

QUEENSBOROUGH COMMUNITY COLLEGE
OF
THE CITY UNIVERSITY OF NEW YORK

PROPOSAL TO ESTABLISH A PROGRAM IN COMPUTER SCIENCE
LEADING TO THE ASSOCIATE IN SCIENCE DEGREE

EFFECTIVE FALL 2023

SPONSORED BY THE DEPARTMENT OF MATHEMATICS AND COMPUTER
SCIENCE

APPROVED BY

QUEENSBOROUGH COMMUNITY COLLEGE ACADEMIC SENATE
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Table of Contents

General Information	3
Executive Summary	4
Abstract	5
Purpose and Goals	5
Need and Justification	5
Students	6
Enrollment Projections.....	7
Admission Requirements and Advisement.....	8
Curriculum	8
Program Format.....	9
Program Outcomes	9
Associate of Science in Computer Science Degree Requirements	10
Shared Governance.....	11
Cost Assessment	11
Faculty.....	11
Facilities and Equipment	11
Evaluation	12
Appendix A: Sample Program Scheduling, Course Descriptions for Required Courses, List of New Courses, Syllabi for New Courses	13
Sample Program Scheduling	13
Course Descriptions for Required and Elective Courses	15
Required Courses	15
Elective Courses.....	17
New Courses.....	22
Appendix B: Faculty Teaching Assignments	23
Appendix C: Financial Tables	38
Enrollment and Seat Projection	38
Projected Revenue.....	39
Revenue (Supporting Materials)	40
Expenditures.....	42
Appendix D: Articulation Agreements	43
Appendix E: Careers in Computer Science and Sample Job Advertisements	54

Careers for Computer Science Majors	54
Computer Programmers.....	54
Software Developers	57
Web Developers	60
Sample Job Advertisements	64
<i>Appendix F: Attestations and Assurances.....</i>	69

General Information

Institution (Legal Name)	Institution Code
Queensborough Community College, City University of New York	373500
Proposed Program Title	Degree Award
Computer Science	A.S.
Address of Any Campus Where the Proposed Program Will Be Offered (main and/or branch campuses)	Full-time or Part-time 1
222-05 56th Avenue Bayside, NY 11364	Full-time
All Program Format(s) (standard, distance education ² , evening, weekend and/or other)	HEGIS Code
Standard and Distance Education	0704.00
Joint Registration IHE (if applicable)	Total Number of Credits
Not applicable	60
Lead Contact [First Name, Last Name, Title]	Telephone Number
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¹ Please refer to §52.2(c) and §145-2.1 of the Regulations of the Commissioner for definitions and information concerning full and part time study. Note: Only programs registered as full time are eligible for TAP. Programs are subject to audit by the NYS Office of the State Comptroller and the Higher Education Services Corporation (HESC) for financial aid compliance purposes.

² If a major portion of the program (50% or more) can be completed through study delivered by distance education then the program must be registered in the distance education format. Hybrid or blended courses do not count toward the 50%.

Executive Summary

The Department of Mathematics and Computer Science at Queensborough Community College (QCC) proposes a new Associate of Science (A.S.) degree in Computer Science. The program is designed to prepare students for transfer to a 4-year college and earn a baccalaureate degree in Computer Science or a related field.

The last few decades have witnessed an extraordinary surge of the use of computers in many if not most aspects of our lives. Furthermore, in the last decade, the use of mobile computing has spread almost beyond the point of being optional, but rather a societal must. As a result, there is now a great need for computer science majors. A high need for computer scientists has led to high salaries in the field. The degree program proposed will provide students with strong foundations in the field of computer science that is needed to prepare them for the B.S. in Computer Science they need to secure those jobs.

Additionally, the program will encourage the expansion of the computing community at our college and fill a need for a degree program that specifically prepares students for the B.S. in Computer Science degree. Queensborough is currently home to several computer-related degree programs that are offered by other departments. However, those programs focus on information technology and do not require the level of mathematics needed to prepare students for typical B.S. programs in Computer Science. Queensborough is the only CUNY Community College that does not offer the A.S. in Computer Science.

In the field of mathematics, the home department of this degree, there is a notable underrepresentation of women and some racial minorities. Unfortunately, that inequity is even more pronounced in computer science. Having the possibility to pursue a computer science degree at Queensborough will provide the students from our extremely diverse borough with the opportunities offered by pursuing careers in the field of computing.

The qualifications of the current faculty members of the Mathematics and Computer Science department at QCC are more than adequate to satisfy the needs of the program and its courses. The mathematics department has 50 full-time faculty and 16 part-time faculty. Our faculty are dedicated to improving computer science education and using new and innovative techniques in the classroom to ensure the highest quality of instruction and engagement and retention of our students. Current classroom, laboratory, and library resources are sufficient to support the requirements of a new computer science degree.

The proposed degree program will be offered in both a traditional, in person, format and as an asynchronous online program. If approved, the program will be launched in the traditional format in Fall 2023. During 2023-24, online sections of the Computer Science and Mathematics courses will be developed. Support for that work will come from both a Department of Education Title V award, which includes funding to improve and expand our online course offerings, as well as from the new [CUNY Online](#) project. We anticipate launching the online A.S. in Computer Science program in Fall 2024.

Abstract

This document presents the proposal by Queensborough Community College of the City University of New York for an Associate in Science (A.S.) degree in Computer Science. It includes an articulation agreement with the B.A. and B.S. programs in Computer Science at Queens College. The program will provide a firm basis in STEM courses with a concentration in computer science as well as a thorough general education component in accordance with the CUNY Pathways requirements. The proposed major will prepare graduates for transferring to computer science bachelor's degree programs.

Purpose and Goals

The proposed A.S. degree in Computer Science is tailored to align well with the CUNY senior colleges that offer bachelor's degrees in computer science. Our goal is to provide students with programming skills required in today's world of computing, including thinking critically and solving complex problems. The goals of the program are to provide solid instruction in the foundations of computer science required to be successful in transferring to four-year degree computer science programs at CUNY senior colleges as well as at SUNY and private universities nationwide.

Need and Justification

Queensborough is currently home to several computer-related degree programs, including a dual/joint A.S./B.S. in Computer Science and Information Security with John Jay College, an A.A.S. in Internet and Information Technology, an A.A.S. in Cybersecurity, and an A.A.S. in Computer Information Systems, which are offered by other departments of the college. However, those programs focus on technical skills and applications of computer science and do not require the use of calculus. Most of the programming courses offered by those departments do not transfer well to traditional B.S. programs in Computer Science.

The Department of Mathematics and Computer Science currently participates in an A.S. degree in Liberal Arts and Sciences (Mathematics and Science). While this program has recommended course sequences in Biology, Chemistry, Computer Science, Mathematics, and Physics, there are no official concentrations in those fields. This general A.S. degree program allows students to take a wide variety of STEM courses as major electives and within the common core. This can make advisement a challenge. Students can complete the degree requirements but arrive at a senior college lacking key courses that prepare them well for junior-level work in a bachelor's degree program in computer science. By separating computer science into its own degree, advisement can be much more targeted and effective for students in this area of interest. Recently, A.S. degree programs in Biology, Physics, and Mathematics were developed for the same reason.

The skills that students learn in the proposed A.S. program in Computer Science, including communication, critical thinking, and applying computer science concepts to

real world situations, will provide students a strong foundation for a wide range of careers such as software developer, database administrator, computer hardware engineer, computer system analyst, computer network architect, and web developer. There is an urgent need for more qualified data scientists, programmers, and high school computer science teachers in the New York City area and Queens specifically. This major will provide the first two years of instruction in preparation for the bachelor's degree required for most jobs in those fields.

The field of computer science has a low rate of participation by women and underrepresented minorities (locally, regionally, and nationally.) The amazing diversity of QCC students and the borough of Queens provide us with an opportunity to help address that problem. Many incoming QCC students are unaware of the opportunities that a computer science major might provide. Having such a major will allow us to actively recruit a diverse group of students from the surrounding high schools during application and registration time.

Students

The department of Mathematics and Computer Science, under the guidance of the Office of Institutional Research, conducted a survey to assess students' interest in a computer science degree. The target population was chosen based on academic interest, as indicated by their declared major and their course work. In total, 300 students completed the survey. The outcomes are very encouraging. Over 73% of the participating students reported being "very interested" or "interested" in such a degree. The figure is a bit lower in female respondents (64%), nonetheless being way above the majority. Black and Hispanic students also showed strong interest. (See Table 1 below.)

The proposed two-year, 60-credit degree, will prepare students to pursue a bachelor's degree in computer science or in most other STEM disciplines. Our courses will provide basic education in subjects such algorithmic problem solving in C++ and Java, computer architecture and assembly language, and discrete structures. In addition to this, the program will have mathematics requirements (calculus and discrete structures) in alignment with math requirements in the CUNY senior college computer science programs. The program can also help students take the first step if they ultimately hope to become a software engineer, database administrator, web programmer and so on. While they will need more than an associate degree to land such jobs, an associate degree in computer science is a great way to get started. In addition, with further education and recruitment highlighting the possibilities for jobs, the number of students with a computer science major is expected to increase.

Table 1. Student survey responses by gender and race/ethnicity.

Interest Level / Group	Very interested	Interested	Neutral/ Not sure	Not interested	Not interested at all
All (n = 300)	52.33%	21.33%	19.67%	4.33%	2.33%
Male (n = 187)	60.96%	18.18%	15.51%	3.74%	1.60%
Female (n = 106)	38.68%	25.47%	26.42%	5.66%	3.77%
Gender Not Specified (n = 7)	28.57%	42.86%	28.57%	0.00%	0.00%
Asian/Pacific Islander (n = 110)	50.91%	19.09%	23.64%	3.64%	2.73%
Black, Non-Hispanic (n = 65)	52.31%	26.15%	16.92%	3.08%	1.54%
Hispanic (n = 63)	55.56%	15.87%	19.05%	4.76%	4.76%
White, Non-Hispanic (n = 14)	28.57%	28.57%	21.43%	21.43%	0.00%
Native American (n = 5)	80.00%	0.00%	20.00%	0.00%	0.00%
Other Ethnicity (n = 43)	55.81%	27.91%	13.95%	2.33%	0.00%

Enrollment Projections

The projected enrollment for the first five years of the program is shown in Table 2 below. The continuing enrollment is estimated from current students who took computer science courses in Fall 2022. We anticipate that many of those students will join the degree program once it is approved.

Table 2. Projected enrollment in the A.S. in Computer Science, 2023-2028.

	2023-24		2024-25		2025-26		2026-27		2027-28	
	New	Cont.	New	Cont.	New	Cont.	New	Cont.	New	Cont.
F-T	2	25	10	35	15	45	15	50	15	60
P-T	1	5	1	5	2	5	2	5	2	5
Subtotal	3	30	14	40	17	50	17	55	17	65
Total	33		54		67		72		82	

Admission Requirements and Advisement

Students seeking admission to the computer science degree program must satisfy the general requirements for entry to Queensborough: completion of either a high school diploma or a New York State Equivalency Diploma. The College's Office of New Student Engagement will help guide students through the admissions process and prepare them for academic success. Students requiring developmental coursework in Math or English have a range of options, including the Accelerated Learning Program which allows them to take a credit-bearing course alongside a developmental co-requisite course, reducing the time to graduation.

Students enrolled in the computer science degree program will be part of Queensborough's STEM Academy. The Department of Mathematics and Computer Science, along with dedicated professional advisers, will guide students on their curriculum and opportunities for transfer to 4-year institutions. The Transfer Resource Center at the College will also advise students on how to prepare for transfer to specific B.S. or B.A. degree programs.

Curriculum

The proposed A.S. in Computer Science degree program will require students to complete courses in the CUNY Pathways General Education curriculum and in Computer Science Major Requirements and Electives. The 60 credits A.S. in Computer Science degree program requires 34 credits of CUNY Pathways courses (including specific mathematics and computer science courses in Areas 1B and 2E) and 26 credits of requirements and electives. The exact requirements are shown in the table below.

Students are able to choose 11 credits of major electives from a range of computer science, information technology, and mathematics courses. They may also elect to take part in undergraduate research under the supervision of a faculty member.

The program easily meets the New York state requirement that A.S. degree programs must include at least 50% of credit hours from Liberal Arts and Sciences courses (Appendix A).

