaching			
EDU 3682	Internship in Teacher Education	1	Course title change
EDU 4601	Professional Development Seminar	3	
EDU 4872	Supervised Student Teaching in Career and Technology Teacher Education	6	
Sub-Total		**10**	
Content Core			
CST 1101	Problem Solving with Computer Programming	3	Python based
CST 1201	Programming Fundamental	3	Java based
CST 2307	Networking Fundamentals	3	
EDU 2430[1]	Programming for Educators	3	TE course, New, course proposal submitted to CCCC
EDU 2461[1]	Communication Information Systems	3	Technology Education (TE) course, Modification proposal submitted to CCCC
EDU 3100	Data Structures for Educators	3	New

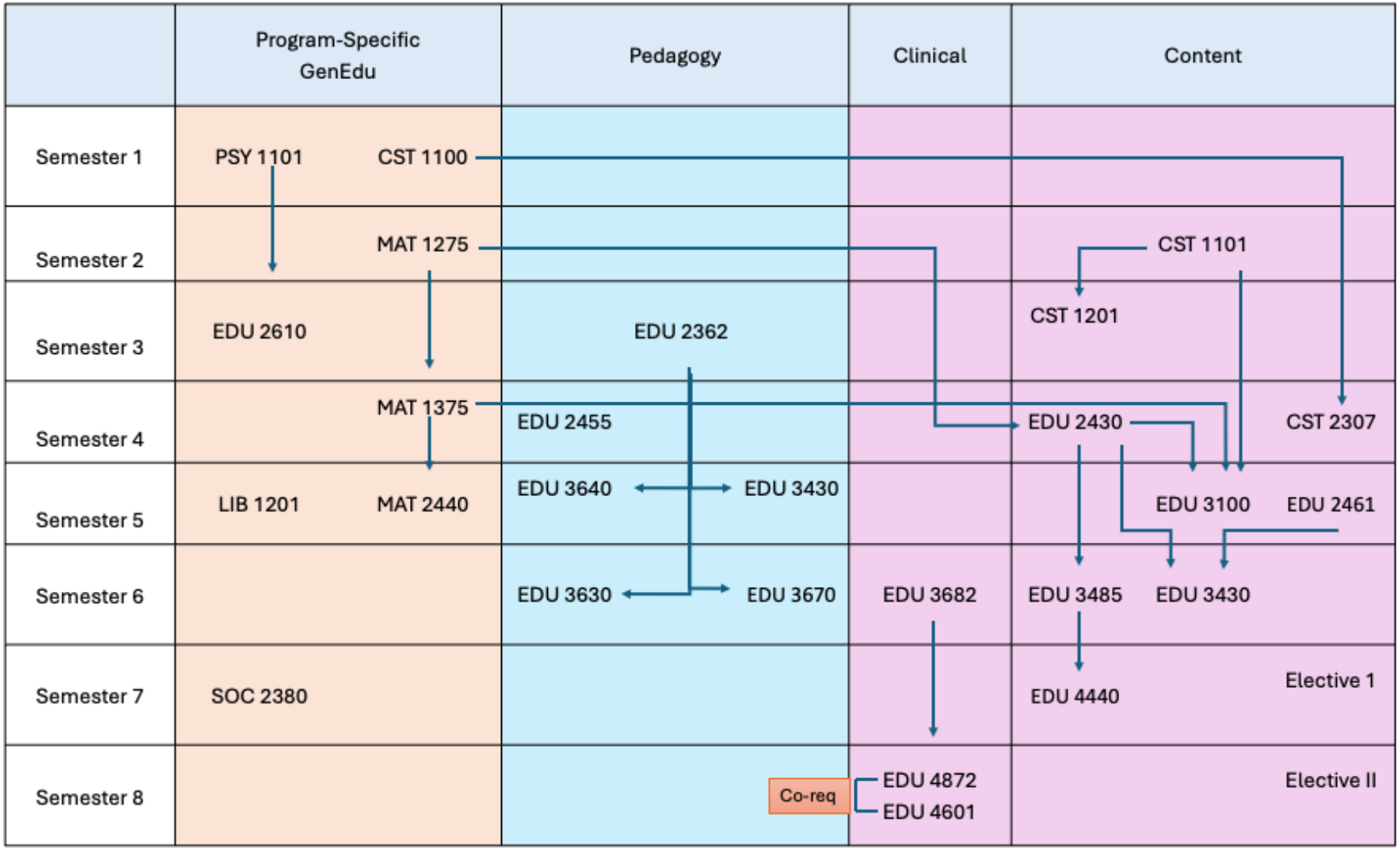
EDU 3430[1]	Computer System Applications	3	TE course, New course proposal submitted to CCCC
EDU 3485	Physical Computing	3	New
EDU 4440	Electronics and Robotics	3	TE course, Existing
Program Elective	Choose two courses from: CST 1204 Database Systems Fundamentals CST 2309 Web Programming CST 2402 Introduction to Data Science CST 2410 Introduction to Security CST 3513 Object Oriented Programming	6	
Sub-Total		**33**	
BS major core total		**61**	
Program Total		**123**	

[1] EDU 2430, EDU 2461, and EDU 3430: new course/modification proposals were submitted to CCCC (# NO000000)

5. Example of a Four-Year Course Sequence

Bachelor of Science in Computer Science Teacher Education Curriculum Map					
	General Education Core	Program-Specific GenEdu Core	Pedagogy	Content Core	Clinical Core
Semester 1	ENG 1101 MAT 1275 SOC 1101 WCGI	CST 1100 PSY 1101			
Semester 2	ENG 1121	MAT 1275		CST 1101	
Semester 3	LPS	EDU 2610	EDU 2362	CST 1201	
Semester 4	SW	MAT 1375	EDU 2455	EDU 2430 CST 2307	
Semester 5	CE Elementary Language I LIB 1201	MAT 2440	EDU 3430 EDU 3640	EDU 3100 EDU 2461	
Semester 6	USED		EDU 3630 EDU 3670	EDU 3430 EDU 3485	EDU 3682
Semester 7	COM 1330	SOC 2380		EDU 4440 Elective 1	
Semester 8	Advanced Liberal Arts ID Core			Elective II	EDU 4872 EDU 4601

BSEd in Computer Science Teacher Course Sequence



6. List of Courses and their Prerequisites for Major Courses

The table below lists the prerequisites for all major courses. The prerequisite for CST 2307 will be waived for Bachelor of Science in Education in Computer Science Teacher Education students upon the CST chair's approval.

Course	Cr.	Name	Prerequisite
Program Specific General Education Core (19 crs)			
PSY 2510/EDU 2610	3	Child & Adolescent Development	Prereq: PSY 1101
CST 1100	3	Introduction to Computer Systems	CUNY certification in mathematics, reading and writing
MAT 1375	4	Pre-calculus	MAT 1275
SOC 2380	3	Sociology of Education	Any 1000-level SOC course or PSY 1101
LIB 1201	3	Research and Doc. In the Information Age	ENG 1101
MAT 2440	3	Discrete Structures and Algorithms I (LibArt, WI)	MAT 1375 or higher and one of the following: CST 1201 or CST 2403 or MAT 1630
Pedagogy Core (18 crs)			
EDU 2362	3	Methods of Teaching	
EDU 2455	3	Methods and Materials for Special Needs	WI
EDU 3430	3	Foundations and Curriculum Development for Computer Science	EDU 2362
EDU 3630	3	Assessing Student Learning Outcomes	EDU 2362
EDU 3640	3	Computers in Education	EDU 2362

EDU 3670	3	Meth. Of Literacy Instruction	ENG 1121 & EDU 2362
Clinical Core (10 crs)			
EDU 3682	1	Internship in CTTE	EDU 2362, EDU 3430
EDU 4602	3	Teacher Preparation Development Seminar	EDU 3682
EDU 4872	6	Supervised Student Teaching	Corequisite EDU 4601
Content Core (33 crs)			
CST 1101	3	Problem Solving with Computer Programming	CUNY Proficiency
CST 1201	3	Programming Fundamental	CST 1101
CST 2307	3	Networking Fundamentals	CST 1215*
EDU 2430	3	Programming for Educators	MAT 1275 or higher
EDU 2461	3	Communication Technology and Information Systems	EDU 1400 or CST 1100
EDU 3100	3	Data Structures for Educators	CST 1101, EDU 2430, MAT 1375
EDU 3430	3	Computer System Applications	EDU 2430, EDU 2461
EDU 3485	3	Physical Computing	EDU 2430
EDU 4440	3	Electronics and Robotics	EDU 3485
Program Elective	6	Choose two courses from: CST 1204 Database Systems Fundamentals CST 2309 Web Programming CST 2402 Introduction to Data Science CST 2410 Introduction to Security CST 3513 Object Oriented Programming	

*Prerequisite CST 1215 for CST 2307 will be waived for BSEd in CS Teacher Education students.

7. Progression Requirements for BSEd Computer Science Teacher Education Students

To successfully complete the BS in Education in Computer Science Teacher Education, Students must receive a grade of "B" or better in each course taken with an EDU prefix. Any student earning a grade lower than "B" in an EDU course may not progress in the program without repeating the course and earning a minimum grade of "B or better". A minimum grade point average of 2.7 is required both for progression within the Computer Science Teacher Education curriculum and for enrollment. in student internship and student teaching. Students who fall below a 2.7 grade point average are required to arrange a meeting with a faculty advisor to discuss plans to improve their academic standing. Students who withdraw will be considered for readmission on an individual basis and only if they withdraw in good standing (passing all courses at time of withdrawal). Student teaching is required for program completion and a college recommendation for New York State certification. Student teaching applications must be submitted to the teacher education faculty during the prior semester. A minimum grade point average of 2.7 is required for graduation. The proposed curriculum requires successful completion of a total of 123 credits distributed as follows: 62 credits of general education (arts and sciences core) and 61 credits from major courses.

