LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF COMPUTER SCIENCE

CURRICULUM CHANGE

1. **Type of change**: New Course.

2.

Department(s)	Computer Science
Career	[ ] Undergraduate [x] Graduate
Academic Level	[x] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Computer Science
Course Prefix & Number	CMP 566
Course Title	Computer Thinking for Educators
Description	A discussion of various computer science topics such as hamming codes, image representation, number systems, data representation, algorithms, artificial intelligence, cryptography, gates, flip-flops, adders. No previous programming experience is required.
Pre / Co Requisites	Prerequisite: MAT 172 or Department of Computer Science permission.
Credits	3
Hours	3
Liberal Arts	[x] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	None
General Education Component	_x__ Not Applicable ____ Required _____ English Composition _____ Mathematics _____ Science _____ Flexible _____ World Cultures _____ US Experience in its Diversity _____ Creative Expression _____ Individual and Society _____ Scientific World

3. **Rationale:**
This is an elective course being added to the MSEd Program in Science Education. Currently, faculty members are collaborating on a Certificate in Computer Science Education that ultimately will be available to master's degree students.

4. **Learning Outcomes (By the end of the course students will be expected to):**
   1. Understand the different number systems and knowing how to convert from one to another
   2. Understand the function of basic hardware components such as: flip/flops, registers, adders
   3. Understand how these components are built from gates
   4. Understand basic internet routing
   5. Use basic artificial intelligence principles to solve problems
   6. Design, build, and operate a simple lego robot according to provided specifications
   7. Solve computational problems by designing well-defined algorithms
   8. Understand how computers interact with numeric, text, sound, and image data
   9. Understand and demonstrate proper use of classic cryptography methods

5. Date of Departmental Approval: October 22, 2021

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Department(s)	Computer Science
Career	[] Undergraduate [x] Graduate
Academic Level	[x] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Computer Science
Course Prefix & Number	CMP 567
Course Title	Programming Methods I for Educators
Description	Structured computer programming using modern high-level programming languages. Includes console I/O, data types, variables, control structures, including iteration, arrays, function definitions and calls, parameter passing, functional decomposition, and an introduction to objects. Debugging.
Pre / Co Requisites	Prerequisite: MAT 172 or Department of Computer Science permission.
Credits	3
Hours	3
Liberal Arts	[x] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	None
General Education Component	_x__ Not Applicable ____ Required _____ English Composition _____ Mathematics _____ Science _____ Flexible _____ World Cultures _____ US Experience in its Diversity _____ Creative Expression _____ Individual and Society _____ Scientific World

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4. **Learning Outcomes (By the end of the course students will be expected to):**
1. Understand and explain how computers and programs work
2. Independently Design and Develop properly styled websites with dynamic content using HTML, CSS, JavaScript
3. Independently design, create, debug simple Java applications
4. Use HTML5 to develop properly structured web pages
5. Use CSS3 to apply proper style to web pages
6. Demonstrate proper use of variables and functions in JavaScript
7. Demonstrate the use of parameters and information passing in programs
8. Use JavaScript to respond to events
9. Use JavaScript to perform calculations and return results
10. Manipulate the DOM and CSSOM through JavaScript
11. Perform Logical Decisions using JavaScript
12. Perform Iteration using JavaScript
13. Demonstrate proper use of variables and methods in Java
14. Perform Logical Decisions using Java
15. Perform Iteration using Java
16. Understand and manipulate Strings
17. Use libraries from the java.util package such as Scanner, Math

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Career	[] Undergraduate [x] Graduate
Academic Level	[x] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Computer Science
Course Prefix & Number	CMP 568
Course Title	Programming Methods II for Educators
Description	Continuation of parameter passing with a focus on devising function definitions and tracing recursive calls. Object Oriented Programming techniques. Arrays. Sorting and searching algorithms as well as a comparison of their performance. Exceptions and Exception Handling. Text File I/O. GUI programming. Lab exercises include designing, writing and debugging programs using commercial IDEs.
Pre / Co Requisites	Prerequisite: CMP 567 or Departmental permission.
Credits	3
Hours	3
Liberal Arts	[x] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	None
General Education Component	_x__ Not Applicable _____ Required _____ English Composition _____ Mathematics _____ Science _____ Flexible _____ World Cultures _____ US Experience in its Diversity _____ Creative Expression _____ Individual and Society _____ Scientific World

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available to master's degree students.

4. **Learning Outcomes (By the end of the course students will be expected to):**

By the end of the course students should be able to read and write java code that does the following:

1. Demonstrate OOP through proper use of encapsulation, polymorphism and inheritance.
2. Independently design, create, debug Java ApplicationsGUI (Graphical User Interface) for desktop applications
3. Perform decision branching using if-else statements, switch cases
4. Perform iteration using loops for, while, do-while
5. Manipulate Arrays 1 Dimensional & 2 Dimensional
6. Manipulate Strings
7. Use Streams and perform File I/O on plain text files
8. Demonstrate use of Exception Handling
9. Use Recursion to solve problems
10. Popular Sorting Algorithms (Bubble, Selection, Insertion, Merge)
11. Popular Searching Algorithms (Sequential, Binary)

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Department(s)	Computer Science
Career	[] Undergraduate [x] Graduate
Academic Level	[x] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Computer Science
Course Prefix & Number	CMP 569
Course Title	Data Structures and Algorithms for Educators
Description	Abstract characterizations as well as the design and implementation of data structures such as arrays, stacks, queues, linked lists, binary search trees, heaps, hash tables and graphs along with algorithms that make use of such structures including algorithms for sorting, searching, will be studied. Algorithms will be analyzed for their asymptotic behavior in terms of time and space complexity. Implementation issues will be considered and students will write programs that embody these data structures and algorithms.
Pre / Co Requisites	Prerequisite: CMP 568 or Department of Computer Science permission.
Credits	3
Hours	3
Liberal Arts	[x] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	None
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4. **Learning Outcomes (By the end of the course students will be expected to):**
   1. Improve skills in object-oriented programming
   2. Improve understanding of recursive methods
   3. Understand a core group of basic data structures as enumerated in topics below
   4. Be able to conceptualize many programming issues at a higher level through data structures
   5. Know the tradeoffs of each studied data structure so as to employ the appropriate one for a given situation
   6. Be able to write parameterized data structures using generics
   7. Be able to design algorithms that incorporate data structures for efficient handling of data
   8. Be able to code algorithms involving data structures using an object oriented programming language
   9. Be able to analyze new data structures and their algorithms for asymptotic behavior
   10. Achieve a level of maturity in the subject so that further study of data structures can be pursued independently

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