Program Format

The proposed degree program will be offered in both a traditional, in person, format and as an asynchronous online program. If approved, the program will be launched in the traditional format in Fall 2023. During 2023-24, online sections of the Computer Science and Mathematics courses will be developed. Support for that work will come from a Department of Education Title V award, which includes funding to improve and expand our online course offerings, as well as from the new [CUNY Online](#) project. The support includes professional development in learning management systems from the [Office of Educational Technology](#) at QCC, [Effective Online Teaching Practices](#) from the [Association of College and University Educators](#), and in online course development and certification from [Quality Matters](#). We anticipate launching the online Computer Science program in Fall 2024.

Program Outcomes

Computer science students should learn the fundamental concepts and theories of the discipline to formulate, analyze, and solve computing problems. They should be prepared to pursue further studies in the field and to assume professional responsibilities. After completing the Computer Science degree program, students will be able to:

- A. Apply fundamental concepts and theories of the discipline to formulate, analyze, and solve computing problems
- B. Explain relationships between computer architectures and software systems (i.e., between hardware and software)
- C. Demonstrate knowledge of the theory of algorithms
- D. Demonstrate proficiency in writing and reading computer programs in order to comprehend and implement algorithms
- E. Apply principles of design and analysis to complete projects involving computing programs and algorithmic design
- F. Communicate technical ideas effectively

Associate of Science in Computer Science Degree Requirements

CUNY Pathways Common Core Requirements	Credits
Required Core 1A: English Composition: ENGL-101 English Composition I	3
Required Core 1A: English Composition: ENGL-102 English Composition II	3
Required Core 1B: Mathematics and Quantitative Reasoning: MA-440 Pre-Calculus Mathematics ^{1,2,3}	4
Required Core 1C: Choose one course	3-4
Flexible Core 2A: Choose one course	3
Flexible Core 2B: Choose one course	3
Flexible Core 2C: Choose one course	3
Flexible Core 2D: Choose one course	3
Flexible Core 2E: CS-101 Algorithmic Problem Solving I ³	4
Additional Flexible Core: MA-441 Analytic Geometry and Calculus I ³	4
Subtotal	33-34
Major Core Requirements	
CS-201 Computer Organization and Assembly Language	4
CS-203 Algorithmic Problem Solving II in C++ OR CS-204 Algorithmic Problem Solving II in Java	4
MA-442 Analytic Geometry and Calculus II	4
MA-471 Introduction to Discrete Mathematics	3
Subtotal	15
Major Electives – Take 11 credits from courses listed below	
CS-100 Introduction to Computers and Programming	3
CS-102 Spreadsheet Programming with MS Excel	3
CS-103 Relational Databases	4
CS-203 Algorithmic Problem Solving II in C++	4
CS-204 Algorithmic Problem Solving II in Java	4
CS-220 Discrete Structures	3
ET-506 LINUX Operating System	3
ET-540 Digital Computer Theory I	3
ET-704 Networking Fundamentals I	3
ET-710 Front End Web Development	3
ET-725 Computer Network Security	3
MA-119 College Algebra ¹	3
MA-121 Elementary Trigonometry ¹	1
MA-443 Analytic Geometry and Calculus III	4
MA-461 Linear Algebra	4
MA-481 Probability and Statistics	3
MA-905 Undergraduate Research in Mathematics and/or Computer Science I	2
MA-906 Undergraduate Research in Mathematics and/or Computer Science II	2
Subtotal	11
Additional Requirements	
One laboratory science course – Select from: BI-132, BI-171, CH-102, CH-111, CH-121, ET-842, or PH-112 ⁴	0-1
Subtotal	0-1
Total Credits Required	60

Notes

- Depending on math placement, students may be required to complete MA-119 and/or MA-121 (both with a C or better) prior to MA-440. When required by math placement, MA-119 and MA-121 will count as major electives.
- Students who place into mathematics at MA-441 will use that course to satisfy Required Core 1B, use MA-442 in the Flexible Core, and take an additional 4 credits of major elective courses to reach 60 credits.
- Students are required to take specific courses in some areas of the Common Core that fulfill both general education and major requirements. If students do not take the required courses in the Common Core, they will have to take additional credits to complete their degree requirements.
- Students who take a STEM variant for Required Core 1C have satisfied this requirement.

All students must successfully complete two (2) writing-intensive classes (designated "WI") to fulfill degree requirements. MA-471 is a writing-intensive (WI) course.

Shared Governance

The Computer Science Program will be overseen by the Department of Mathematics and Computer Science and a faculty program director will be appointed by the department. Any changes to the program will be reviewed and approved by the departmental curriculum committee before being submitted for approval to the College's Academic Senate Curriculum Committee and subsequently to the Academic Senate and CUNY.

Cost Assessment

Faculty

The faculty of the Department of Mathematics and Computer Science have the necessary qualifications, expertise, and experience to provide valuable guidance and support to the proposed Computer Science program. The Department has 50 full-time faculty members, 35 of whom hold doctorate degrees in Mathematics, Computer Science, or a related field. All faculty members are engaged in student advisement and mentoring. Many of the full-time faculty conduct original research and many of them involve Queensborough students. Computer Science program students will have opportunity to gain research experience performing projects with these faculty. To support their research efforts, the faculty have secured and continue to apply for funding from both the CUNY programs and outside of CUNY, including from the National Science Foundation. External funding will provide students with the opportunity to obtain scholarships to participate in research. Many of the faculty incorporate high impact practices into their courses, including writing intensive courses, and courses incorporating undergraduate research. No new faculty will need to be hired to support the proposed degree program. All proposed courses will be taught by existing qualified QCC faculty.

Facilities and Equipment

The Department of Mathematics and Computer Science is home to six computer classrooms with one computer for each of 23 to 27 students, with a total capacity of 152 seats. This capacity is sufficient to support the proposed degree program and enrollment levels. The Department is home to a Director of Math Computing Facilities and three full-time College Laboratory Technicians. These personnel are responsible for the management and upkeep of the computer classrooms. They have recently updated the technology in three of the rooms. The remainder of the classrooms will be upgraded over time as our budget allows.

Evaluation

Queensborough Community College has an Institutional Framework in place for evaluating degree programs and for assessing individual courses. General Education Objectives as well as Program Outcomes are assessed in individual courses. Each degree program is evaluated every five years on a designated schedule. The program review consists of two parts: a self-study and an external evaluation. The A.S. degree in Computer Science will undergo Program Review in the same manner. The self-study will be conducted by a committee formed by the Department of Mathematics and Computer Science. Using data provided by Institutional Research and individual course assessment, the committees will discuss student outcomes, curriculum, faculty, and facilities and then generate major findings and formulate recommendations. The committee will prepare a report according to a standardized template. An external reviewer, with expertise in computer science, will be invited to read the report, visit the campus, and meet with faculty members, administrators, and students. The external reviewer will then prepare a report that includes recommendations. In response to this report, an action plan is developed, followed by an administrative response that operationalizes the action plan and sets the strategic direction of the program for the next five years.

In addition to the college-wide assessment plan, the Mathematics and Computer Science department has created a course assessment plan that regularly assesses each course and provides valuable feedback to the instructors and the chair of the department. Using a combination of nationally accepted concept inventory tests and locally generated problem-solving questions and rubrics that are offered on a consistent basis in the relevant classes, the department tracks progress within the semester as well as through time. In addition to individual courses, course sequences and program outcomes are evaluated internally.

Appendix A: Sample Program Scheduling, Course Descriptions for Required Courses, List of New Courses, Syllabi for New Courses

Sample Program Scheduling

Term: Fall #1		Credits per classification				Term: Spring #1		Credits per classification			
Course Number & Title	Cr	LAS	Maj	New	Prerequisite(s)	Course Number & Title	Cr	LAS	Maj	New	Prerequisite(s)
Required Core 1A ENGL-101: English Composition 1	3	X				Required Core 1A ENGL-102: English Composition II	3	X			ENGL-101
Required Core 1B MA-440: Pre-Calculus Mathematics	4	X	X		MA-119 and MA-121 or placement	Flexible Core 2E CS-101: Algorithmic Problem Solving I	4	X	X		Co-requisite MA-441
Flexible Core 2A, 2B, 2C, or 2D	3	X				Flexible Core 2E MA-441: Analytic Geometry & Calculus I	4	X	X		MA-440
Flexible Core 2A, 2B, 2C, or 2D	3	X				Flexible Core 2A, 2B, 2C, or 2D	3	X			
Advised Major Elective	3	X	X								
Term credit total:	16	16	7			Term credit total:	14	14	8		

Term: Fall #2		Credits per classification				Term: Spring #2		Credits per classification			
Course Number & Title	Cr	LAS	Maj	New	Prerequisite(s)	Course Number & Title	Cr	LAS	Maj	New	Prerequisite(s)
CS-203 or 204: Algorithmic Problem Solving II in C++/Java	4	X	X		MA-441 and CS-101	CS-201: Computer Organization and Assembly Language	4	X	X		MA-441 and CS-101
MA-471: Introduction to Discrete Structures	3	X	X		MA-440	MA-442: Analytic Geometry and Calculus II	4	X	X		MA-441
Required Core 1C and related laboratory course	4	X				Advised Major Elective(s)	5	X	X		
Advised Major Elective	3	X	X			Flexible Core Course 2A, 2B, 2C, or 2D	3	X			
Term credit total:	14	14	10			Term credit total:	16	16	13		
Program Totals:	Credits: 60		Liberal Arts & Sciences: 60		Major: 38		Elective & Other: 0				
Cr = credits	LAS = Liberal Arts and Sciences		Maj = major requirement		New = new course		Prerequisite(s) = list prerequisite(s) for the noted courses				

Course Descriptions for Required and Elective Courses

Required Courses

MA-440 Pre-Calculus Mathematics

3 class hours, 2 recitation hours, 4 credits

Prerequisite: MA-119 and MA-121 with a C or better in both courses or MA-114 with a grade of C or better, or advanced math placement

Mathematical foundations necessary for the study of the calculus. An introduction to analytic geometry, and the elementary functions of analysis, including algebraic, trigonometric, logarithmic, and exponential functions. The use of the graphing calculator will be included.

MA-441 Analytic Geometry and Calculus I

4 class hours, 1 recitation hour, 4 credits

Prerequisite: MA-440 (with a grade of C or better) or advanced math placement (see Proficiency in Math and English)

Functions and graphs; derivative of algebraic and trigonometric functions with applications; indefinite and definite integrals with applications; the fundamental theorem of integral calculus; conic sections. Students will develop problem solving skills and construct mathematical models in the computer laboratory using software such as MAPLE, DERIVE, CONVERGE, and MATHCAD.

MA-442 Analytic Geometry and Calculus II

4 class hours, 1 recitation hour, 4 credits

Prerequisite: MA-441 (with a grade of C or better)

Coordinated continuation of MA-441 (Analytic Geometry and Calculus I); transcendental functions; integration by various techniques; parametric equations; infinite series. Students will develop problem solving skills and construct mathematical models in the computer laboratory using software such as MAPLE, DERIVE, CONVERGE, and MATHCAD.

MA-471 Introduction to Discrete Structures

3 class hours, 3 credits

Prerequisite: MA-440

Concepts in set theory, functions, logic, proofs, elementary number theory, introduction to abstract algebra.

CS-101 Algorithmic Problem Solving I

3 class hours, 2 laboratory hours, 4 credits

Co-requisite: MA-441

Primitive data types; single and multidimensional arrays; strings; control structures; basic I/O; subprograms and parameter passing; references; scope; introduction to recursion; designing, coding, debugging and documenting programs in a high-level language.

CS-201 Computer Organization and Assembly Language

3 class hours, 1 recitation hour, 1 lab hour, 4 credits

Prerequisite: CS-101 with a grade of C or better and MA-441

Principles of computer design and implementation. Instruction set architecture and register-transfer level execution; storage formats; binary data encoding; bus structures; assembly language programming.

CS-203 Algorithmic Problem Solving II in C++

3 class hours, 2 recitation hours, 4 credits

Prerequisite: MA-441 and C or better in CS-101

User defined data types, pointers and linked lists, ADT's, stacks, queues, recursion, searching and simple sorting, elementary memory management. Object oriented problem solving.

CS-204 Algorithmic Problem Solving II in Java

3 class hours, 2 laboratory hours, 4 credits

Prerequisite: MA-441 and C or better in CS-101

Algorithmic object-oriented problem solving in Java, elements of graphical user interfaces (GUIs) and event driven programming; exception handling, inheritance and polymorphism; searching and sorting; recursion; linked lists, stacks and queues; file processing; testing and debugging.