8. Catalog Description of the Four New Courses

1) EDU 3430: Foundations and Curriculum Development for Computer Science

The development of K-12 computer science curriculum based on its foundation. Analysis of the computer science education standards, instructional resources facilities, management, maintenance, safety and daily routines. Emphasis on New York State Computer Science and Digital Fluency Standards and recent topics in K-12 computer science.
Prerequisites: EDU 2362

2) EDU 3100: Data Structures for Educators

Fundamental understanding of data structures and algorithms. Students will learn different methods of data structure expression and develop problem-solving skills by applying them. The course will cover various data structures through theoretical analysis, implementation, application, and reflection. Topics will include lists, stacks, queues, heaps, dictionaries, maps, hashing, and trees.
Prerequisites: CST 1101, EDU 2430, MAT 1375

3) EDU 3485: Physical Computing

Fundamental concepts and skills of physical computing. Students will learn various physical computing systems through hands-on, real-world problem-solving. Physical computing comprises various smart devices, sensors, microcontrollers, electronic circuits, and programming. Emphasis on hands-on program solving, use of microcontrollers, and object-oriented programming.
Prerequisites: EDU 2430

4) EDU 4490: Capstone Design in Computer Science

This course is a laboratory-based capstone course designed to enable the student teacher to teach K-12 computer science using project/problem-based learning approach. Focus is on the application of computing pedagogy into real-world problem-solving using knowledge and skills in computer science. This capstone course includes the recent trends and topics in computer science.
Prerequisite: EDU 2430, EDU 3485

9. Mapping Anticipated Learning Outcomes to the Major Courses

	Obj1	Obj2	Obj3	Obj4	Obj5	Obj6
EDU 2610					X	X
CST 1100	X	X				
EDU 2362					X	
EDU 2455					X	X
EDU 3430	X		X			
EDU 3630					X	X
EDU 3640					X	
EDU 3670		X				X
EDU 3682	X		X		X	
EDU 4601					X	X
EDU 4872	X		X		X	
CST 1101	X	X		X		
CST 1201	X	X				
CST 2307	X		X	X		
EDU 2430	X			X		
EDU 2461		X		X		
EDU 3100	X		X	X		
EDU 3430	X	X		X		
EDU 3485			X	X		
EDU 4440	X	X	X	X		
Electives	X	X	X	X		

Note: Obj 1- Rigorous knowledge of computer science; Obj 2- Computing as a fundamental literacy; Obj 3- Competency in using computer science as an interdisciplinary tool; Obj 4- Ability to solve new problems with computer science; Obj 5- Culturally responsive and sustaining CS education; Obj 6- Commitment to lifelong learning.

10. Mapping K-12 Computer Science Education Standards to the Major Content Courses

	IC	CT	NSD	CY	DL
CST 1100			X		X
CST 1101		X			
CST 1201		X			
CST 2307			X	X	
EDU 2430		X			
EDU 2461	X		X	X	
EDU 3430			X		
EDU 3100		X			
EDU 3485		X	X		
EDU 4440		X	X		X

NOTE: IC-Impacts of Computing; CT-Computational; NSD-Networks and Systems Design; CY-Cybersecurity; DL-Digital Literacy from New York State Computer Science and Digital Fluency Standards (2020)

V. Cost Assessment

The Career and Technology Teacher Education (CTTE) Department at City Tech has the necessary resources to offer a Bachelor of Science in Computer Science Education program. The lab classroom located in Pearl 509 is equipped with 18 desktop computers, a faculty podium computer, two lab computers, 5 3D printers, and a laser engraver, which are sufficient to run programming and physical computing courses. Furthermore, CTTE maintains a fabrication lab classroom in Pearl 508, which is equipped with a variety of hands-on tools, including a bandsaw, a table saw, a miter saw, and an electronic soldering station.

The students pursuing a Bachelor of Science in Computer Science Education will have access to the education resources provided by the CTTE department. Currently, the CTTE department offers two teacher education programs – Technology Teacher and Career and Technical Teacher Education. The department will provide pedagogy and clinical courses for these programs and partner with multiple CTE high schools in New York City to offer internships and student teaching through their clinical coordination program. Students will obtain the NYC Finger Printing through the EDU 3682 Internship course and complete state mandatory workshop through the EDU 4601 Professional Development Seminar courses. The program completers will receive a K-12 Computer Science teaching certificate under the guidance of the CTTE Department's certification officer.

VI. Faculty

The Career and Technology Teacher Education (CTTE) department currently has three full-time faculty members and is in the process of recruiting a fourth faculty member as of December 27, 2023. All the faculty members have the necessary qualifications to teach the coursework related to the proposed Bachelor of Science in Computer Science Teacher Education degree programs. The students enrolled in the program will take the required CST courses from the Computer System Technology department. The CTTE's faculty members have academic backgrounds in technology education, computer science education, electrical engineering, and mathematics education and are actively involved in STEM education and computing-integrated teacher education research. Please find below the list of faculty members currently working in the CTTE department.

Euisuk Sung
Education: Ph.D. in Engineering and Technology Education, Purdue University. M.S. in Vocational Education. B.S. in Computer Science Education.

Raaghav Pandya
Education: Ph.D. in STEM Education, Columbia University. M.S. in STEM Teacher Education. B.S. in Physics and Philosophy.

Hon Jie Teo
Education: Ph.D. in Engineering Education, Virginia Tech. M.S. and B.Eng. in Electrical Engineering from the University of Minnesota.

Alfred S. Posamentier
Education: Ph.D. in Mathematics Education from Fordam Univeristy. M.S. in Mathematics Education from The City College of the City University of New York. A.B. in Mathematics from Hunter College of the City University of New York.

Appendix A: Course Descriptions For Existing Required Courses

EDU 2610 or PSY 2501
Child and Adolescent Development
3 cl hrs, 3 cr
Exploration of childhood and adolescent development. Analyses of developmental theories and principles in the areas of perception, cognition, language, personality, social relations, moral behavior and developmental disorders. Emphasis is placed on application of findings in educational settings.
Prerequisite: PSY 1101

MAT 1375
Precalculus
Pathways: Math and Quantitative Reasoning, Scientific World
4 cl hrs, 4 cr
Topics include an in-depth study of functions such as polynomial functions, inverse functions, radical functions, rational functions, trigonometric functions, exponential and logarithmic functions; solving inequalities; elements of vectors and complex numbers; solving trigonometric equations and identities involving sum, double and half-angle formulas; Binomial Theorem; and progressions. A graphing calculator is required.
Prerequisite: MAT 1275 or for new students, scores of at least 80 on the ACCUPLACER College Algebra Test

SOC 2380
Sociology of Education
3 cl hrs, 3 cr
Examines the social influences on education and the effects of education and schooling on the social experiences and identities of individuals and groups in contemporary society. Focus is on the history, philosophy and the role of education as well as the responsibilities of teachers, school administrators and other professional staff, students, parents, and community members with regard to education. Emphasizes the importance of productive relationships and interactions among the school, home, and community.
Prerequisite: Any 1000-level SOC course or PSY 1101

LIB 1201
Research & Documentation for the Information Age
3 cl hrs, 3 cr
In this course we will explore issues in research and documentation for text (in print and online), images, sound, and multimedia. You will investigate where information comes from and how it is organized in both traditional and emerging media. We will examine the ethics of information use and determine how to critically evaluate sources. Throughout the course, you will create and present research and documentation projects using traditional and emerging media and technologies.
Prerequisite: ENG 1101

MAT 2440
Discrete Structures and Algorithms I
Pathways: Scientific World, Writing Intensive
2 cl hrs, 2 lab hrs, 3 cr
This course introduces the foundations of discrete mathematics as they apply to computer science, focusing on providing a solid theoretical foundation for further work. Topics include functions, relations, sets, simple proof techniques, Boolean algebra, propositional logic, elementary number theory, writing, analyzing and testing algorithms.
Prerequisites: (MAT 1375 or higher) and (CST 1201 or CST 2403 or MAT 1630)

EDU 2362
Methods of Teaching in Career and Technology Education I
3 cl hrs, 3 cr
Designing, planning, implementing, and managing the instructional process and engaging students in meaningful learning. Emphasis is on selecting and using a variety of appropriate teaching methods, assessment techniques, and resources, including technology, to meet the needs of all learners.
Prerequisite: None (open to CTTE majors only)

EDU 2455
Methods and Materials for Special Needs Students
Writing Intensive
3 cl hrs, 3 cr
A review of current methods and materials in working with special needs students. Content includes developmental psychology pertaining to the student population and preparation of individual education plans.
Prerequisite: None (open to education majors only)

EDU 3630
Assessing Student Learning Outcomes
3 cl hrs, 3 cr
A study of traditional and alternative assessment techniques. Provides hands-on experiences on development and administration of assessment instruments and interpretation of assessment data. Using assessment and analysis results to improve instruction.
Prerequisite: EDU 2362

EDU 3640
Computers in Education
2 cl hrs, 3 lab hrs
A hands-on computing literacy course on how microcomputers can improve teaching and learning environments. Emphasis is placed on the process of planning, designing and implementing pedagogical techniques that best facilitate student learning. Topics include word processing, spreadsheet and database management systems, interactive multimedia software, Internet and World Wide Web.
Prerequisite: EDU 2362

EDU 3682
Internship in Career and Technology Teacher Education 1 *cl hrs, 12 field hrs, 1 cr*
A field-based internship experience designed to provide reinforcement for pre-service teacher candidates. Interns must spend at least 15 hours working with students with disabilities. Students attend scheduled instructional seminars very early in the semester and are observed at a school site on at least three occasions by a college supervisor. A mentor teacher provides on-going support and guidance between observations. Emphasis is placed on developing valid lesson objectives, effective questioning techniques, and the fundamentals of lesson planning and delivery. Monthly logs, reflective essays, participation in seminars, a comprehensive assignment based on field experiences are required. *Prerequisites: EDU 2520, EDU 2362, and department approval one semester in advance*

EDU 3670
Methods of Literacy Instruction in Teacher Education
Writing Intensive
3 cl hrs, 0 lab hrs, 3 cr
This course prepares teacher candidates for literacy instruction in career and technology and mathematics content areas. Emphasis is on designing and adapting content materials and assessments to help students develop literacy skills and learning strategies.
Prerequisites: ENG 1121, EDU 2362 or MEDU 1021, EDU 2610

EDU 4602
Teacher Preparation Development Seminar
3 cl hrs, 3 cr
A series of seminars that accompany the student teaching experience and TPA. Seminar topics focus on both the student teaching experience and a broad range of educational issues which form the basis for student reports and reflective essays. Students complete their teacher performance assessment and develop a professional teaching portfolio in order to demonstrate their learning. This course also covers special topics and workshops mandated by New York State Law and the Regents Standards including Dignity for All Student Act, Child Abuse, and School Violence Intervention and Prevention for Preparing Classroom Teachers.
Prerequisites: EDU 3682, EDU 2362; Corequisite: EDU 4872

EDU 4872
Supervised/Student Teaching in Career and Technology Education
30 field hrs/wk, 3 cr
A field-based supervised/student teaching experience mandated in the Regents standards for preparing classroom teachers. This professional experience is designed to improve and reinforce individual strategies developed during previous field experiences. Emphasis is on instructional planning, implementation, and assessment. Must be accompanied by the professional development seminar, EDU 4601. Requires a minimum of 450 hours of supervised classroom experiences (or 30 hours per week). Prior approval of departmental faculty must be obtained one semester in advance.