Elective Courses

CS-100 Introduction to Computers and Programming

3 class hours, 3 credits

Prerequisite/Co-requisite: Students must complete any developmental requirements in Mathematics (see Proficiency in Math and English) prior to taking this course

Project-based approach to the introduction of programming using a high-level language. Topics illustrate the use of computers in society with projects inspired from: mathematics, physics, statistics, word and image processing, biology, and political science. Covered concepts: objects (including lists, strings), input and output, selective control, iterative control, functions, and modules.

CS-102 Spreadsheet Programming with MS Excel

3 class hours, 1 laboratory hour

Prerequisites: MA-119 with C or better, or Permission of the Department

Introduction to the organization, processing, and analysis of data through programmed spreadsheets, as would apply to data science and related mathematical concepts. Topics include: cell operations, text manipulation, formulas, functions, arrays, charting techniques, pivot tables, conditional formatting, and VBA programming, as they relate to data science.

CS-103 Relational Databases

3 class hours, 2 laboratory hours, 4 credits

Prerequisite: MA-119 with C or better, MA-114 with C or better, or Permission of the Department

Principles of relational databases; data manipulation using SQL queries, as would apply to data science and related mathematical concepts: selection, insertion and deletion, aggregates, joins, views, integrity constraints, triggers; table management; database design. Emphasis is on the writing of SQL queries and PL/SQL scripts in a scalable, cross-platform, and client-server database systems (such as MySQL, PostgreSQL, or Oracle) with an understanding of the mathematical underpinnings.

CS-203 Algorithmic Problem Solving II in C++

3 class hours, 2 recitation hours, 4 credits

Prerequisite: MA-441 and C or better in CS-101

User defined data types, pointers and linked lists, ADT's, stacks, queues, recursion, searching and simple sorting, elementary memory management. Object oriented problem solving.

CS-204 Algorithmic Problem Solving II in Java

3 class hours, 2 laboratory hours, 4 credits

Prerequisite: MA-441 and C or better in CS-101

Algorithmic object-oriented problem solving in Java, elements of graphical user interfaces (GUIs) and event driven programming; exception handling, inheritance and polymorphism; searching and sorting; recursion; linked lists, stacks and queues; file processing; testing and debugging.

CS-220 Discrete Structures

3 class hours, 3 credits

Prerequisite: MA-471

Recursion, recurrence and generating functions; relations; graphs and applications; asymptotics; trees; applications in computer science.

ET-506 Linux Operating System

3 class hours, 2 laboratory hours, 3 credits

Co-requisites: ET-704 or Permission of the Department

This foundation course introduces the basics of LINUX system administration and security. Linux core topics include shell commands and processes with an emphasis on administration including files and directory structure, user and group management, networking and shell scripting. LINUX security topics include: vulnerability analysis, intrusion detection, firewall and file system encryption. Hands-on lab activities will complement the lecture topics.

ET-540 Digital Computer Theory I

3 class hours, 3 laboratory hours, 4 credits

Prerequisites: none

Number systems; Boolean algebra; logic elements; multivibrators; clock circuits; decoders;

counters; data registers. Laboratory hours complement class work.

ET-704 Networking Fundamentals I

3 class hours, 3 laboratory hours, 4 credits

Prerequisites: none

This is an introductory level course that provides students with the basic terminology and skills needed to design, build and maintain small to medium networks. It provides in-depth coverage of the most important concepts in contemporary networking, such as TCP/IP, Ethernet, wireless transmission, virtual networks, cloud computing, segmentation, security, and troubleshooting. Topics include: OSI model; electronics and signals, collisions and collision domains, MAC addressing, LANs, structured cabling, cabling tools, network design and documentation, power supply issues, Internet Protocol addressing and subnetting, network protocols. Hands-on lab activities will complement lecture topics.

ET-710 Front-End UI/UX Web Development

2 class hours, 2 laboratory hours, 3 credits

Prerequisites: none

This course focuses on students developing competency in coding the user experience and user interaction (UI/UX) for front-end, browser-based web applications using HTML, CSS, Frameworks and industry tooling. The student will publish static websites to the internet using traditional web servers and modern object storage while learning current best practices and design patterns for UI/UX website implementation. Topics include: the HTML & CSS languages, Frameworks, responsive web design, source code/version control, an introduction to routing, application programming interfaces (API), API query languages and the fundamentals of cloud computing. Hands-on lab activities and projects complement lecture topics.

ET-725 Computer Network Security

3 class hours, 3 credits

Co-requisites: ET-704

This course covers computer network security design and vulnerabilities. Topics include: Cryptography and encryption, denial-of-service attacks, firewalls and intrusion prevention systems, software and operating system [OS] security, legal and ethical aspects of cybercrime, and computer crime.

MA-119 College Algebra

3 class hours, 1 recitation hour, 3 credits

Prerequisite/Co-requisite: Students must complete any developmental requirements in Mathematics prior to taking this course or enroll in MA-10ALP while taking this course.

A basic presentation of the fundamental concepts of college algebra, systems of linear equations, inequalities, linear, quadratic, exponential, and logarithmic functions. During the recitation hour, students review properties of signed numbers, graphing of linear equations, basic geometric concepts, solution of linear equations, factoring algebraic expressions and its applications to rational expressions.

MA-121 Elementary Trigonometry

1 class hour, 1 credit

Co-requisite: MA-119

This course is a basic presentation of the fundamental concepts of trigonometry, angles and their measure, basic trigonometric functions, right triangle trigonometry, graphing, and solving trigonometric equations.

MA-443 Analytic Geometry and Calculus III

4 class hours, 1 recitation hour, 4 credits

Prerequisite: MA-442 (with a grade of C or better).

Continuation of MA-442 (Analytic Geometry and Calculus II); polar coordinates; solid analytic geometry and vectors; partial derivatives; multiple integrals. Students will develop problem solving skills and construct mathematical models in the computer laboratory using software such as MAPLE, DERIVE, CONVERGE, and MATHCAD.

MA-461 Linear Algebra

4 class hours, 1 recitation hour, 4 credits

Prerequisite: MA-441 (with a grade of C or better)

Vector spaces; systems of linear equations; determinants; linear operations; matrices; inner product spaces; eigenvalues and eigenvectors. Students will solve application problems using software such as MAPLE.

MA-481 Probability and Statistics

3 class hours, 3 credits

Co-requisite: MA-442

Axioms of probability, combinatorial methods, conditional probability, discrete and continuous random variables and distributions, binomial, Poisson, normal and exponential distributions, independent discrete random variables, Law of Large Numbers and the Central Limit Theorem, expectation, confidence intervals and test of hypotheses.

MA-905 Undergraduate Research in Mathematics and/or Computer Science I

90 Hours of Research, 2 credits

Prerequisite: MA-440 or permission of the Department. Students must have permission from the course instructor and a letter of recommendation from a Math and Computer Science instructor who has had the student in a college-level class.

MA-905 will focus on a specific research question or topic to be announced in advance and will vary each semester as well as it will vary by section. Descriptions of the research topic in a particular section in a particular semester will be available in the Math & CS Department before registration. Areas of research include but are not limited to: Mathematical Modeling, Simulations, Computer Coding or Web Design, Statistical Research, Logic, Algebra, Geometry, Number Theory, Actuarial Science, Signal Processing, Mathematical Neuroscience, Dynamical Systems, Pedagogical Research (in Math), and History of Mathematics.

MA-906 Undergraduate Research in Mathematics and/or Computer Science II

90 Hours of Research, 2 credits

Prerequisite: MA-905 or permission of the Department. Students must have permission from the course instructor to register for a section of this course.

MA-906 will be offered exclusively to student-faculty pairs working on a research question or topic started in MA-905 but that requires a second semester of research to be completed in a meaningful way.

[New Courses](#)

No new courses are required for proposed degree program.

Appendix B: Faculty Teaching Assignments

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Haishen Yao Professor and Chair	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Haya Adner Professor	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Zeynep Akcay Ozkan Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Applied Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Changiz Alizadeh Lecturer	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.A., Mathematics	
Lyubomir Boyadzhiev Assistant Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Andrew Bulawa Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Beata Ewa Carvajal Lecturer	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441	Full-time, 10%	M.A., Mathematics	
Steven Cheng Lecturer	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441	Full-time, 10%	M.A., Mathematics Education	
Kwai Chiu Lecturer	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441	Full-time, 10%	M.A., Mathematics	
Danielle Cifone Lecturer	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-461, MA-471, MA-481	Full-time, 10%	M.A., Mathematics Education	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Jonathan Cornick Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematical Sciences	
Yusuf Danisman Assistant Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 30%	Ph.D., Mathematics	
Robert W. Donley, Jr. Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Mercedes Franco Professor	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Applied Mathematics	
Jonathan Funk Associate Professor	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Daniel Garbin Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 30%	Ph.D., Mathematics	
John Gordon Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Yusuf Z. Gurtas Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Robert J. Holt Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Francis Jordan Associate Professor	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Nataliya Khomyak Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-471, MA-905/6	Full-time, 10%	M.A., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Kwang Hyun Kim Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 30%	Ph.D., Mathematics	
Carolyn King Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Urban Education-SMT	
Whanki Lee Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Lixu Li Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442	Full-time, 10%	M.A, Mathematics	
Wenjian Liu Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Lucian Makalanda Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.A., Mathematics	
Azita Mayeli Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Richard Micieli Lecturer	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 30%	M.S., Computer Science M.A., Mathematics	
Nam Jong Moh Associate Professor	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
David N. Pham Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Susana Pinheiro Assistant Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Karan M. Puri Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Tian Ren Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Andrew S.H. Russell Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.A. and M.S., Mathematics Education	
Kenneth Schmidt Lecturer	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.A., Mathematics Education	
Venessa Singhroy Assistant Professor	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Educational Psychology (specialization in Quantitative Methods)	
Bianca Sosnovski Assistant Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Eric Sponza Lecturer	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.A., Mathematics	
Howard Sporn Associate Professor	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ed.D., Mathematics Education	
Ewa Stelmach Lecturer	CS-100, CS-101, CS-102, CS-103, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics Education	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Kostas Stroumbakis Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ed.D., Mathematics Education	
Evelyn Tam Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.A., Mathematics	
Clara Wajngurt Professor	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Patrick Wallach Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	D.A., Mathematics	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Biao Wang Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Fei Ye Associate Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	Ph.D., Mathematics	
Esmay Yildirim Assistant Professor	CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220, MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 100%	Ph.D., Computer Science	

Existing Core Faculty				
Faculty Member Name, Title, and Rank	Courses to be taught	Full-time or Part-time (If Full-time identify % of time to the program)	Highest Earned Degree, Discipline, IHE	Additional qualifications
Reuvain Zahavy Lecturer	MA-119, MA-121, MA-440, MA-441, MA-442, MA-443, MA-451, MA-461, MA-471, MA-481, MA-905/6	Full-time, 10%	M.S., Mathematics	

Appendix C: Financial Tables

Enrollment and Seat Projection

Projected Enrollment	Year One	Year Two	Year Three	Year Four	Year Five
Existing Full-time Students	25	35	45	50	60
In-State	25	35	45	50	60
Out-of-State					
Existing Full-time Total	25	35	45	50	60
Existing Part-time Students	5	5	5	5	5
In-State	5	5	5	5	5
Out-of-State					
Existing Part-time Total	5	5	5	5	5
New Full-time Students	2	10	15	15	15
In-State	2	10	15	15	15
Out-of-State					
NEW Full-time Total	2	10	15	15	15
New Part-time Students	1	1	2	2	2
In-State	1	1	2	2	2
Out-of-State					
New Part-time Total	1	1	2	2	2
Section Seats per Student	Year One	Year Two	Year Three	Year Four	Year Five
Full-time Students	27	45	60	65	75
Existing Courses	7	7	7	7	7
New Courses	3	3	3	3	3
Total (normally equals 10)	10	10	10	10	10
Part-Time Students	6	6	7	7	7
Existing Courses	3	3	3	3	3
New Courses	1	1	1	1	1
Total (normally equals 4-6)	4	4	4	4	4
Seat & Section Needs	Year One	Year Two	Year Three	Year Four	Year Five
	2022-23	2023-24	2024-25	2025-26	2026-27
Seat Need for Existing Students					
Existing Courses	(80)	(110)	(140)	(155)	(185)
New Courses	80	110	140	155	185
Seat Need for New Students					
Existing Courses	17	73	111	111	111
New Courses	7	31	47	47	47
Total Seat Need					
Existing Courses	(63)	(37)	(29)	(44)	(74)
Avail. Seats in Existing Courses					
Net Seat Need in Existing	(63)	(37)	(29)	(44)	(74)
New Courses	87	141	187	202	232
All Courses	24	104	158	158	158
Average Seats per Section					
Existing Courses	24	24	24	24	24
New Courses	24	24	24	24	24
Net New Section Need					
Existing Courses	-2.6	-1.5	-1.2	-1.8	-3.1
New Courses	3.6	5.9	7.8	8.4	9.7
Total	1.0	4.3	6.6	6.6	6.6

Projected Revenue

Projected Revenue Related to the Proposed Program					
	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
Revenues[1]	Academic Year[2]	Academic Year [†]	Academic Year [†]	Academic Year [†]	Academic Year [†]
Tuition Revenue[3]					
01. From Existing Sources[4]	\$132,030	\$184,610	\$239,240	\$270,003	\$328,399
02. From New Sources[5]	\$11,718	\$51,904	\$80,415	\$82,023	\$83,663
03. Total	\$143,748	\$236,514	\$319,655	\$352,026	\$412,062
State Revenue[6]					
04. From Existing Sources [§]	\$64,183	\$88,403	\$112,623	\$124,733	\$148,953
05. From New Sources ^{**}	\$5,571	\$24,947	\$37,783	\$37,783	\$37,783
06. Total	\$69,754	\$113,350	\$150,406	\$162,516	\$186,736
Other Revenue[7]					
07. From Existing Sources [§]	\$0	\$0	\$0	\$0	\$0
08. From New Sources ^{**}	\$0	\$0	\$0	\$0	\$0
09. Total	\$0	\$0	\$0	\$0	\$0
Grand Total[8]					
10. From Existing Sources [§]	\$196,213	\$273,013	\$351,863	\$394,736	\$477,352
11. From New Sources ^{**}	\$17,289	\$76,850	\$118,198	\$119,806	\$121,447
TOTAL	\$213,502	\$349,863	\$470,061	\$514,542	\$598,799

Revenue (Supporting Materials)

	2023/24	2024/25	2025/26	2026/27	2027/28
EXISTING FULL-TIME STUDENTS	Year One	Year Two	Year Three	Year Four	Year Five
Tuition & Fees:					
# of EXISTING FULL-TIME, In-State Students (linked from "Enroll & Seat Need Projections")	25	35	45	50	60
Tuition Income (calculates 2% increase per year after Fall 2023)	\$4,896	\$4,994	\$5,094	\$5,196	\$5,300
Total Tuition	\$122,400	\$174,787	\$229,221	\$259,784	\$317,975
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total In-State Tuition & Fees	\$122,400	\$174,787	\$229,221	\$259,784	\$317,975
Tuition & Fees:					
# of EXISTING FULL-TIME, Out-of-State Students (linked from "Enroll & Seat Need Projections")	0	0	0	0	0
Annual Avg # of Credits per FT student (24-30)					
Tuition Income (Specify Rate per credit. Calculates 2% annual increase after Fall 2023)	\$326	\$333	\$339	\$346	\$353
Total Tuition	\$0	\$0	\$0	\$0	\$0
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total Out-of-State Tuition & Fees	\$0	\$0	\$0	\$0	\$0
TOTAL EXISTING FULL-TIME TUITION REVENUE	\$122,400	\$174,787	\$229,221	\$259,784	\$317,975
EXISTING PART-TIME STUDENTS	Year One	Year Two	Year Three	Year Four	Year Five
Tuition & Fees:					
# of EXISTING PART-TIME, In-State Students (linked from "Enroll & Seat Need Projections")	5	5	5	5	5
Total Enrolled Credits (Enter Avg # credits per student per year-Fall+ Spring+Summer – i.e. 6 Fall, 6 Spring, 3 Summer=15)	9	9	9	9	9
Tuition Income (Specify Rate per credit. Calculates 2% increase per year after Fall 2023)	\$214	\$218	\$223	\$227	\$232
Total Tuition	\$9,630	\$9,823	\$10,019	\$10,219	\$10,424
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total In-State Tuition & Fees	\$9,630	\$9,823	\$10,019	\$10,219	\$10,424
Tuition & Fees:					
# of EXISTING PART-TIME Out of State Students (linked from "Enrollment and Seat Need Projections")	0	0	0	0	0
Total Enrolled Credits (Enter Avg # credits per student per year-Fall+ Spring+Summer – i.e. 6 Fall, 6 Spring, 3 Summer=15)					
Tuition Income (Specify Rate per credit. Calculates 2% increase per year after Fall 2023)	\$320	\$326	\$333	\$340	\$346
Total Tuition	\$0	\$0	\$0	\$0	\$0
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total Out-of-State Tuition & Fees	\$0	\$0	\$0	\$0	\$0
TOTAL EXISTING PART TIME REVENUE	\$9,630	\$9,823	\$10,019	\$10,219	\$10,424
TOTAL EXISTING REVENUE (LINKS TO REVENUE SPREADSHEET ROW 5)	\$132,030	\$184,610	\$239,240	\$270,003	\$328,399

NEW FULL-TIME STUDENTS	Year One	Year Two	Year Three	Year Four	Year Five
Tuition & Fees:					
# of NEW FULL-TIME, In-State Students (linked from "Enroll & Seat Need Projections")	2	10	15	15	15
Tuition Income (Calculates 2% increase per year after Fall 2023)	\$4,896	\$4,994	\$5,094	\$5,196	\$5,300
Total Tuition	\$9,792	\$49,939	\$76,407	\$77,935	\$79,494
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total In-State Tuition & Fees	\$9,792	\$49,939	\$76,407	\$77,935	\$79,494
Tuition & Fees:					
# of NEW FULL-TIME, Out-of-State Students (linked from "Enroll & Seat Need Projections")	0	0	0	0	0
Annual Avg # of Credits per FT student (24-30)					
Tuition Income (Specify Rate per credit. Calculates 2% increase per year after Fall 2023)	\$326	\$333	\$339	\$346	\$353
Total Tuition	\$0	\$0	\$0	\$0	\$0
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total Out-of-State Tuition & Fees	\$0	\$0	\$0	\$0	\$0
TOTAL NEW FULL-TIME TUITION REVENUE	\$9,792	\$49,939	\$76,407	\$77,935	\$79,494
NEW PART-TIME STUDENTS	Year One	Year Two	Year Three	Year Four	Year Five
Tuition & Fees:					
# of NEW PART-TIME, In-State Students (linked from "Enroll & Seat Need Projections")	1	1	2	2	2
Total Enrolled Credits (Enter Avg # credits per student per year-Fall+Spring+Summer -- i.e. 6 Fall, 6 Spring, 3 Summer=15)	9	9	9	9	9
Tuition Income (Specify Rate per credit. Calculates 2% increase per year after Fall 2023)	\$214	\$218	\$223	\$227	\$232
Total Tuition	\$1,926	\$1,965	\$4,008	\$4,088	\$4,170
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total In-State Tuition & Fees	\$1,926	\$1,965	\$4,008	\$4,088	\$4,170
Tuition & Fees:					
# of NEW PART-TIME, Out-of-State Students	0	0	0	0	0
Total Enrolled Credits (Enter Avg # credits per student per year-Fall+Spring+Summer -- i.e. 6 Fall, 6 Spring, 3 Summer=15)					
Tuition Income (Specify Rate per credit) calculates 2% increase per year	\$326	\$333	\$339	\$346	\$353
Total Tuition	\$0	\$0	\$0	\$0	\$0
Student Fees (enter ANNUAL program fees other than standard CUNY fees)					
Total Fees	0	0	0	0	0
Total Out-of-State Tuition & Fees	\$0	\$0	\$0	\$0	\$0
TOTAL NEW PART-TIME REVENUE	\$1,926	\$1,965	\$4,008	\$4,088	\$4,170
TOTAL NEW REVENUE (LINKS TO REVENUE SPREADSHEET ROW 7)	\$11,718	\$51,904	\$80,415	\$82,023	\$83,663
STATE REVENUE	Year One	Year Two	Year Three	Year Four	Year Five
# EXISTING FTEs	26.5	36.5	46.5	51.5	61.5
Appropriation per FTE	\$2,422	\$2,422	\$2,422	\$2,422	\$2,422
STATE REVENUE FROM EXISTING SOURCES -LINKS TO REVENUE SPREADSHEET ROW 9	\$64,183	\$88,403	\$112,623	\$124,733	\$148,953
# NEW FTEs	2.3	10.3	15.6	15.6	15.6
Appropriation per FTE	\$2,422	\$2,422	\$2,422	\$2,422	\$2,422
STATE REVENUE FROM NEW SOURCES -LINKS TO REVENUE SPREADSHEET ROW 11	\$5,571	\$24,947	\$37,783	\$37,783	\$37,783
OTHER REVENUE	Year One	Year Two	Year Three	Year Four	Year Five
Other Revenue From Existing Sources (specify and explain)-LINKS TO REVENUE SPREADSHEET ROW 13)					
Other Revenue New (specify and explain) (LINKS TO REVENUE SPREADSHEET ROW 15)					

Expenditures

	2023/24	2024/25	2025/26	2026/27	2027/28
	Year 1	Year 2	Year 3	Year 4	Year 5
DIRECT OPERATING EXPENSES					
<small>Include additional expenses incurred by other programs when satisfying needs of new program. Faculty need should be commensurate with "net section needs" based on enrollment (see "Enroll & Seat Need Projections" tab)</small>					
Current Full Time Faculty Overload (include Summer)					
New Full Time Faculty Base Salary (list separately)					
New Full Time Faculty Overload (include Summer)					
New Faculty Re-assigned Time (list separately)					
Full Time Employee Fringe Benefits (41.6%)	0	0	0	0	0
Total (Links to Full-Time Faculty on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
Part Time Faculty Actual Salaries	\$ 11,500.20	\$ 11,500.20	\$ 11,500.20	\$ 11,500.20	\$ 11,500.20
Part Time Faculty Actual Fringe Benefits (24.3%)	\$ 2,794.55	\$ 2,794.55	\$ 2,794.55	\$ 2,794.55	\$ 2,794.55
Total (Links to Part-Time Faculty Program Exp Worksheet)	\$ 14,294.75	\$ 14,294.75	\$ 14,294.75	\$ 14,294.75	\$ 14,294.75
Full Time Staff Base Salary (list separately)					
Full Time Staff Fringe Benefits (41.6%)	0	0	0	0	0
Total (Links to Full-Time Staff on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
	Year 1	Year 2	Year 3	Year 4	Year 5
PART-TIME STAFF (do not include library staff in this section)					
Part Time Staff Base Salary (list separately)					
Faculty Replacement Costs (replacement of full-time faculty - e.g. on release time - with part-time faculty)					
Graduate Assistants					
Student Hourly					
Part Time Employee Fringe Benefits (24.3%)	0	0	0	0	0
Total (Links to Part-Time Staff on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
LIBRARY					
Library Resources					
Library Staff Full Time (List Separately)					
Full Time Staff Fringe Benefits (41.6%)	0	0	0	0	0
Library Staff Part Time (List Separately)					
Part Time Employee Fringe Benefits (24.3%)	0	0	0	0	0
TOTAL (Links to Library on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
EQUIPMENT					
Computer Hardware					
Office Furniture					
Other (Specify)					
Total (Links to Equipment on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
LABORATORIES					
Laboratory Equipment					
Other (list separately)					
TOTAL (Links to Laboratories on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
	Year 1	Year 2	Year 3	Year 4	Year 5
SUPPLIES AND EXPENSES (OTPS)					
Consultants and Honoraria					
Office Supplies					
Instructional Supplies					
Faculty Development					
Travel and Conferences					
Membership Fees					
Advertising and Promotion					
Accreditation					
Computer Software					
Computer License Fees					
Computer Repair and Maintenance					
Equipment Repair and Maintenance					
New Total Supplies and OTPS Expenses (Links to Supplies on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
CAPITAL EXPENDITURES					
Facility Renovations					
Classroom Equipment					
Other (list separately)					
TOTAL (Links to Capital Expenditures on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -
Other (list separately)					
TOTAL (Links to Other on Program Exp Worksheet)	\$ -	\$ -	\$ -	\$ -	\$ -

Appendix D: Articulation Agreements

This proposal contains articulation agreements with the B.A. and B.S. in Computer Science programs at Queens College.