Prerequisites: EDU 2362, EDU 2610/ PSY 2501, EDU 3640, EDU 3682 and (EDU 2455 or EDU 3650); Corequisite: EDU 4601

CST 1100
Introduction to Computer Systems
Writing Intensive
2 cl hrs, 2 lab hrs, 3 cr
An overview of machine architecture, software development, software engineering, data organization, ethics, computer security and the theory of computing. The course will cover algorithms – the introduction to computer programming –and historical and evolutionary developments of computers. Individual lab assignments and team projects will require Microsoft Office applications to create Word documents, charts (Excel), presentations (PowerPoint) and manipulation of databases (Access). *Pre- or corequisite: CUNY proficiency in reading, writing and mathematics or, if the course is taken as part of a Learning Community, CUNY proficiency in mathematics and reading; Corequisite: ENG 092W*

CST 1101
Problem Solving with Computer Programming
2 cl hrs, 2 lab hrs, 3 cr
Introduces concepts of problem solving using constructs of logic inherent in computer programming languages. Augmented by high level computer tools, enabling solutions to common algorithmic problems. Use of flowcharts to diagram problem solutions. Object oriented packages, flowcharting tools and viewing generated software code. *Prerequisite: CUNY proficiency in mathematics, reading and writing*

CST 1201 - Programming Fundamentals
2 cl hrs, 2 lab hrs
Introduction to computer programming using the Java language. Fundamentals of Java programming language including control structures and user-defined methods. Concepts of object-oriented programming. Create simple Graphic User Interfaces and web applications. Some Java libraries will be introduced in developing application projects.
Prerequisites: CST 1101 (and CST 1100 for CST students) with a grade of C or higher

CST 2307
Networking Fundamentals
2 cl hrs, 2 lab hrs, 3 cr
Introduces fundamental computer networking concepts and skills. Provides instruction in networking media, physical and logical topologies, and common networking standards and protocols. Conceptual framework of the OSI model, and its implementation with the TCP/IP and other network protocols. Both networking design and analysis methods. Provides knowledge necessary to design, install, configure and support network infrastructure effectively. Networking administration skills are developed for different operating systems.
Prerequisite: CST 1215

EDU 2430
Programming for Educators
2 cl hrs, 2 lab hrs, 3 cr
Foundations of computer programming for K-12 educators using high-level programing languages. This course introduces essential computer programming concepts including syntax,

data types, data structures, functions, arrays, conditional statements, and iterations. Students develop computational thinking through decomposition, generalization, abstraction, pattern recognition, algorithm design, and debugging.
Prerequisite: MAT 1275 or higher

EDU 2461
Communication Technology and Information Systems
2 cl hrs, 3 lab hrs, 3 cr
Development of foundational understandings of information and communication. Explore the components of data, information, and knowledge and their effective transmission modes. The topics include computers and related devices, graphic media, electronic communication, and entertainment technologies. Students develop an understanding of up-to-date communication technologies, including computer networks, the Internet, cybersecurity, the impacts of communication, and artificial intelligence.
Prerequisite: EDU 1400 or CST 1100

EDU 3430
Computer System Applications
2 cl hrs, 2 lab hrs, 3 cr
Develop problem-solving skills utilizing computer systems. Students develop a fundamental understanding of computer systems for teaching computer technology with an emphasis on secondary education. Topics include computer hardware, operating systems, memory structures, peripheral devices, software, and the impact of computing.
Prerequisite: EDU 2430 or EDU 2461

Appendix B: New Courses

1. EDU 3100 Data Structures for Educators

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the Curriculum Modification Proposal Form and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

Course Title	Data Structures for Educators
Proposal Date	1/5/2024
Proposer's Name	Euisuk Sung
Course Number	EDU 3100
Course Credits, Hours	3 cr, 2 cl hrs, 2 lab hrs
Course Pre / Co-Requisites	Prerequisite CST 1101, EDU 2430, MAT 1375
Catalog Course Description	Fundamental understanding of data structures and algorithms. Students will learn different methods of data structure expression and develop problem-solving skills by applying them. The course will cover various data structures through theoretical analysis, implementation, application, and reflection. Topics will include lists, stacks, queues, heaps, dictionaries, maps, hashing, trees, and balanced trees.
Brief Rationale Provide a concise summary of why this course is important to the department, school or college.	Data structures and algorithms are one of the most important subjects taught in computer science in K-12. Through this course, students develop computational thinking in K-12 based on an understanding of college-level data structures. Particularly, this course is aligned with the New York K-12 Computer Science and Digital Fluency Standards (2020): 9-12.CT.6- Demonstrate how at least two classic algorithms work and analyze the trade-offs related to two or more algorithms for completing the same task. 9-12.CT.7-Design or remix a program that utilizes a data structure to maintain changes to related pieces of data This course focuses on developing the skills that K-12 computer science teachers must know including the ability to design data structures, the ability to analyze algorithms, and the ability to apply data structures and algorithms to problem solving. Additionally, this course covers the content required by CollegeBoard K-12 AP Computer Science A. (CollegeBoard AP Computer Science).
CUNY – Course Equivalencies	None

Provide information about equivalent courses within CUNY, if any.	
Intent to Submit as Common Core If this course is intended to fulfill one of the requirements in the common core, then indicate which area.	None
For Interdisciplinary Courses: - Date submitted to ID Committee for review - Date ID recommendation received - Will all sections be offered as ID? Y/N	N/A
Intent to Submit as a Writing Intensive Course	N/A

NEW COURSE PROPOSAL CHECK LIST

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

Completed NEW COURSE PROPOSAL FORM	
• Title, Number, Credits, Hours, Catalog course description	Y
• Brief Rationale	Y
• CUNY – Course Equivalencies	Y
Completed Library Resources and Information Literacy Form	
Course Outline Include within the outline the following.	
Hours and Credits for Lecture and Labs If hours exceed mandated Carnegie Hours, then rationale for this	Y
Prerequisites/Co- requisites	Y
Detailed Course Description	Y
Course Specific Learning Outcome and Assessment Tables • Discipline Specific • General Education Specific Learning Outcome and Assessment Tables	Y
Example Weekly Course outline	Y
Grade Policy and Procedure	Y
Recommended Instructional Materials (Textbooks, lab supplies, etc)	Y
Library resources and bibliography	Y
Course Need Assessment. Describe the need for this course. Include in your statement the following information.	
Target Students who will take this course. Which programs or departments, and how many anticipated? Documentation of student views (if applicable, e.g. non-required elective).	
Projected headcounts (fall/spring and day/evening) for each new or modified course.	
If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction.	
Where does this course overlap with other courses, both within and outside of the department?	
Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this?	
If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need.	

Course Design Describe how this course is designed.	
Course Context (e.g. required, elective, capstone)	Y
Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)?	Y
Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture)	Y
How does this course support Programmatic Learning Outcomes?	Y
Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program.	N
Additional Forms for Specific Course Categories	
Interdisciplinary Form (if applicable)	
Interdisciplinary Committee Recommendation (if applicable and if received)* *Recommendation must be received before consideration by full Curriculum Committee	
Common Core (Liberal Arts) Intent to Submit (if applicable)	
Writing Intensive Form if course is intended to be a WIC (under development)	
If course originated as an experimental course, then results of evaluation plan as developed with director of assessment.	
(Additional materials for Curricular Experiments)	
Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information).	
Established Timeline for Curricular Experiment	

New York City College of Technology
Department of Career and Technology Teacher Education

Course Number: **EDU-3100**	Title: Data Structures for Educators
Credit Hours: 3 (2cl, 2 lab hrs)	Class Meeting Times:
Instructor:	Classroom:
Email:	Office:
Office Phone:	Office Hours:

Course Description

Fundamental understanding of data structures and algorithms. Students will learn different methods of data structure expression and develop problem-solving skills by applying them. The course will cover various data structures through theoretical analysis, implementation, application, and reflection. Topics will include lists, stacks, queues, heaps, dictionaries, maps, hashing, and trees.
Prerequisites: CST 1101, EDU 2430, MAT 1375

Learning Outcomes

After successful completion of this course, you will be able to:

1. Understand elementary data structures and the importance of algorithms in computer science.
2. Choose the appropriate data structure as applied to specific computer programs.
3. Analyze and compare the trade-off of data structures and algorithms for efficiency.
4. Implement and use linear data structures, including lists, stacks, and queues.
5. Implement and use search structures and algorithms, including binary search, search trees, and hash tables.
6. Understand and implement various sorting algorithms and analyze their performance.
7. Write recursive functions and understand when recursion is appropriate to a problem.
8. Develop instructional skills for teaching data structures and algorithms in AP Computer Science courses.