The City University of New York
Articulation Agreement Between
Queensborough Community College
and
Queens College

A. Sending and Receiving Institutions

Sending Institution: Queensborough Community College (QCC)
Department: Mathematics and Computer Science
Program: Computer Science
Degree: Associate of Science (A.S.)

Receiving Institution: Queens College (QC)
Department: Computer Science
Program: Computer Science
Degree: Bachelor of Science (B.S.)

B. Admission Requirements for Senior College Program

Minimum GPA: 2.0
Minimum grade for CSCI courses required for the major: C
Minimum grade for non-CSCI courses required for the major: C-

To take advantage of this articulation agreement, students must complete the A.S. in Computer Science at Queensborough Community College prior to transfer to Queens College. Upon transfer, students must declare a major in Computer Science.

Total transfer credits granted toward the baccalaureate degree: 60 credits. Total additional credits required at the Queens College to complete the baccalaureate degree: 60 credits

C. Course-to-Course Equivalencies and Transfer Credit Awarded

Queensborough Community College		Queens College		
Course and Title	Credit	Course and Title	Credit	Transfer Credits
Common Core Requirements		Course Equivalency		
Required Core 1A:		English Composition 1 and 2:		
ENGL-101 English Composition I	3	ENGL 110 College Writing I	3	3
ENGL-102 English Composition II	3	ENGL 130 Writing about Literature in English	3	3
Required Core 1B: MA-440 Pre-Calculus Mathematics ^{1,2,3}	4	Math and Quantitative Reasoning: MATH 122 Precalculus	4	4
Required Core 1C: Select one course	3-4	Life and Physical Sciences:	3-4	3-4
Flexible Core 2A: Select one course	3	World Cultures and Global Issues	3	3
Flexible Core 2B: Select one course	3	US Experience in Its Diversity	3	3
Flexible Core 2C: Select one course	3	Creative Expression	3	3
Flexible Core 2D: Select one course	3	Individual and Society	3	3
Flexible Core 2E: CS-101 Algorithmic Problem Solving I ³	4	Scientific World: CSCI-111 + CSCI 499	4	4
Additional Flexible Core Course: MA-441 Calculus I ^{2,3}	4	Additional Flexible Core Course: MATH 151 Calculus	4	4
Subtotal	33-34	Subtotal	33-34	
Requirements for the Major		Course Equivalency		
CS-201 Computer Organization and Assembly Language	4	CSCI 240 Computer Org and Assembly Lang + CSCI 499	4	4
CS-203 Algorithmic Problem Solving II in C++ or CS-204 Algorithmic Problem Solving II in Java	4	CSCI 211 Object-Oriented Prog in C++ or CSCI 212 Object -Oriented Prog in Java + CSCI 499	4	4
MA-442 Analytic Geometry and Calculus II	4	MATH 152 Calculus/Integration and Infinite Series	4	4
MA-471 Introduction to Discrete Mathematics	3	MATH 120 Discrete Math	3	3
Subtotal	15	Subtotal	15	
Major Electives - Select 11 credits from below, recommended courses in bold				
CS-100 Introduction to Computers and Programming	3	CSCI 80 Problem Solving with Computers	3	3
CS-102 Spreadsheet Programming with MS Excel	3	CSCI 48 Spreadsheet Programming	3	3
CS-103 Relational Databases	4	CSCI 85 Database Application Programming + CSCI 499	4	4
CS-203 Algorithmic Problem Solving II in C++	4	CSCI 211 Object-Oriented Prog in C++ + CSCI 499	4	4
CS-204 Algorithmic Problem Solving II in Java	4	CSCI 212 Object -Oriented Prog in Java + CSCI 499	4	4
CS-220 Discrete Structures	3	CSCI 220 Discrete Structures	3	3
ET-506 Linux Operating System	3	LAE 499 Liberal Arts Elective	3	3
ET-540 Digital Computer Theory I	3	NLAE 499 Non-Liberal Arts Elective Credit	3	3
ET-704 Networking Fundamentals I	3	CSCI 499 Computer Science Elective Credit	3	3
ET-710 Front-End UI/UX Web Development	3	CSCI 499 Computer Science Elective Credit	3	3
ET-725 Computer Network Security	3	LAE 499 Liberal Arts Elective	3	3
MA-119 College Algebra ¹	3	LAE 499 Liberal Arts Elective	3	3
MA-121 Elementary Trigonometry ¹	1	LAE 499 Liberal Arts Elective	1	1
MA-443 Analytic Geometry and Calculus III	4	MATH 201 Multivariable Calculus	4	4
MA-451 Differential Equations	4	MATH 223 Diff Equations with Num Methods I + MATH 499	4	4
MA-461 Linear Algebra	4	MATH 231 Linear Algebra	4	4
MA-481 Probability and Statistics	3	MATH 241 Intro to Prob and Math Statistics	3	3
MA-905 Undergraduate Res in Math/Comp Sci I	2	MATH 499 Mathematics Elective Credit	2	2
MA-906 Undergraduate Res in Math/Comp Sci II	2	MATH 499 Mathematics Elective Credit	2	2
Subtotal	11	Subtotal	11	
Additional Requirements		Course Equivalency		
One laboratory science course – Select from: BI-132, BI-171, CH-102, CH-111, CH-121, ET-842, or PH-112 ⁴	0-1	To be evaluated upon transfer	–	0-1
Subtotal	0-1	Subtotal	0-1	
Total	60	Total	60	

Notes

- Depending on their incoming math placement, students may be required to complete MA-119 and/or MA-121 (both with a C or better) prior to MA-440. When required by math placement, MA-119 and MA-121 will count as major electives.
- Students who place into mathematics at MA-441 will use that course to satisfy Required Core 1B, use MA-442 in the Flexible Core, and take an additional 4 credits of major elective courses to reach 60 credits.
- Students are required to take specific courses in some areas of the Common Core that fulfill both general education and major requirements. If students do not take the required courses in the Common Core, they will have to take additional credits to complete their degree requirements.
- Students who take a STEM variant for Required Core 1C have satisfied this requirement.

All students must successfully complete two (2) writing-intensive classes (designated "WI") to fulfill degree requirements. MA-471 is a writing-intensive (WI) course.

D. Senior College Courses Remaining for Baccalaureate Degree

Course and Title	Credits
College Option General Education Courses	
One Literature Course (LIT)	3
One Language Course (LANG)	3
Major Requirements ¹	
CSCI 211 Object-Oriented Prog in C++ or CSCI 212 Object-Oriented Prog in Java (If not taken as a major elective at QCC)	0-3
CSCI 220 - Discrete Structures (If not taken as a major elective at QCC)	0-3
CSCI 313 Data Structures	3
CSCI 316 Principles of Programming Languages	3
CSCI 320 Theory of Computation	3
CSCI 323 Design & Analysis of Algorithms	3
CSCI 331 Database Systems	3
CSCI 340 Operating Systems Principles	3
CSCI 343 Computer Architecture	3
CSCI 370 Software Engineering	3
MATH 241 Probability and Statistics (If not taken as a major elective at QCC)	0-3
MATH 231 Linear Algebra I (If not taken as a major elective at QCC)	0-3
Select 21 credits of major electives – <u>see the QC Bulletin for options</u> (MATH 223 may be taken as a major elective at QCC)	18-21
Subtotal²	48-60
Additional course work to reach 120 credits	0-12
Total credits to be earned at Queens College	60

Notes:

1. Minimum Grade Requirements All computer science courses required for the major must be completed with a minimum grade of C. All other courses required for the major must be completed with a minimum grade of C-. A required course may not serve as a prerequisite until it has been passed with an appropriate minimum grade or better. Courses completed at QCC that do not meet the minimum grade requirement at QC must be repeated and passed with the required minimum grade.
2. Students must complete at least half the courses for the majors Queens College.

E. Summary of Credits Required

Total credits to be earned at Queensborough Community College	60
Total credits to be earned at Queens College	60
Total credits required for the B.S. degree	120

F. Articulation Agreement Follow-up Procedures

Procedures for reviewing, updating, modifying, or terminating the agreement:

This agreement will be valid for 3 academic years from the Effective Date (below). Each year, there will be a review of the agreement's effectiveness by the Academic Affairs Officers at each institution.

When any of the programs within this agreement undergo any changes relevant to this agreement, this agreement will be reviewed and revised as necessary by the Curriculum Committees of both the sending and receiving program.

Either party may independently cancel this agreement by notifying the other party no less than one academic year before the intended date of cancellation.

Procedures for evaluating agreement:

Queens College will keep data on the academic progress of the transfer students. Upon request, it will provide Queensborough Community College with names and academic status of all recent transfer students from QCC pursuing the abovementioned bachelor's degree program.

Sending and receiving college procedures for publicizing agreement:

Queensborough Community College and Queens College will collaborate in publicizing this agreement on their websites and in their catalogs. They will share brochures and other marketing materials including web-based promotions. Transfer advisors will be made aware of this agreement and will have available all necessary materials to publicize the agreement to the students with whom they work.

Members of the Senior College Enrollment Management Division will have this agreement and attend recruitment events at the Sending Institution. They will be assisted by the Office of Academic Affairs and the Transfer Resource Center at Queensborough Community College.

Effective Date: Fall 2023

For Queensborough Community College:

Sandra Palmer Jan 4, 2023
Sandra Palmer (Jan 4, 2023 08:02 EST)

Sandra Palmer, Ph.D. Date
Interim Provost and Vice-President
for Academic Affairs

Michael Pullin Jan 3, 2023

Michael Pullin, Ph.D. Date
Dean of Academic Initiatives

Haishen Yao Jan 3, 2023

Haishen Yao, Ph.D. Date
Professor and Chair, Department
of Mathematics and Computer
Science

For Queens College:

Meghan Healey Jan 3, 2023

Patricia Price, Ph.D. Date
Interim Provost and Senior Vice
President for Academic Affairs

Meghan Healey Jan 3, 2023

Meghan Healey, Ph.D. Date
Interim Associate Provost for
Academic and Faculty Affairs

Alexander Ryba Jan 3, 2023
alexander ryba (Jan 3, 2023 16:46 EST)

Alexander Ryba, Ph.D. Date
Professor and Chair, Department of
Computer Science

The City University of New York
Articulation Agreement Between
Queensborough Community College
and
Queens College

A. Sending and Receiving Institutions

Sending Institution: Queensborough Community College (QCC)
Department: Mathematics and Computer Science
Program: Computer Science
Degree: Associate of Science (A.S.)

Receiving Institution: Queens College (QC)
Department: Computer Science
Program: Computer Science
Degree: Bachelor of Arts (B.A.)

B. Admission Requirements for Senior College Program

Minimum GPA: 2.0
Minimum grade for CSCI courses required for the major: C
Minimum grade for non-CSCI courses required for the major: C-

To take advantage of this articulation agreement, students must complete the A.S. in Computer Science at Queensborough Community College prior to transfer to Queens College. Upon transfer, students must declare a major in Computer Science.