Course Materials

Michael Goodrich, Roberto Tamassia, Michael H. Goldwasser. (2014). Data Structures and Algorithms in Java, 6th edition.Wiley. ISBN: 9781118771334

Technology Requirements

The PowerPoint lecture presentations, coding assignments, quizzes, and rubrics are located on the Brightspace site for the course. To participate in learning activities and complete assignments, you will need:

- Access to a working computer that has a current operating system with updates installed.
- Microsoft Word or Google Docs as your word processing program; and
- Reliable data storage for your work, such as a USB drive or Office365 OneDrive cloud storage.

Attendance/Participation

- You will earn 0-10 points per class within the following guidelines. This policy begins in the first class.
- 10 points are awarded to students who are on time, stay on task, contribute to the overall class discussions, and complete all required activities during each class.
- 9-1 points are awarded for students who arrive late, do not stay on topic, and come to class unprepared to engage in class discussions.
- 0 points were awarded for absence from class.
- Students are allowed **no more than two (2) absences**. Absences in excess of this will lower the final grade by one full letter grade.
- All students should attend the class on time. Two late days represent one absence.

Please Note: **The instructor has the right to award any point value between 1-10 following the above guidelines.**

Excused Absence

- An excused absence must be pre-approved by the instructor.
- Medical absences will only be awarded when the student provides a Drs. note based on appropriate situations.
- Only documented emergencies or unavoidable events will be excused.

Course Assignments and Grading

Assignment Weights	Percent
Class participation	10%
Quizzes	20%
Programming assignments	50%
Final Exam	20%
Total	100%

Grading System

100-93: A	92.9-90: A-	89.9-87: B+	86.9-83: B	82.9-80: B-
79.9-77: C+	76.9-73: C	72.9-70: C-	69.9-60: D	Below 60: F

Submission

Programming assignments must be submitted electronically to the assignment submission Brightspace site. Assignments are posted in Brightspace under the Module in which they are assigned. Please do not submit assignments through any other means, for example, email or printed copy unless an explicit exception is provided by the instructor.
Failing to submit three or more assignments by the required due date during the course semester may result in a withdrawal from the course.
Any code submitted for assignment must be executable. Code that contains syntax errors will receive a grade of 0. Any work submitted for assignment must be your own work. Submitting the work of others, including that found on the internet, will be assigned a grade of 0 and reported per CUNY Academic Integrity Policy.

Students With Special Needs
Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Students Support Services (OSSS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from OSSS, which is located in Room A-P508. It is the student's responsibility to initiate contact with the OSSS staff and to follow the established procedures to send the accommodation notice to the instructor.

Course Schedule

Week	Topics	Readings
1	Introduction to Data Structures and Algorithms Classes, Objects, Data Types	Chapter 1 (1-55)
2	Object-Oriented Design	Chapter 2 (59-80)
3	Fundamental Data Structures: Arrays, Linked List	Chapter 3 (103-145)
4	Stacks, Queues, and Deques	Chapter 6 (225-252)
5	Array and positional Lists	Chapter 7 (257-276) Quiz 1
6	Iterators and Java collections framework	Chapter 7 (282-300)
7	Algorithm Analysis	Chapter 4 (149-182)
8	Recursion	Chapter 5 (189-221)
9	Tree structures	Chapter 8 (307-350) Quiz 2
10	Priority Queues	Chapter 9 (359-368)
11	Heaps and Sorting	Chapter 9 (370-395)
12	Maps, Hash Tables	Chapter 10 (401-451)
13	Search Trees	Chapter 11 (459-475)
14	Sorting and Selection	Chapter 12 (531-566)
15	**Final exam**	

Academic Integrity Pledge

I understand the value of personal integrity and ethical behavior in all aspects of my professional and personal life. By committing to honesty and personal responsibility, I earn respect and trust of others. As a student at New York City College of Technology, I recognize that the value of my education is not just being able to say I am a college graduate but also incorporating the skills, deals, and knowledge I have acquired. I thus commit myself to upholding academic integrity as an important aspect of my personal integrity. I understand that academic integrity includes:

1. Fully observing the rules governing exams and assignments regarding resource material, electronic aids, copying, collaborating with others, or engaging in any other behavior that subverts the purpose of the exam or assignment, and the directions of the instructor.
2. Only turning in work that I have done myself, and not using unattributed work done by others. While working and studying with others can be an effective way to learn, submitted work will be my own.
3. Giving full and proper credit to sources and references, and acknowledging the contributions and ideas of others, in my academic work.

I have read and understand the Academic Integrity Policy found in the New York City College of Technology College Catalog

Printed Name _____
Signature _____ _____
Date _____
Course, section _EDU 3100, _____

Modified from the Marquette University Honor Code, PB, RB; AM; 12/23/20

Bibliography

CollegeBoard. (2020). AP Computer Science A: Course and Exam Description. Available from https://apcentral.collegeboard.org/media/pdf/ap-computer-science-a-course-and-exam-description.pdf

New York State Education Department (2020). Computer Science and Digital Fluency Learning Standards. Available from https://www.nysed.gov/curriculum-instruction/computer-science-and-digital-fluency-learning-standards

Learning Outcomes and Assessment Methods

EDU 3100 Data Structures for Educators
Career and Technology Teacher Education (CTTE)

LEARNING OUTCOMES	ASSESSMENT METHODS
1. Understand elementary data structures and the importance of algorithms in computer science.	Evaluation of student knowledge about data structures and algorithms.
2. Choose the appropriate data structure as applied to specific computer programs.	Analysis of computer programming assignments to related data structure.
3. Analyze and compare the trade-off of data structures and algorithms for efficiency.	Analysis of computer programming assignments and efficacy reports.
4. Implement and use linear data structures, including lists, stacks, and queues.	Analysis of computer programing assignments related to linear data structures.
5. Implement and use search structures and algorithms, including binary search, search trees, and hash tables.	Analysis of computer programing assignments related to search structures and algorithms
6. Understand and implement various sorting algorithms and analyze their performance.	Evaluation of knowledge and programming assignments related to sorting algorithms.
7. Write recursive functions and understand when recursion is appropriate to a problem.	Analysis of computer programing assignments using recursion
8. Develop instructional skills for teaching data structures and algorithms in AP Computer Science courses.	Evaluation of final project and lesson developments.

Course Need

Students who would take this course: students in the BSEd in Computer Science Education program.

Department: Career and Technology Teacher Education

Program: Bachelors of Science in Education in Computer Science Teacher Education

The number of section (s) anticipated: one section for the first year

Projected headcount: 16 students

Physical Resources required: Computer lab, 16 computers, an overhead projector.

Course overlap: None

Faculty qualified for teaching this course: Full-time and adjunct faculty members who have a higher education degree in computer science or related domain.

Course Design

Course context: This course will be primarily designed for students in the Computer Science Teacher Bachelor's degree program. Students will learn the algorithms, data structures, and programming skills necessary to teach high school computer science AP courses.

Course structure: This course will be delivered through lectures and projects.

Anticipated Pedagogical Strategies and Instructional Design: This course will be taught through lectures and student-led project learning methods. Lectures will cover algorithms, data structure theory, and programming processes, and each week, students will solve data structure/algorithm assignments using programing. Since data structures involve complex algorithms that are very difficult for students to understand, students will be required to write their own programs. In addition, peer-programming teaching methods will be used to teach students to each other.

Providing Support to Programmatic Learning Outcomes: Data structures are important not only for the ability to understand them, but also for the ability to solve problems using them. Therefore, this course will use the problem/project-based learning method so that students will have opportunities to apply their knowledge into practice. In addition, through repetitive programming practice, assignments will be presented so that the understanding and use of data structures can reach the level of automation.

CHANCELLOR'S REPORT FORM
New Course Proposal: Data Structures for Educators

Department(s)	Career and Technology Teacher Education
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Data Structures
Course Prefix	EDU
Course Number	3100
Course Title	Data Structures for Educators
Catalog Description	Fundamental understanding of data structures and algorithms. Students will learn different methods of data structure expression and develop problem-solving skills by applying them. The course will cover various data structures through theoretical analysis, implementation, application, and reflection. Topics will include lists, stacks, queues, heaps, dictionaries, maps, hashing, and trees.
Prerequisite(s)	CST 1101, EDU 2430, MAT 1375
Corequisite	None
Pre- or corequisite	None
Credits	3
Contact Hours	4 (2 lecture and 2 lab hours)
Liberal Arts	[ ] Yes [X] No
Course Attribute (e.g. Writing Intensive, etc).	None
Course Applicability	[x] Major [ ] Gen Ed Required [ ] Gen Ed – Flexible [ ] – Gen Ed – College Option [ ] English Composition [ ] World Culture [ ] Speech [ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary [ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts [ ] Individual and Society [ ] Scientific World
Effective Term	Fall 2026

2. EDU 3430 Foundations and Curriculum Development for Computer Science

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the Curriculum Modification Proposal Form and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

Course Title	Foundations and Curriculum Development for Computer Science
Proposal Date	1/5/2024
Proposer's Name	Euisuk Sung
Course Number	EDU 3430
Course Credits, Hours	3 cr, 3 cl hrs
Course Pre / Co-Requisites	Prerequisite EDU 2362
Catalog Course Description	The development of K-12 computer science curriculum based on its foundation. Analysis of the computer science education standards, instructional resources facilities, management, maintenance, safety and daily routines. Emphasis on New York State Computer Science and Digital Fluency Standards and recent topics in K-12 computer science.
Brief Rationale Provide a concise summary of why this course is important to the department, school or college.	This course was designed to convey the basic knowledge and skills of physical computing necessary for computer science teachers to teach computer science in elementary, middle, and high schools. Everything made in the world these days is designed and controlled through computers, and this is called physical computing. Students understand how physical computing works by designing the movement of objects using microcontrollers and designing logic using programming. This course is aligned with Impact of Computing and Computational Thinking in the New York State Computer Science and Digital Fluency Standards (2020) computer science standards, and teaches a variety of computing skills that can be used in middle school or high school level Introduction to Computer Science classes.
CUNY – Course Equivalencies Provide information about equivalent courses within CUNY, if any.	None
Intent to Submit as Common Core If this course is intended to fulfill one of the requirements in the common core, then indicate which area.	None
For Interdisciplinary Courses:	N/A