Total transfer credits granted toward the baccalaureate degree: 60 credits. Total additional credits required at the Queens College to complete the baccalaureate degree: 60 credits

C. Course-to-Course Equivalencies and Transfer Credit Awarded

Queensborough Community College		Queens College		
Course and Title	Credit	Course and Title	Credit	Transfer Credits
Common Core Requirements		Course Equivalency		
Required Core 1A: ENGL-101 English Composition I	3	English Composition 1 and 2: ENGL 110 College Writing I	3	3
ENGL-102 English Composition II	3	ENGL 130 Writing about Literature in English	3	3
Required Core 1B: MA-440 Pre-Calculus Mathematics ^{1,2,3}	4	Math and Quantitative Reasoning: MATH 122 Precalculus	4	4
Required Core 1C: Select one course	3-4	Life and Physical Sciences:	3-4	3-4
Flexible Core 2A: Select one course	3	World Cultures and Global Issues	3	3
Flexible Core 2B: Select one course	3	US Experience in Its Diversity	3	3
Flexible Core 2C: Select one course	3	Creative Expression	3	3
Flexible Core 2D: Select one course	3	Individual and Society	3	3
Flexible Core 2E: CS-101 Algorithmic Problem Solving I ³	4	Scientific World: CSCI-111 + CSCI 499	4	4
Additional Flexible Core Course: MA-441 Calculus I ^{2,3}	4	Additional Flexible Core Course: MATH 151 Calculus	4	4
Subtotal	33-34	Subtotal	33-34	
Requirements for the Major		Course Equivalency		
CS-201 Computer Organization and Assembly Language	4	CSCI 240 Computer Org and Assembly Lang + CSCI 499	4	4
CS-203 Algorithmic Problem Solving II in C++ or CS-204 Algorithmic Problem Solving II in Java	4	CSCI 211 Object-Oriented Prog in C++ or CSCI 212 Object -Oriented Prog in Java + CSCI 499	4	4
MA-442 Analytic Geometry and Calculus II	4	MATH 152 Calculus/Integration and Infinite Series	4	4
MA-471 Introduction to Discrete Mathematics	3	MATH 120 Discrete Math	3	3
Subtotal	15	Subtotal	15	
Major Electives - Select 11 credits from below, recommended courses in bold				
CS-100 Introduction to Computers and Programming	3	CSCI 80 Problem Solving with Computers	3	3
CS-102 Spreadsheet Programming with MS Excel	3	CSCI 48 Spreadsheet Programming	3	3
CS-103 Relational Databases	4	CSCI 85 Database Application Programming + CSCI 499	4	4
CS-203 Algorithmic Problem Solving II in C++	4	CSCI 211 Object-Oriented Prog in C++ + CSCI 499	4	4
CS-204 Algorithmic Problem Solving II in Java	4	CSCI 212 Object -Oriented Prog in Java + CSCI 499	4	4
CS-220 Discrete Structures	3	CSCI 220 Discrete Structures	3	3
ET-506 Linux Operating System	3	LAE 499 Liberal Arts Elective	3	3
ET-540 Digital Computer Theory I	3	NLAE 499 Non-Liberal Arts Elective Credit	3	3
ET-704 Networking Fundamentals I	3	CSCI 499 Computer Science Elective Credit	3	3
ET-710 Front-End UI/UX Web Development	3	CSCI 499 Computer Science Elective Credit	3	3
ET-725 Computer Network Security	3	LAE 499 Liberal Arts Elective	3	3
MA-119 College Algebra ¹	3	LAE 499 Liberal Arts Elective	3	3
MA-121 Elementary Trigonometry ¹	1	LAE 499 Liberal Arts Elective	1	1
MA-443 Analytic Geometry and Calculus III	4	MATH 201 Multivariable Calculus	4	4
MA-451 Differential Equations	4	MATH 223 Diff Equations with Num Methods I + MATH 499	4	4
MA-461 Linear Algebra	4	MATH 231 Linear Algebra	4	4
MA-481 Probability and Statistics	3	MATH 241 Intro to Prob and Math Statistics	3	3
MA-905 Undergraduate Res in Math/Comp Sci I	2	MATH 499 Mathematics Elective Credit	2	2
MA-906 Undergraduate Res in Math/Comp Sci II	2	MATH 499 Mathematics Elective Credit	2	2
Subtotal	11	Subtotal	11	
Additional Requirements		Course Equivalency		
One laboratory science course – Select from: BI-132, BI-171, CH-102, CH-111, CH-121, ET-842, or PH-112 ⁴	0-1	To be evaluated upon transfer	-	0-1
Subtotal	0-1	Subtotal	0-1	
Total	60	Total	60	

Notes

- Depending on their incoming math placement, students may be required to complete MA-119 and/or MA-121 (both with a C or better) prior to MA-440. When required by math placement, MA-119 and MA-121 will count as major electives.
- Students who place into mathematics at MA-441 will use that course to satisfy Required Core 1B, use MA-442 in the Flexible Core, and take an additional 4 credits of major elective courses to reach 60 credits.
- Students are required to take specific courses in some areas of the Common Core that fulfill both general education and major requirements. If students do not take the required courses in the Common Core, they will have to take additional credits to complete their degree requirements.
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D. Senior College Courses Remaining for Baccalaureate Degree

Course and Title	Credits
College Option General Education Courses	
One Literature Course (LIT)	3
One Language Course (LANG)	3
Major Requirements ¹	
CSCI 211 Object-Oriented Prog in C++ or CSCI 212 Object-Oriented Prog in Java (If not taken as a major elective at QCC)	0-3
CSCI 220 - Discrete Structures (If not taken as a major elective at QCC)	0-3
CSCI 313 Data Structures	3
CSCI 316 Principles of Programming Languages	3
CSCI 320 Theory of Computation	3
CSCI 323 Design & Analysis of Algorithms	3
CSCI 331 Database Systems	3
CSCI 340 Operating Systems Principles	3
CSCI 343 Computer Architecture	3
CSCI 370 Software Engineering	3
MATH 241 Probability and Statistics (If not taken as a major elective at QCC)	0-3
MATH 231 Linear Algebra I (If not taken as a major elective at QCC)	0-3
Select 9 credits of major electives – see the QC Bulletin for options (MATH 223 may be taken as a major elective at QCC)	6-9
Subtotal²	36-51
Additional course work to reach 120 credits	9-24
Total credits to be earned at Queens College	60

Notes:

1. Minimum Grade Requirements All computer science courses required for the major must be completed with a minimum grade of C. All other courses required for the major must be completed with a minimum grade of C-. A required course may not serve as a prerequisite until it has been passed with an appropriate minimum grade or better. Courses completed at QCC that do not meet the minimum grade requirement at QC must be repeated and passed with the required minimum grade.
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Effective Date: Fall 2023

For Queensborough Community College:

Sandra Palmer Jan 4, 2023
Sandra Palmer (Jan 4, 2023 08:03 EST)
Sandra Palmer, Ph.D. Date
Interim Provost and Vice-President
for Academic Affairs

For Queens College:

Meghan Healey Jan 10, 2023
Patricia Price, Ph.D. Date
Interim Provost and Senior Vice
President for Academic Affairs

Michael Pullin Jan 3, 2023
Michael Pullin, Ph.D. Date
Dean of Academic Initiatives

Meghan Healey Jan 10, 2023
Meghan Healey, Ph.D. Date
Interim Associate Provost for
Academic and Faculty Affairs

Haishen Yao Jan 3, 2023
Haishen Yao, Ph.D. Date
Professor and Chair, Department
of Mathematics and Computer
Science

alexander ryba Jan 3, 2023
alexander ryba (Jan 3, 2023 16:45 EST)
Alexander Ryba, Ph.D. Date
Professor and Chair, Department of
Computer Science

Appendix E: Careers in Computer Science and Sample Job Advertisements

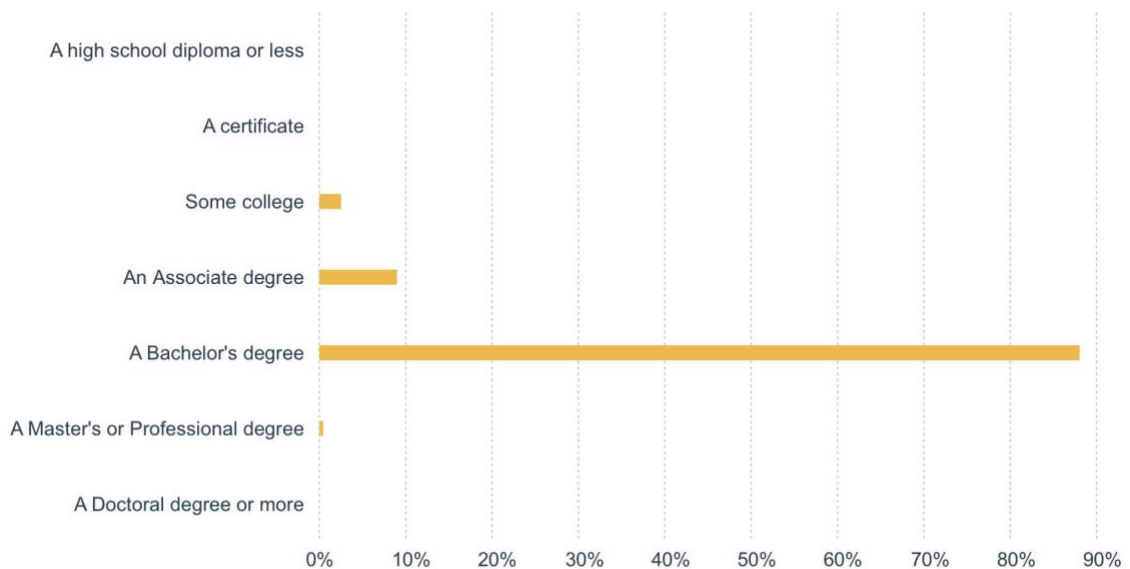
Careers for Computer Science Majors

A degree in Computer Science in New York can offer job opportunities in positions such as software developers, computer programmers, web developers, software quality assurance analysts and testers, web and digital interface designers, and information security engineers. Educational attainment, salary range, job openings, and required skills sought for some of those job titles are summarized below. Data from Lightcast (formerly Burning Glass/EMSI)³.

Computer Programmers

New workers start with a salary around \$29,183. Normal pay is \$79,269 per year, but highly experienced workers can earn up to \$170,548. There are around 951 annual job openings in New York State.

The following bar chart shows the percentage of Computer Programmers that have achieved different levels of education.



³ <https://qcc.lightcastcc.com/browse-careers/11.3?region=New%20York%20State&radius=100%20miles>

Hard Skills Required in Computer Programmers (with the number of positions requiring)

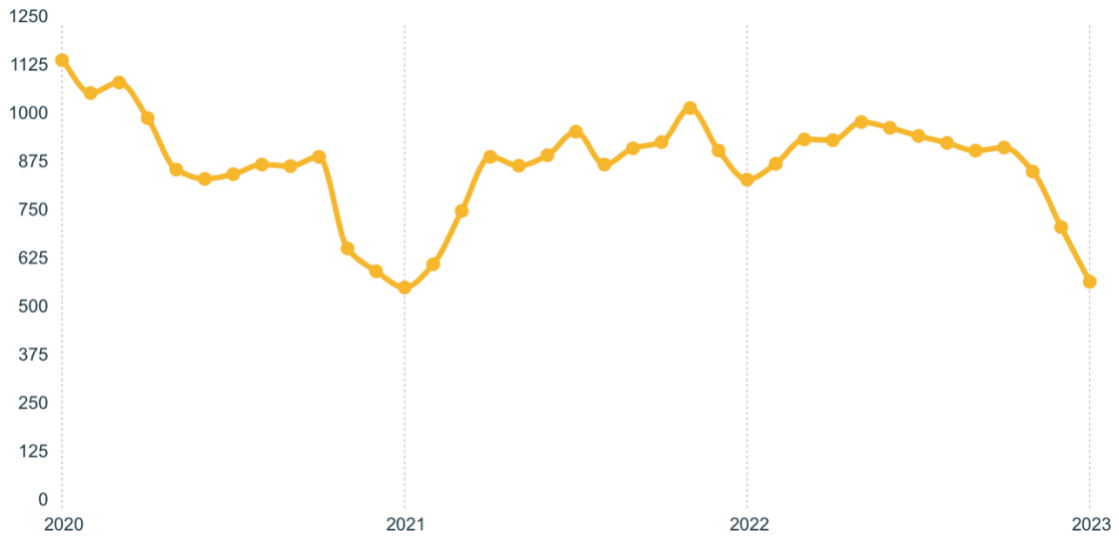


The following courses from our program match the hard skills mentioned above:

- SQL : CS-103
- Computer Science : CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220
- Java : CS-204
- Python: CS-100
- JavaScript: ET-710
- Agile Methodology: CS-203, CS-204
- API: CS-203, CS-204
- Software Development: CS-203, CS-204

Monthly Job Postings for Computer Programmers

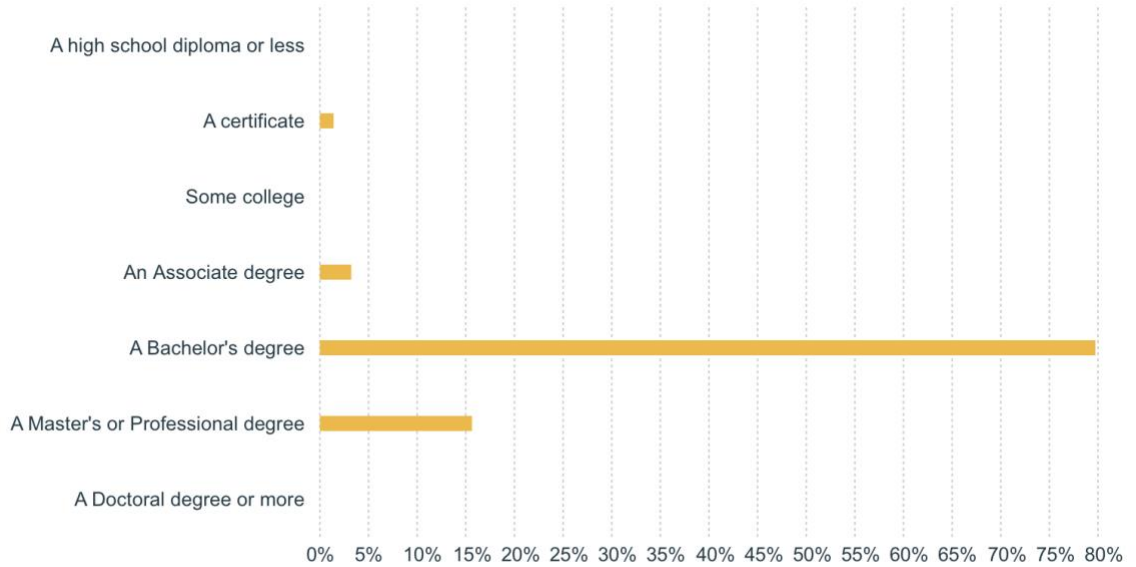
Since January 2020, 2,980 companies have posted 12,133 jobs for Computer Programmers in New York State.