- Date submitted to ID Committee for review - Date ID recommendation received - Will all sections be offered as ID? Y/N	
Intent to Submit as a Writing Intensive Course	N/A

NEW COURSE PROPOSAL CHECK LIST

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

Completed NEW COURSE PROPOSAL FORM	
• Title, Number, Credits, Hours, Catalog course description	Y
• Brief Rationale	Y
• CUNY – Course Equivalencies	Y
Completed Library Resources and Information Literacy Form	
Course Outline Include within the outline the following.	
Hours and Credits for Lecture and Labs If hours exceed mandated Carnegie Hours, then rationale for this	Y
Prerequisites/Co- requisites	Y
Detailed Course Description	Y
Course Specific Learning Outcome and Assessment Tables • Discipline Specific • General Education Specific Learning Outcome and Assessment Tables	Y
Example Weekly Course outline	Y
Grade Policy and Procedure	Y
Recommended Instructional Materials (Textbooks, lab supplies, etc)	Y
Library resources and bibliography	Y
Course Need Assessment. Describe the need for this course. Include in your statement the following information.	
Target Students who will take this course. Which programs or departments, and how many anticipated? Documentation of student views (if applicable, e.g. non-required elective).	
Projected headcounts (fall/spring and day/evening) for each new or modified course.	
If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction.	
Where does this course overlap with other courses, both within and outside of the department?	
Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this?	
If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need.	

Course Design Describe how this course is designed.	
Course Context (e.g. required, elective, capstone)	Y
Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)?	Y
Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture)	Y
How does this course support Programmatic Learning Outcomes?	Y
Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program.	N
Additional Forms for Specific Course Categories	
Interdisciplinary Form (if applicable)	
Interdisciplinary Committee Recommendation (if applicable and if received)* *Recommendation must be received before consideration by full Curriculum Committee	
Common Core (Liberal Arts) Intent to Submit (if applicable)	
Writing Intensive Form if course is intended to be a WIC (under development)	
If course originated as an experimental course, then results of evaluation plan as developed with director of assessment.	
(Additional materials for Curricular Experiments)	
Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information).	
Established Timeline for Curricular Experiment	

New York City College of Technology
Department of Career and Technology Teacher Education

Course Number: **EDU-3430**
Title: Foundations and Curriculum Development for Computer Science

Credit Hours: 3 (2cl, 2 lab hrs)	Class Meeting Times:
Instructor:	Classroom:
Email:	Office:
Office Phone:	Office Hours:

Course Description

The development of K-12 computer science curriculum based on its foundation. Analysis of the computer science education standards, instructional resources facilities, management, maintenance, safety and daily routines. Emphasis on New York State Computer Science and Digital Fluency Standards and recent topics in K-12 computer science.
Prerequisites: EDU 2362

Learning Outcomes

After successful completion of this course, you will be able to:

1. Discuss the philosophical basis and the educational aims and objectives of computer science education.
2. Trace the historical development of computer science education from the era of the Information Communication Technology (ICT) movement to the present.
3. Understand the development of the curriculum models of K-12 computer science education.
4. Analyze and interpret Learning Standards for K-12 Computer Science and Digital Fluency Standards to design relevant curricula.
5. Develop effective instructional strategies based on the understanding of K-12 computer science education.
6. Integrate science, engineering, and mathematics into the computer science education curriculum content.
7. Discuss strategies for computer science education program evaluation.
8. Discuss the recent trends in computer science education.

Course Materials

- Shuchi Grover. (2020). Computer Science in K-12: An A-To-Z Handbook on Teaching Programming. Edfinity. ISBN: 9781734662702
- Tom Liam Lynch, Gerald Ardito, & Pamela Amendola (2020). Integrating Computer Science Across the Core: Strategies for K-12 Districts (1st Edition). Routledge, ISBN: 0367198622,9780367198626
- New York State Education Department (2020). Computer Science and Digital Fluency Learning Standards. Available from https://www.nysed.gov/curriculum-instruction/computer-science-and-digital-fluency-learning-standards

Technology Requirements

The PowerPoint lecture presentations, coding assignments, quizzes, and rubrics for the course are located on the Brightspace site. To participate in learning activities and complete assignments, you will need:

- Access to a working computer that has a current operating system with updates installed.
- Microsoft Word or Google Docs as your word processing program; and
- Reliable data storage for your work, such as a USB drive or Office365 OneDrive cloud storage.

Attendance/Participation

- You will earn 0-10 points per class within the following guidelines. This policy begins in the first class.
- 10 points are awarded to students who are on time, stay on task, contribute to the overall class discussions, and complete all required activities during each class.
- 9-1 points are awarded for students who arrive late, do not stay on topic, and come to class unprepared to engage in class discussions.
- 0 points were awarded for absence from class.
- Students are allowed **no more than two (2) absences**. Absences in excess of this will lower the final grade by one full letter grade.
- All students should attend the class on time. Two late days represent one absence.

Please Note: **The instructor has the right to award any point value between 1-10 following the above guidelines.**

Excused Absence

- An excused absence must be pre-approved by the instructor.
- Medical absences will only be awarded when the student provides a Drs. note based on appropriate situations.
- Only documented emergencies or unavoidable events will be excused.

Course Assignments and Grading

Assignment Weights	Percent
Class participation	10%
Weekly Reflection	20%
Midterm Exam	20%
Final Exam	20%
Final Project	30%
Total	100%

Grading System

100-93: A	92.9-90: A-	89.9-87: B+	86.9-83: B	82.9-80: B-
79.9-77: C+	76.9-73: C	72.9-70: C-	69.9-60: D	Below 60: F

Students With Special Needs

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Students Support Services (OSSS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from OSSS, which is located in Room A-P508. It is the student's responsibility to initiate contact with the OSSS staff and to follow the established procedures to send the accommodation notice to the instructor.

Course Schedule

Week	Topics	Readings
1	Introduction to the class	
2	The Emergence of Computer Science in K-12 Schools	Tom et al (1-25)
3	Abstraction & Algorithm	Tom et al (26-68)
4	Programming, Data, Network	Tom et al (69-106)
5	Data Structure, Event & Coding	Grover (22-47)
6	Exploring Unplugged Activities and Hands-on Approach	Grover (63-82)
	Integrating Programming in School Subject	Grover (83-98)
7	**Mid-term Exam**	
8	Knowledge, Skill, Attitudes & Beliefs	Grover (83-98)
9	Learner-Centered and Culturally Relevant Pedagogy Peer Collaboration and Pair Programming	Grover (125-129, 171-179)
10	Questions and Inquiry, Repetition and Recuision, and Testing and Debugging	Grover (180-218)
11	New York State Computer Science and Digital Fluency Standards: Impacts of Computing, Computational Thinking	
12	New York State Computer Science and Digital Fluency Standards: Networks & System Design, Cybersecurity, and Digital Literacy	
13	Curriculum design Project	
14	Developing Final Project	
15	**Final exam**	

Academic Integrity Pledge

I understand the value of personal integrity and ethical behavior in all aspects of my professional and personal life. By committing to honesty and personal responsibility, I earn respect and trust of others. As a student at New York City College of Technology, I recognize that the value of my education is not just being able to say I am a college graduate but also incorporating the skills, deals, and knowledge I have acquired. I thus commit myself to upholding academic integrity as an important aspect of my personal integrity. I understand that academic integrity includes:

1. Fully observing the rules governing exams and assignments regarding resource material, electronic aids, copying, collaborating with others, or engaging in any other behavior that subverts the purpose of the exam or assignment, and the directions of the instructor.
2. Only turning in work that I have done myself, and not using unattributed work done by others. While working and studying with others can be an effective way to learn, submitted work will be my own.
3. Giving full and proper credit to sources and references, and acknowledging the contributions and ideas of others, in my academic work.

I have read and understand the Academic Integrity Policy found in the New York City College of Technology College Catalog

Printed Name _____
Signature _____ _____
Date _____
Course, section _EDU 3430, _____

Modified from the Marquette University Honor Code, PB, RB; AM; 12/23/20

Bibliography

New York State Education Department (2020). Computer Science and Digital Fluency Learning Standards. Available from https://www.nysed.gov/curriculum-instruction/computer-science-and-digital-fluency-learning-standards

Shuchi Grover. (2020). Computer Science in K-12: An A-To-Z Handbook on Teaching Programming. Edfinity. ISBN: 9781734662702

Tom Liam Lynch, Gerald Ardito, & Pamela Amendola (2020). Integrating Computer Science Across the Core: Strategies for K-12 Districts (1st Edition). Routledge, ISBN: 0367198622,9780367198626

Learning Outcomes and Assessment Methods

EDU 3430 Foundations and Curriculum Development for Computer Science
Career and Technology Teacher Education (CTTE)

LEARNING OUTCOMES	ASSESSMENT METHODS
1. Discuss the philosophical basis and the educational aims and objectives of computer science education.	Evaluation of student knowledge about computer science education.
2. Trace the historical development of computer science education from the era of the Information Communication Technology (ICT) movement to the present.	Evaluation of student knowledge about the development of computer science teacher education.
3. Understand the development of the curriculum models of K-12 computer science education.	Analysis of the final project developing computer science education curriculum.
4. Analyze and interpret Learning Standards for K-12 Computer Science and Digital Fluency Standards to design relevant curricula.	Analysis of writing assignments in K-12 computer science education curriculum development.
5. Develop effective instructional strategies based on the understanding of K-12 computer science education.	Evaluation of mockup teaching and lesson development.
6. Integrate science, engineering, and mathematics into the computer science education curriculum content.	Analysis of the final project developing computer science education curriculum.
7. Discuss strategies for computer science education program evaluation.	Analysis of weekly reflection and evaluation of final project developing computer science education curriculum.
8. Discuss the recent trends in computer science education.	Analysis of classroom discussion regarding the recent trends in computer science education.

Course Need

Students who would take this course: students in the BSEd in Computer Science Education program.

Department: Career and Technology Teacher Education

Program: Bachelors of Science in Education in Computer Science Teacher Education

The number of section (s) anticipated: one section for the first year

Projected headcount: 16 students

Physical Resources required: Computer lab, 16 computers, an overhead projector.

Course overlap: None

Faculty qualified for teaching this course: Full-time and adjunct faculty members who have a higher education degree in computer science or related domain.

Course Design

Course context: This course will be primarily designed for students in the Computer Science Teacher Bachelor's degree program. Students will learn about the foundation of computer science, computational thinking, and computer science learning standards. Students will also learn to develop computer science curriculum aligned with CS and technology education standards.

Course structure: This course will be delivered through lectures and projects.

Anticipated Pedagogical Strategies and Instructional Design: This course will be taught through lectures and student-led project learning methods. Lectures will cover computer science foundation, history, curriculum development, and computational thinking. The course content will be delivered via student-centered learning methodologies including debates, problem-based learning, inquiry, and project-based learning.

Providing Support to Programmatic Learning Outcomes: In this course, students will learn the foundation, rationale, and methodology of K-12 computer science education. This course will learn the overview and components of computational thinking, which is the foundation of K-12 computer science, through project-based learning. Hands-on tools such as micro:bit will be used for this purpose. In addition, for curriculum development, this course will support students to develop a curriculum that fits their local context through project-based learning methods.

CHANCELLOR'S REPORT FORM
New Course Proposal: Data Structures for Educators

Department(s)	Career and Technology Teacher Education
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Curriculum Development
Course Prefix	EDU
Course Number	3430
Course Title	Foundations and Curriculum Development for Computer Science
Catalog Description	The development of K-12 computer science curriculum based on its foundation. Analysis of the computer science education standards, instructional resources facilities, management, maintenance, safety and daily routines. Emphasis on New York State Computer Science and Digital Fluency Standards and recent topics in K-12 computer science.
Prerequisite(s)	EDU 2362
Corequisite	None
Pre- or corequisite	None
Credits	3
Contact Hours	4 (2 lecture and 2 lab hours)
Liberal Arts	[ ] Yes [X] No
Course Attribute (e.g. Writing Intensive, etc).	None
Course Applicability	[x] Major [ ] Gen Ed Required [ ] Gen Ed – Flexible [ ] – Gen Ed – College Option [ ] English Composition [ ] World Culture [ ] Speech [ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary [ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts [ ] Individual and Society [ ] Scientific World
Effective Term	Fall 2026

3. EDU 3485 Physical Computing

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the Curriculum Modification Proposal Form and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

Course Title	Physical Computing
Proposal Date	1/5/2024
Proposer's Name	Euisuk Sung
Course Number	EDU 3485
Course Credits, Hours	3 cr, 2 cl hrs, 2 lab hrs
Course Pre / Co-Requisites	Prerequisite EDU 2430
Catalog Course Description	Introduces the fundamentals of physical computing using a microcontroller. The course covers a broad range of topics including basic electronics, programming, and the design and construction of simple robotic systems with consideration for computer-human interaction design. Students will engage in hands-on activities, building and programming their own microcontroller projects with inputs and outputs to solve real-world problems. Emphasis on creativity, critical thinking, and collaboration as students learn to apply engineering principles.
Brief Rationale Provide a concise summary of why this course is important to the department, school or college.	This course was designed to convey the basic knowledge and skills of physical computing necessary for computer science teachers to teach computer science in elementary, middle, and high schools. Everything made in the world these days is designed and controlled through computers, and this is called physical computing. Students understand how physical computing works by designing the movement of objects using microcontrollers and designing logic using programming. This course is aligned with Impact of Computing and Computational Thinking in the New York State Computer Science and Digital Fluency Standards (2020) computer science standards, and teaches a variety of computing skills that can be used in middle school or high school level Introduction to Computer Science classes.
CUNY – Course Equivalencies Provide information about equivalent courses within CUNY, if any.	None
Intent to Submit as Common Core If this course is intended to fulfill one of the requirements in the common core, then indicate which area.	None

For Interdisciplinary Courses: - Date submitted to ID Committee for review - Date ID recommendation received - Will all sections be offered as ID? Y/N	N/A
Intent to Submit as a Writing Intensive Course	N/A

NEW COURSE PROPOSAL CHECK LIST

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

Completed NEW COURSE PROPOSAL FORM	
• Title, Number, Credits, Hours, Catalog course description	Y
• Brief Rationale	Y
• CUNY – Course Equivalencies	Y
Completed Library Resources and Information Literacy Form	
Course Outline Include within the outline the following.	
Hours and Credits for Lecture and Labs If hours exceed mandated Carnegie Hours, then rationale for this	Y
Prerequisites/Co- requisites	Y
Detailed Course Description	Y
Course Specific Learning Outcome and Assessment Tables • Discipline Specific • General Education Specific Learning Outcome and Assessment Tables	Y
Example Weekly Course outline	Y
Grade Policy and Procedure	Y
Recommended Instructional Materials (Textbooks, lab supplies, etc)	Y
Library resources and bibliography	Y
Course Need Assessment. Describe the need for this course. Include in your statement the following information.	
Target Students who will take this course. Which programs or departments, and how many anticipated? Documentation of student views (if applicable, e.g. non-required elective).	
Projected headcounts (fall/spring and day/evening) for each new or modified course.	
If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction.	
Where does this course overlap with other courses, both within and outside of the department?	
Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this?	
If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need.	

Course Design Describe how this course is designed.	
Course Context (e.g. required, elective, capstone)	Y
Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)?	Y
Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture)	Y
How does this course support Programmatic Learning Outcomes?	Y
Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program.	N
Additional Forms for Specific Course Categories	
Interdisciplinary Form (if applicable)	
Interdisciplinary Committee Recommendation (if applicable and if received)* *Recommendation must be received before consideration by full Curriculum Committee	
Common Core (Liberal Arts) Intent to Submit (if applicable)	
Writing Intensive Form if course is intended to be a WIC (under development)	
If course originated as an experimental course, then results of evaluation plan as developed with director of assessment.	
(Additional materials for Curricular Experiments)	
Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information).	
Established Timeline for Curricular Experiment	

New York City College of Technology
Department of Career and Technology Teacher Education

Course Number: **EDU-3485**	Title: Physical Computing
Credit Hours: 3 (2cl, 2 lab hrs)	Class Meeting Times:
Instructor:	Classroom:
Email:	Office:
Office Phone:	Office Hours:

Course Description

Introduces the fundamentals of physical computing using a microcontroller. The course covers a broad range of topics including basic electronics, programming, and the design and construction of simple robotic systems with consideration for computer-human interaction design. Students will engage in hands-on activities, building and programming their own microcontroller projects with inputs and outputs to solve real-world problems. Emphasis on creativity, critical thinking, and collaboration as students learn to apply engineering principles.
Prerequisites: EDU 2430

Course Objectives

Key objectives for this course include:

1. Understanding the basic principles of physical computing and robotics.
2. Learning the components and functions of the microcontroller.
3. Developing skills in writing and debugging code for inputs and outputs.
4. Exploring basic electronics, including circuits, sensors, and actuators.
5. Designing, building, and programming robotic systems.
6. Fostering problem-solving, teamwork, and project management skills

Learning Outcomes

After successful completion of this course, you will be able to:

1. Demonstrate an understanding of electronic components and their functions in circuits
2. Analyze and solve problems related to robotic design & functionality
3. Create, build, and program robotic systems using Arduino, sensors, and actuators
4. Critique the performance of a robotic system and make improvements as necessary
5. Collaborate effectively in teams to design and build complex projects

Course Materials

Jody Culkin & Eric Hagan. (2017). Make: Learn electronics with Arduino: an illustrated beginner's guide to physical computing. Maker Media. ISBN: 9-781-68045-374-4.

Simon Monk. (2016). Programming the Raspberry Pi: Getting Started with Python. McGraw Hill. ISBN: 978-1-25-958740-5.

Course Resources

- Arduino Reference
- Tutorials | Arduino Documentation
- Arduino - Circuit Basics
- Arduino - Get Started
- Arduino - SparkFun Learn

Technology Requirements

The PowerPoint lecture presentations, coding assignments, quizzes, and rubrics for the course are located on the Brightspace site. To participate in learning activities and complete assignments, you will need:

- Access to a working computer that has a current operating system with updates installed.
- Microsoft Word or Google Docs as your word processing program; and
- Reliable data storage for your work, such as a USB drive or Office365 OneDrive cloud storage.

Attendance/Participation

- You will earn 0-10 points per class within the following guidelines. This policy begins in the first class.
- 10 points are awarded to students who are on time, stay on task, contribute to the overall class discussions, and complete all required activities during each class.
- 9-1 points are awarded for students who arrive late, do not stay on topic, and come to class unprepared to engage in class discussions.
- 0 points were awarded for absence from class.
- Students are allowed **no more than two (2) absences**. Absences in excess of this will lower the final grade by one full letter grade.
- All students should attend the class on time. Two late days represent one absence.

Please Note: **The instructor has the right to award any point value between 1-10 following the above guidelines.**

Excused Absence

- An excused absence must be pre-approved by the instructor.
- Medical absences will only be awarded when the student provides a Drs. note based on appropriate situations.
- Only documented emergencies or unavoidable events will be excused.

Course Assessment Measures

Unit 1 - What is a Robot?

- Project(s)
  - Theorycraft a robot to solve a real-world problem.
- Guiding Question(s)
  - What key characteristics define a robot vs. an automated machine?
  - How do the mechanical components of a robot contribute to its overall functionality?

Unit 2 - Introduction to Programming with the Digital Sandbox

- Project(s)
  - Program a "whack-a-mole" style reaction testing game with LEDs
  - Create a multi-function automatic night light with adjustable RGB color
- Guiding Question(s)
  - How might a microcontroller be used to automate a simple task in a household?
  - What strategies can you use to test and debug code used for physical circuits?