Software Developers

New workers start around \$75,874. Normal pay is \$126,677 per year. Highly experienced workers can earn up to \$201,048. There are 9,545 annual job openings in New York State.

The following bar chart shows the percentage of Computer Programmers that have achieved different levels of education.



Hard Skills Required for Software Developers (with the number of employers reporting)

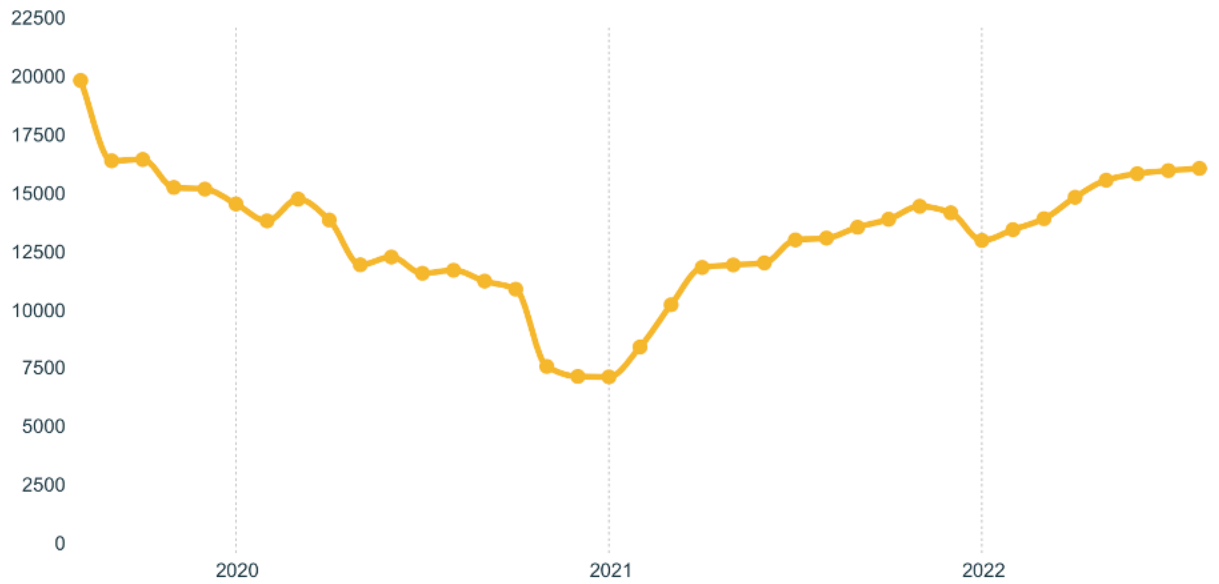
Java (Programming Language)	23393	
Software Engineering	23225	
Computer Science	22899	
Python (Programming Language)	20053	
Agile Methodology	19581	
Software Development	18715	
SQL (Programming Language)	17949	
JavaScript (Programming Language)	17903	
Amazon Web Services	15371	
Application Programming Interface (API)	14778	

The following courses from our program match the hard skills as mentioned above:

- Software Engineering: CS-203, CS-204
- Agile Methodology: CS-203, CS-204
- Python: CS-100
- Java : CS-204
- Computer Science: CS-100, CS-101, CS-102, CS-103, CS-201, CS-203, CS-204, CS-220
- API: CS-203, CS-204
- Software Development: CS-203, CS-204
- SQL : CS-103
- Javascript : ET-710

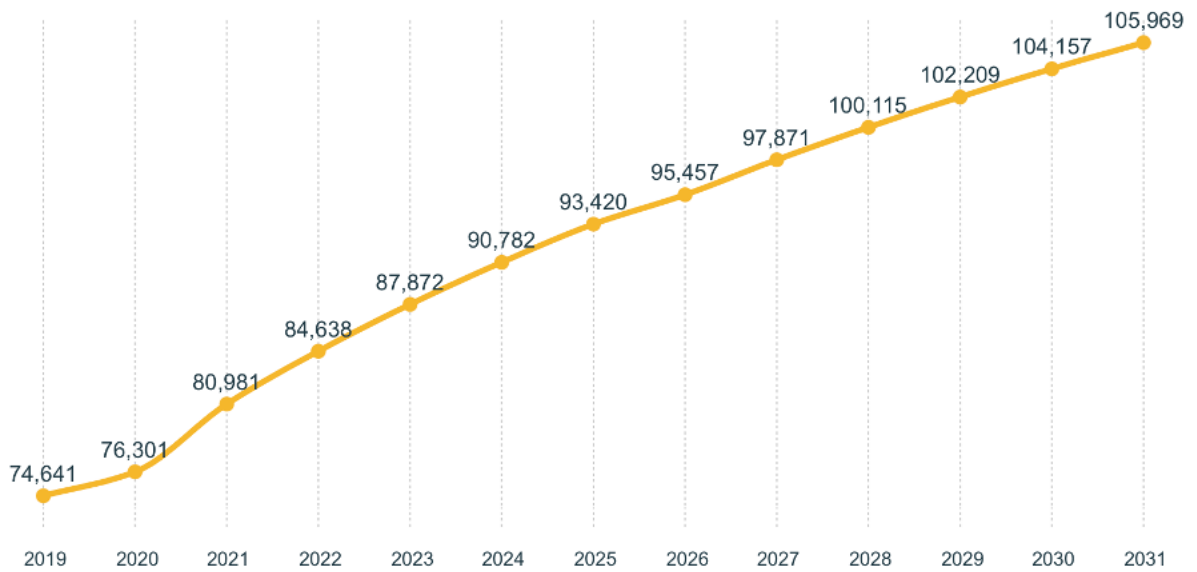
Monthly Job Postings for Software Developers

Since August 2019, 10,921 companies have posted 192,849 jobs for Software Developers in New York State.



Employment Projection for Software Developers

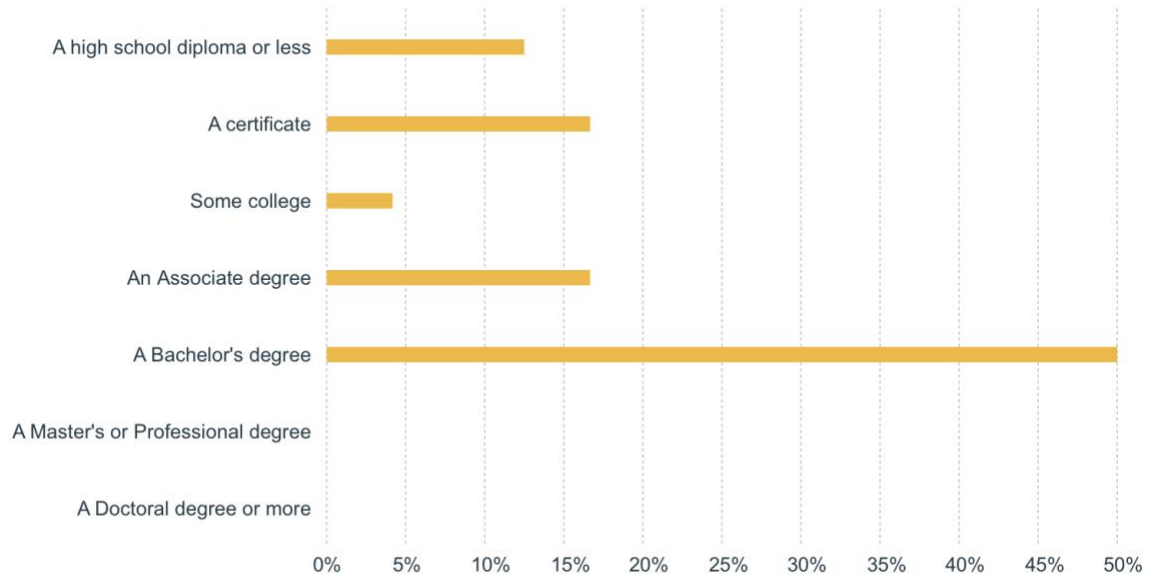
There are 84,638 Software Developers in New York State and the projection shows an increase until at least 2031.













Web Developers

New workers start around \$26,754. Normal pay is \$60,697 per year. Highly experienced workers can earn up to \$128,103. There are 780 annual job openings in New York State.

The following bar chart shows the percentage of Web Developers that have achieved different levels of education.



Hard Skills Required for Web Developers

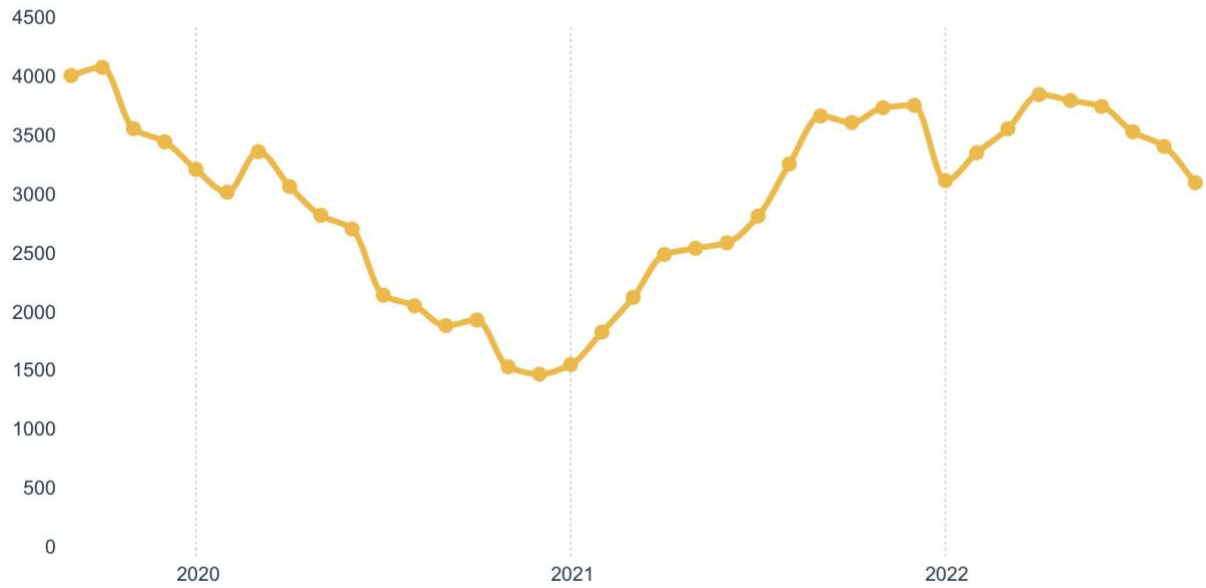
User Experience	6036	
JavaScript (Programming Language)	5941	
Cascading Style Sheets (CSS)	4835	
Front End (Software Engineering)	4555	
HyperText Markup Language (HTML)	4320	
User Interface	4177	
React.js	3867	
Computer Science	3864	
Agile Methodology	3559	
Application Programming Interface (API)	3070	

The following courses from our program match the hard skills as mentioned above:

- User Experience: CS-204, ET-710
- JavaScript: ET-710
- Front End: CS-204, ET-710,
- Cascading Style Sheets: ET-710
- HyperText Markup Language: ET-710
- User Interface : CS-204, ET-710
- Computer Science : CS-100, CS-101, CS-102, CS-103, CS-203, CS-204, CS-201, CS-220
- Agile Methodology : CS-203, CS-204
- API : CS-203, CS-204

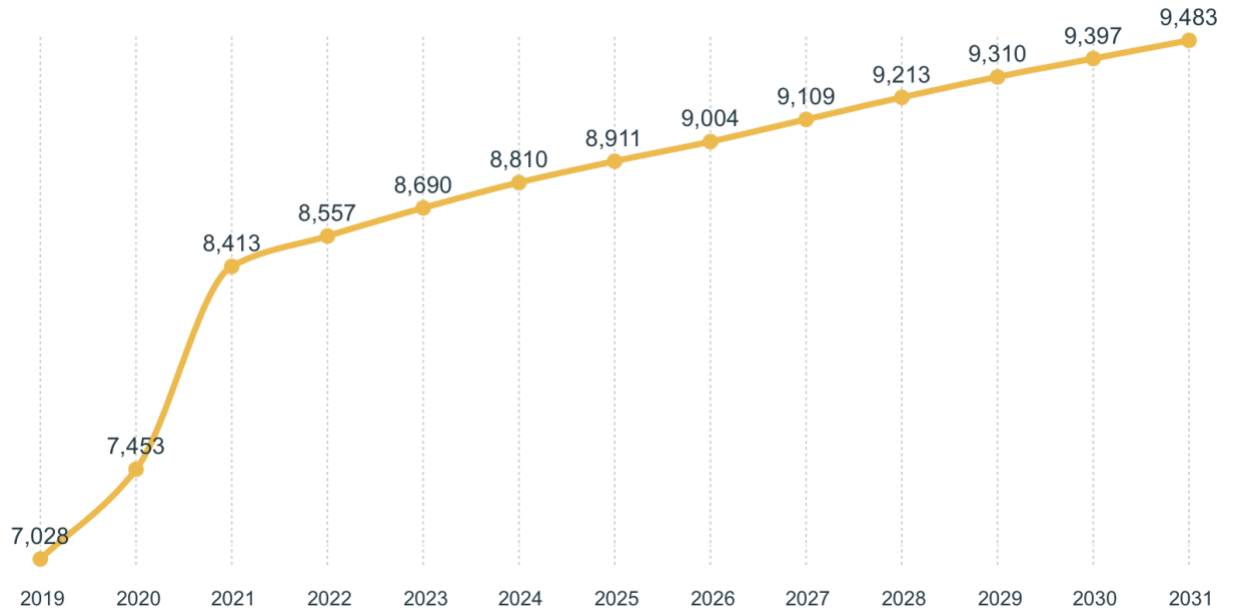
Monthly Job Postings for Web Developers

Since September 2019, 6,006 companies have posted 41,783 jobs for Web Developers in New York State.



Employment Projection for Web Developers

There are 8557 Web Developers employed in New York State and the trend shows an increase until at least 2031.




Sample Job Advertisements


Link Accessed on Oct 13, 2022:


https://www.linkedin.com/jobs/search/?currentJobId=3291041711&f_E=1%2C2&keywords=programmer&location=New%20York%2C%20NY&refresh=true


C++ Developer


Beacon Hill Staffing Group · Oakland, NJ (Hybrid) **11 hours ago** · 4 applicants

 Full-time · Entry level

 1,001-5,000 employees · Staffing and Recruiting

 5 school alumni

 See how you compare to 4 applicants. [Retry Premium Free](#)

 Actively recruiting

[Apply !\[\]\(95e1df5b0da0945e982bb2a79f9be895_img.jpg\)](#) [Saved](#)

- C++ Development experience with Hardware
- Hardware Controls
- Working closely with team updating/monitoring Coding process that is being installed onto the physical hardware
- Python
- GPU
- CUDA

Beacon Hill is an Equal Opportunity Employer that values the strength diversity brings to the workplace. Individuals with Disabilities and Protected Veterans are encouraged to apply.

Company Profile:

Beacon Hill Technologies, a premier National Information Technology Staffing Group, provides world class technology talent across all industries utilizing a complete suite of staffing services. Beacon Hill Technologies' dedicated team of recruiting and staffing experts consistently delivers quality IT professionals to solve our customers' technical and business needs.

Link Accessed on Oct 13, 2022:


https://www.linkedin.com/jobs/search/?currentJobId=3284275375&distance=10&f_E=1%2C2&keywords=programmer&location=New%20York%20NY&refresh=true

Entry Level Software Engineer



Revature · Nyack, NY

 Full-time · Entry level

 1,001-5,000 employees · IT Services and IT Consulting

 See recent hiring trends for Revature. [Reactivate Premium](#)

 No longer accepting applications

We are seeking talented individuals that are motivated to kickstart their technology career. No prior professional experience required.

Revature is the largest and fastest growing employer of emerging technology talent across the U.S. Come join us! As a **Revature Entry Level Software Engineer** you will receive on-the-job-training to become an experienced software engineer.

Remote interviews are starting now!

Benefits For Entry Level Software Engineer

- Launch a software engineering career with no prior experience
- Learn to code on the job. that's right: we pay you to learn.
- Competitive salary
- Relocation & housing assistance
- Paid time off
- Industry Certifications - Employer paid.
- 401k
- Mentoring program
- Career acceleration: over 72% of Revature alumni have received an additional promotion and 92% saw their salary significantly increase after launching their tech career with Revature

Entry Level Software Engineer Training Programme

- Full-time, paid training
- Work on real world projects in a team environment to get you enterprise-ready for placement with one of our corporate partners.
- Training on the most in-demand programming skills in the job market. we work together with our corporate partners, to identify the skills that are most vital to their organisation
- We're invested in your success-you'll have an employee engagement team member to support and provide you with a wide range of assistance
- As a Revature employee, you'll also have access to our expansive network of like minded peers who will show you the ropes to ensure you'll rock your tech career

What We Are Looking For

- College degree (Associates or Bachelors)
- Must be authorized to work in the US
- Strong desire to learn to code - No prior professional experience required.
- A natural problem solver
- Team player
- Challenge seekers looking to develop tech skills
- Adaptable
- Strong communication and interpersonal skills
- Willing to relocate anywhere in the US - Relocation assistance provided

Working for Revature is more than a job, we develop you into an experienced software engineer and put you on an accelerated career path. **Fast track your tech career and work for a company that invests in you-whose own success is dependent on your success.**

Link Accessed on Oct 13, 2022:


https://www.linkedin.com/jobs/search/?currentJobId=3188269812&distance=10&f_E=1%2C2&keywords=programmer&location=New%20York%2C%20NY&refresh=true


Java Software Engineer



Colonial Surety Company · Woodcliff Lake, NJ (On-site)

 Full-time

 11-50 employees

 See how you compare to 102 applicants. [Reactivate Premium](#)

 No longer accepting applications

Meet the hiring team



Jay Lee · 3rd

Chief Technology Officer at Colonial Surety Company

Job poster · LinkedIn member since 2018

Message

About us:

Colonial Surety Company is a leading, national, direct seller and writer of surety bond, fidelity bonds and insurance products for a wide range of professionals and industries.

Founded in 1930, we proudly use our experience—plus technology—to give busy people and businesses easy, direct and digital access to our growing portfolio of bond and insurance products.

Position Summary:

This role will be responsible for hands-on web and application development to support the entire company.

The candidate will be a member of a cross-functional team that includes other developers as well as people working in disciplines. Must be a highly motivated, self-directed individual capable of working within tight time frames and possess proven analytical, and interpersonal skills.

Job Functions, Essential Duties, And Responsibilities:

- Responsible for developing, enhancing, modifying and/or maintaining applications
- Understanding requirements and handling Analysis, Design, Coding, Testing and Quality processes
- Ensure proper approach, best-practice application, and correct separation of presentation code from business logic
- Implement and support build processes and test environments
- Provide project and task estimates

Experience, Skills, Knowledge Requirements:

- Bachelor's degree from an accredited college preferred but not required
- Hands-on Development experience on multiple stacks
- Should be familiar with on-site off-shore delivery model
- Full Software Development Life Cycle (SDLC) Experience
- Experience with 3rd party software integration in the form of both server-side and client-side
- Experience with headless, decoupled CMS architecture
- Experience interfacing with RESTful APIs, including a solid understanding of API architecture
- Demonstrated knowledge of client-side/backend performance analysis and optimization techniques
- Experience with Microservices and Spring boot
- Experience with one of scripting/programming language (Java EE/Core, PHP, Ruby, C#)
- Experience with CI/CD pipeline and automation (Kubernetes and Docker)
- Experience with relational databases, SQL and ORM technologies (SQL Server, Postgresql)
- Experience with data pipeline and ML/AI are plus

Appendix F: Attestations and Assurances

On behalf of the institution, I hereby attest to the following:

That all educational activities offered as part of this proposed curriculum are aligned with the institutions' goals and objectives and meet all statutory and regulatory requirements, including but not limited to Parts 50, 52, 53 and 54 of the Rules of the Board of Regents and the following specific requirements:

That credit for study in the proposed program will be granted consistent with the requirements in §50.1(o).

That, consistent with §52.1(b)(3), a reviewing system has been devised to estimate the success of students and faculty in achieving the goals and objectives of the program, including the use of data to inform program improvements.⁴

That, consistent with §52.2(a), the institution possesses the financial resources necessary to accomplish its mission and the purposes of each registered program, provides classrooms and other necessary facilities and equipment as described in §52.2(a)(2) and (3), sufficient for the programs dependent on their use, and provides libraries and library resources and maintains collections sufficient to support the institution and each registered curriculum as provided in §52.2(a)(4), including for the program proposed in this application.

That, consistent with §52.2(b), the information provided in this application demonstrates that the institution is in compliance with the requirements of §52.2(b), relating to faculty.

That all curriculum and courses are offered and all credits are awarded, consistent with the requirements of §52.2(c).

That admissions decisions are made consistent with the requirements of §52.2(d)(1) and (2) of the Regulations of the Commissioner of Education.

That, consistent with §52.2(e) of the Regulations of the Commissioner of Education: overall educational policy and its implementation are the responsibility of the institution's faculty and academic officers, that the institution establishes, publishes and enforces explicit policies as required by §52.2(e)(3), that academic policies applicable to each course as required by §52.2(e)(4), including learning objectives and methods of assessing student achievement, are made explicit by the instructor at the beginning of each term; that the institution provides academic advice to students as required by §52.2(e)(5), that the institution maintains and provides student records as required by §52.2(e)(6).

That, consistent with §52.2(f)(2) of the Regulations of the Commissioner of Education, the institution provides adequate academic support services and that all educational activities offered as part of a registered curriculum meet the requirements

⁴ The Department reserves the right to request this data at any time and to use such data as part of its evaluation of future program registration applications submitted by the institution.

established by state, the Rules of the Board of Regents and Part 52 of the Commissioner's regulations.

CHIEF ADMINISTRATIVE or ACADEMIC OFFICER/ PROVOST	
Signature <u><i>Sandra Palmer</i></u> <small>Sandra Palmer (Feb 9, 2023 09:56 EST)</small>	Date Feb 9, 2023
Type or print the name and title of signatory Sandra Palmer, Interim Provost and Vice President of Academic Affairs	Phone Number 718-281-5731







QCC Proposal AS in Computer Science 2023

Final Audit Report

2023-02-09

Created:	2023-02-09
By:	Michael Pullin (mpullin@qcc.cuny.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAANunJQ3esfgt4600h9asc2i4txYYsUJHI

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-  Document emailed to spalmer@qcc.cuny.edu for signature
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-  Email viewed by spalmer@qcc.cuny.edu
2023-02-09 - 2:56:00 PM GMT- IP address: 67.80.209.76
-  Signer spalmer@qcc.cuny.edu entered name at signing as Sandra Palmer
2023-02-09 - 2:56:55 PM GMT- IP address: 67.80.209.76
-  Document e-signed by Sandra Palmer (spalmer@qcc.cuny.edu)
Signature Date: 2023-02-09 - 2:56:57 PM GMT - Time Source: server- IP address: 67.80.209.76
-  Agreement completed.
2023-02-09 - 2:56:57 PM GMT