Unit 3 - Introduction to Arduino & Circuits

- Project(s)
  - Refactor the automatic night light from Unit 2 to include dimming, color-mixing, and user-adjusted maximum brightness
  - Design, program, and build a "Theremin" using a passive buzzer, ultrasonic sensor, and another analog sensor of your choice
- Guiding Question(s)
  - Compare the functionalities of an analog sensor (such as a potentiometer) and a digital sensor (such as a push button). How does the Arduino handle input from each type of sensor?
  - Explain how you can use the serial monitor in the Arduino IDE to debug a program.
  - What information can you gather from it, and how can it help improve your code?

Unit 4 - Control Structures & Advanced Components

- Project(s)
  - Create a quiz game using serial input, arrays, and return functions, with physical feedback in the form of lights and buzzers.
  - Use a switch-case to take in a 10 digit number and display it on an SSD
  - Create a Mastermind or Wordle-style game using 2D arrays, a keypad, and an LCD
- Guiding Question(s)
  - What are the essential steps in programming a robotic system to perform a specific task?
  - How do you ensure the robot executes the task reliably?

SUMMATIVE PROJECT - Students complete their own research on a component or advanced programming concept not covered in this class, then use what they learn to create a DIY "Instructables" for a project of their choice and design. Their project report should discuss their research, background information about the component or concept, and blueprints and instructions explaining their design and debugging process with enough detail that others may recreate their project.

Unit X - Advanced Arduino Concepts

- millis() & micros(), types of delays, debounces
- Types of interrupts and their applications
- Advanced data handling and storage
- ASSESSMENT PROJECT:
  - Create a program and circuit that utilizes millis(), polling, external interrupts, and debouncing to achieve a goal. Options include: Traffic Light Controller, Stopwatch with Lap Timer, Whack-a-Mole (with buttons and LEDs), or design your own.

Unit Y - Communication Protocols

- I2C Communication
- UART/Serial Communication
- Wireless Communication with Bluetooth
- ASSESSMENT PROJECT:
  - Create programs and a circuit that utilizes I2C protocols to communicate between one parent and 2-4 children. Options include: I2C Chat Room, Multi-Zone Audio System, Smart Home System with sensor feedback, or design your own.

Unit Z - Motor Control

- Understanding diodes and transistors-as-switches
- Implementing H-bridges
- Motor control with IC motor drivers
- **SUMMATIVE ASSESSMENT**: In groups, design and build an RC car with a Bluetooth joystick controller. The car should be small and maneuverable enough to be navigated through a simple maze. Students may all choose to work on all parts, or may assign individual roles within the design and implementation process.

Course Assignments and Grading

Assignment Weights	Percent
Class participation	10%
Hands-on mini projects	20%

Assignment Weights	Percent
Midterm Exam	20%
Final Exam	20%
Final Project	30%
Total	100%

Grading System

100-93: A	92.9-90: A-	89.9-87: B+	86.9-83: B	82.9-80: B-
79.9-77: C+	76.9-73: C	72.9-70: C-	69.9-60: D	Below 60: F

Students With Special Needs

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Students Support Services (OSSS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from OSSS, which is located in Room A-P508. It is the student's responsibility to initiate contact with the OSSS staff and to follow the established procedures to send the accommodation notice to the instructor.

Course Schedule

Week	Topics	Readings
1	Introduction to Arduino	Culkin & Hagan (1-30)
2	Meet the Circuit	Culkin & Hagan (31-72)
3	Programming the Arduino	Culkin & Hagan (73-136)
4	Electricity and Metering	Culkin & Hagan (137-192)
5	Switches, LEDs, and Analog Communications	Culkin & Hagan (193-288)
6	Serve Motors	Culkin & Hagan (289-332)
7	**Mid-term Exam**	
8	Introduction to Raspberry Pi	Monk (1-24)
9	Python Programming for Raspberry Pi	Monk (25-74)
10	Interfacing Hardware	Monk (115-142)
11	LED Fader Project	Monk (143-148)
12	Prototyping Project	Monk (149-158)
13	Raspberry Pi Robot	Monk (159-172)
14	Developing Final Project	
15	**Final exam**	

Course Content

Unit 1 - What is a Robot?

- Overview of robotics and its applications
- Systems, subsystems, and mechanics of robots
- Robotics applications (types of robots, problem solving with robots)

Unit 2 - Introduction to Programming with the Digital Sandbox

This unit uses a pre-made "sandbox" with I/O that is used to teach programming without the necessity of building and debugging a circuit. This can be done with simulation software.

- Introduction to physical computing and the role of microcontrollers
- Setting up the Arduino IDE
- Basic Arduino programming and syntax (including variables, loops, and conditionals)
- Overview of digital I/O (e.g. LEDs, push buttons, active buzzer)

Unit 3 - Introduction to Arduino & Circuits

- Safety guidelines and best practices in the lab
- Working with breadboards, resistors, capacitors, and LEDs
- Using multimeters and other diagnostic tools
- Overview of analog I/O (e.g. PWM, ultrasonic sensors, potentiometers)
- Implementing serial communication for data input and output

Unit 4 - Control Structures & Advanced Components

- Introduction to actuators (e.g. motors, servos, relays)
- Further Arduino programming and syntax (e.g. 2-D arrays, switch case, objects)
- Designing and constructing simple robotic structures
- Programming and testing robotic systems

Academic Integrity Pledge

I understand the value of personal integrity and ethical behavior in all aspects of my professional and personal life. By committing to honesty and personal responsibility, I earn respect and trust of others. As a student at New York City College of Technology, I recognize that the value of my education is not just being able to say I am a college graduate but also incorporating the skills, deals, and knowledge I have acquired. I thus commit myself to upholding academic integrity as an important aspect of my personal integrity. I understand that academic integrity includes:

1. Fully observing the rules governing exams and assignments regarding resource material, electronic aids, copying, collaborating with others, or engaging in any other behavior that subverts the purpose of the exam or assignment, and the directions of the instructor.
2. Only turning in work that I have done myself, and not using unattributed work done by others. While working and studying with others can be an effective way to learn, submitted work will be my own.
3. Giving full and proper credit to sources and references, and acknowledging the contributions and ideas of others, in my academic work.

I have read and understand the Academic Integrity Policy found in the New York City College of Technology College Catalog

Printed Name _____
Signature _____ _____
Date _____
Course, section _EDU 3485, _____

Modified from the Marquette University Honor Code, PB, RB; AM; 12/23/20

Bibliography

CollegeBoard. (2020). AP Computer Science A: Course and Exam Description. Available from https://apcentral.collegeboard.org/media/pdf/ap-computer-science-a-course-and-exam-description.pdf

Jody Culkin & Eric Hagan. (2017). Make: Learn electronics with Arduino: an illustrated beginner's guide to physical computing. Maker Media. ISBN: 9-781-68045-374-4.

New York State Education Department (2020). Computer Science and Digital Fluency Learning Standards. Available from https://www.nysed.gov/curriculum-instruction/computer-science-and-digital-fluency-learning-standards

Simon Monk. (2016). Programming the Raspberry Pi: Getting Started with Python. McGraw Hill. ISBN: 978-1-25-958740-5.

Learning Outcomes and Assessment Methods

EDU 3485 Physical Computing
Career and Technology Teacher Education (CTTE)

LEARNING OUTCOMES	ASSESSMENT METHODS
1. Demonstrate an understanding of electronic components and their functions in circuits	Evaluation of student knowledge about physical computing and its impact.
2. Analyze and solve problems related to robotic design & functionality	Analysis of hands-on projects and reflection reports.
3. Create, build, and program robotic systems using Arduino, sensors, and actuators	Analysis of hands-on projects and reflection reports.
4. Critique the performance of a robotic system and make improvements as necessary	Analysis of programing assignments for microcontroller.
5. Collaborate effectively in teams to design and build complex projects	Analysis of final project solving a real-world computing problem.

Course Need

Students who would take this course: students in the BSEd in Computer Science Education program.

Department: Career and Technology Teacher Education

Program: Bachelors of Science in Education in Computer Science Teacher Education

The number of section (s) anticipated: one section for the first year

Projected headcount: 16 students

Physical Resources required: Computer lab, 16 computers, an overhead projector.

Course overlap: None

Faculty qualified for teaching this course: Full-time and adjunct faculty members who have a higher education degree in computer science or related domain.

Course Design

Course context: This course will be primarily designed for students in the Computer Science Teacher Bachelor's degree program. Students will learn the overview of robotics and its applications, systems, mechanics of robots.

Course structure: This course will be delivered through project-based learning.

Anticipated Pedagogical Strategies and Instructional Design: This course will be taught through student-led project learning methods. The course consists of four-unit modules and each module contains small mini-projects. After the each unit, students will conduct a project which will be used as a summative assessment. Additionally, reflecting computer and robotics fields, students will conduct a variety of group projects.

Providing Support to Programmatic Learning Outcomes: Physical Computing is a key course in K-12 computer science education that stimulates students' interest and allows them to apply computing to real-world situations. In this course, students will learn how to solve problems using microcontrollers. Through projects, students will design and develop their own robotic systems, which will develop their analytical, critical, and collaborative skills.

CHANCELLOR'S REPORT FORM
New Course Proposal: Data Structures for Educators

Department(s)	Career and Technology Teacher Education
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Physical Computing
Course Prefix	EDU
Course Number	3485
Course Title	Physical Computing
Catalog Description	Introduces the fundamentals of physical computing using a microcontroller. The course covers a broad range of topics including basic electronics, programming, and the design and construction of simple robotic systems with consideration for computer-human interaction design. Students will engage in hands-on activities, building and programming their own microcontroller projects with inputs and outputs to solve real-world problems. Emphasis on creativity, critical thinking, and collaboration as students learn to apply engineering principles.
Prerequisite(s)	EDU 2430
Corequisite	None
Pre- or corequisite	None
Credits	3
Contact Hours	4 (2 lecture and 2 lab hours)
Liberal Arts	[ ] Yes [X] No
Course Attribute (e.g. Writing Intensive, etc).	None
Course Applicability	[x] Major [ ] Gen Ed Required [ ] Gen Ed – Flexible [ ] – Gen Ed – College Option [ ] English Composition [ ] World Culture [ ] Speech [ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary [ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts [ ] Individual and Society [ ] Scientific World
Effective Term	Fall 2026

Appendix C: Letters of Support

Brooklyn Technical High School *David Newman, Principal*

29 Fort Greene Place · Brooklyn, New York · 11217 · Telephone: (718) 804-6400· Fax: (718) 260 – 9245 · www.bths.edu

January 25th, 2024

Career and Technology Teacher Education Department
New York City College of Technology
300 Jay Street,
Brooklyn, NY, 11201

Dear CTTE Department,

I am writing to express my support for your plans to develop a new Bachelor of Science in Education degree in Computer Science Teacher Education.

After reviewing the proposed curriculum, I am confident that it represents a balanced program that can effectively prepare graduates to teach computer science in K-12 schools. I am especially pleased to see that the program covers various courses in pedagogy knowledge, clinical experience, and professional knowledge in computer science, all of which are essential for K-12 computer science teachers.

With the high demand for K-12 computer science teachers, it's crucial to have qualified teachers who possess a solid understanding of basic concepts of computer science and the ability to transform and deliver them to K-12 students. This degree program will equip graduates with the knowledge and skills required in K-12 computer science classrooms and prepare them for graduate-level work in school.

I believe that your proposed program will help address the gap and prove beneficial both to your students and the NYS education system. If you need any further discussion, please do not hesitate to contact me.

Respectfully,

Rosabeth Eddy

DocuSigned by:
Rosabeth Eddy
93465...

Sincerely,

Rosabeth Eddy
Assistant Principal of Computer Science and Engineering Department
Brooklyn Technical High School

NEW YORK CITY
COLLEGE OF TECHNOLOGY
THE CITY UNIVERSITY OF NEW YORK
300 JAY STREET, BROOKLYN, NY 11201-2983
COMPUTER SYSTEMS TECHNOLOGY DEPARTMENT
Namm Hall 914
718-260-5170 · Fax: 718-254-8659

January 8th, 2024

Career and Technology Teacher Education Department
New York City College of Technology
300 Jay Street,
Brooklyn, NY, 11201

Dear CTTE Department,

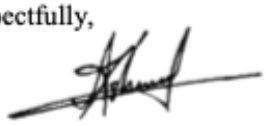
I am writing to express my support for your plans to develop a new Bachelor of Science in Education degree in Computer Science Teacher Education.

After reviewing the proposed curriculum, I am confident that it represents a balanced program that can effectively prepare graduates to teach computer science in K-12 schools. I am especially pleased to see that the program covers various courses in pedagogy knowledge, clinical experience, and professional knowledge in computer science, all of which are essential for K-12 computer science teachers.

With the high demand for K-12 computer science teachers, it's crucial to have qualified teachers who possess a solid understanding of basic concepts of computer science and the ability to transform and deliver them to K-12 students. This degree program will equip graduates with the knowledge and skills required in K-12 computer science classrooms and prepare them for graduate-level work in school.

I believe that your proposed program will help address the gap and prove beneficial both to your students and the NYS education system. If you need any further discussion, please do not hesitate to contact me.

Respectfully,



Ashwin Satyanarayana, Ph.D.
Associate Professor / Department Chair
Department of Computer Systems Technology,
New York City College of Technology
300 Jay Street - Namm 914, Brooklyn, NY 11201
Ph: (718) 260-5161

HOFSTRA UNIVERSITY
CENTER FOR STEM EDUCATION RESEARCH
HOFSTRA UNIVERSITY
773 FULTON AVE.
HEMPSTEAD, NY 11549-7730

Center Administration

Co-Directors
David Burghardt, Ph.D.
m.d.burghardt@hofstra.edu
Michael Hacker, Ph.D.
michael.hacker@hofstra.edu

Visiting Scholar
Anthony T. Gordon
Anthony.T.Gordon@hofstra.edu

Administrative Assistants
Stephanie Glace
Stephanie.glace@hofstra.edu

Contact Information:
Telephone: 516-463-6482
*Website:*www.hofstra.edu/csr

Center Capabilities

- Developing and managing large-scale funded projects in STEM (science, technology, engineering and mathematics) education
- Planning and conducting educational conferences
- Designing professional development programs
- Developing instructional and professional development materials

Currently or Recently Administered NSF Projects

- Needed Math (NSF 2100062)
- Exploring Computation Integrated into Technology and Engineering (ExCITE) (NSF 1923552)
- Exploring Computation Integrated into Technology and Engineering II (ExCITE II) (NSF 2318343)
- WISE Guys and Gals (NSF #1422436)
- Engineering for All (NSF #1316601)

January 8, 2024

Career and Technology Teacher Education Department
New York City College of Technology
300 Jay Street,
Brooklyn, NY, 11201

Dear CTTE Department,

I am writing to express my support for your plans to develop a new Bachelor of Science in Education degree in Computer Science Teacher Education.

After reviewing the proposed curriculum, I am confident that it represents a balanced program that can effectively prepare graduates to teach computer science in K-12 schools. I am especially pleased to see that the program covers various courses in pedagogical knowledge, clinical experience, and professional knowledge in computer science, all of which are essential for K-12 computer science teachers.

With the high demand for K-12 computer science teachers, it's crucial to have qualified teachers who possess a solid understanding of basic concepts of computer science and the ability to transform and deliver them to K-12 students. This degree program will equip graduates with the knowledge and skills required in K-12 computer science classrooms and prepare them for graduate-level work in school.

I believe that your proposed program will help address the gap and prove beneficial both to your students and the NYS education system. If you need any further discussion, please do not hesitate to contact me.

Respectfully,

Michael Hacker

Michael Hacker, Ph.D.

The mission of the Center for STEM Education Research is to promote and support the improvement of STEM literacy for K-16 students and faculty.

January 22, 2024

Career and Technology Teacher Education Department
New York City College of Technology
300 Jay Street,
Brooklyn, NY, 11201

Dear CTTE Department,

I am writing to express my support for your plans to develop a new Bachelor of Science in Education degree in Computer Science Teacher Education.

After reviewing the proposed curriculum, I am confident that it represents a balanced program that can effectively prepare graduates to teach computer science in K-12 schools. I am especially pleased to see that the program covers various courses in pedagogy knowledge, clinical experience, and professional knowledge in computer science, all of which are essential for K-12 computer science teachers.

With the high demand for K-12 computer science teachers, it's crucial to have qualified teachers who possess a solid understanding of basic concepts of computer science and the ability to transform and deliver them to K-12 students. This degree program will equip graduates with the knowledge and skills required in K-12 computer science classrooms and prepare them for graduate-level work in school.

As the New York Regional Manager for the Microsoft Philanthropies TEALS Program, the CSForNY Coalition Leader, and a NYC Chapter Leader for the Computer Science Teachers Association, I know firsthand that the demand for excellent computer science teachers is growing in New York. The proposed program at New York City College of Technology is another crucial piece of our computer science education ecosystem and I'm confident that your team can help increase the supply of certified computer science teachers in our state.

I believe that your proposed program will help address the gap and prove beneficial both to your students and the NYS education system. If you need any further discussion, please do not hesitate to contact me.

Respectfully,

Thomas O'Connell
CSForNY Coalition
Computer Science Teachers Association NYC Chapter

NYC Public Schools
Chancellor David C. Banks

January 16th, 2024

Career and Technology Teacher Education Department
New York City College of Technology
300 Jay Street,
Brooklyn, NY, 11201

Dear CTTE Department,

I am writing to express my support for your plans to develop a new Bachelor of Science in Education degree in Computer Science Teacher Education.

After reviewing the proposed curriculum, I am confident that it represents a balanced program that can effectively prepare graduates to teach computer science in K-12 schools. I am especially pleased to see that the program covers various courses in pedagogy knowledge, clinical experience, and professional knowledge in computer science, all of which are essential for K-12 computer science teachers.

With the high demand for K-12 computer science teachers, it's crucial to have qualified teachers who possess a solid understanding of basic concepts of computer science and the ability to transform and deliver them to K-12 students. This degree program will equip graduates with the knowledge and skills required in K-12 computer science classrooms and prepare them for graduate-level work in school.

I believe that your proposed program will help address the gap and prove beneficial both to your students and the NYS education system. If you need any further discussion, please do not hesitate to contact me.

Respectfully,

Ramy Fakhr
Director of Success Via Apprenticeship Program
Office of Student Pathways
NYC Public Schools

TECHNOLOGY & ENGINEERING STUDIES
SCHOOL OF TECHNOLOGY

IRA A. FULTON COLLEGE OF ENGINEERING

January 29th, 2024

Career and Technology Teacher Education Department
New York City College of Technology
300 Jay Street,
Brooklyn, NY, 11201

Dear CTTE Department,

I am writing to express my support for your plans to develop a new Bachelor of Science in Education degree in Computer Science Teacher Education.

After reviewing the proposed curriculum, I am confident that it represents a balanced program that can effectively prepare graduates to teach computer science in K-12 schools. I am especially pleased to see that the program covers various courses in teacher pedagogical content knowledge, clinical experiences, and professional knowledge in computer science - all of which are essential for K-12 computer science teachers.

With the high demand for K-12 computer science teachers, it's crucial to have qualified teachers who possess a solid understanding of basic concepts of computer science and the ability to transform and deliver them to K-12 students. This degree program is a great step towards equipping graduates with the knowledge and skills required in K-12 computer science classrooms and preparing them for graduate-level work in school.

As the creator of the Purdue University Computer Science teaching minor, and the University Supervisor for our Computer Science Teacher Education program here at Brigham Young University, I believe that your proposed program will help address the gap and prove beneficial both to your students and the NYS education system. If you need any further discussion, please do not hesitate to contact me.

Respectfully,

Scott R. Bartholomew, PhD
Technology & Engineering Studies
Brigham Young University
801-422-6310
scottbartholomew@byu.edu