

PASSAIC COUNTY TECHNICAL INSTITUTE
45 Reinhardt Rd.
Wayne, NJ

Computer Science III
(CS3)
Course 1029
Credits 12.5
2018

I. **Course Description**

Computer Science III is a full year course for students continuing in the Academy of Information Technology. The main aspect of the third-year course is to provide an introduction to the theory and practice of computer programming, problem solving skills using Python, and robotic development and programming. Topics include basic strategies for problem solving, conditional statements, repetition, function and other constructs that control the flow of execution of a program. The use of high level data types such as lists, strings, dictionaries in problem representation, visual programming environment (LabVIEW), Robot C coding language, JavaScript coding, and database objects, forms, charts, integration and security. Hands-on laboratory work will be done to solidify each concept.

In this course in addition to mastering the programming and problem-solving materials, it is expected to learn to effectively use learning strategies and materials. Students learn how to efficiently prepare for a knowledge intensive profession. This includes effective use of knowledge resources: reading documentation, asking and answering peer questions, consulting with more experienced persons, and searching on-line for answers. It also includes tools and methodology: testing to verify the correctness of code, use of an integrated development environment (IDE) and debugger, writing specifications and documentation.

PYTHON PROGRAMMING

Seton Hall - Introduction to Computer Science (CSAS 1111)

Introduction to Computer Science I Problem solving using computers. The design and implementation of computer programs. Major areas and issues in computer science including social and ethical concerns. Problem solving and pseudocode. Formal specification and verification. Basic software engineering techniques and software reuse. Data structures. Structured types: arrays, records, files. Objects and methods.

ROBOTICS PROGRAMMING

In the final part of the course, students will explore principles of engineering as well as the exciting world of robotic development and programming to construct and program robotic devices using Lego Mindstorms and Vex Robotics Programming. A visual programming environment (LabVIEW) and RobotC coding language will be utilized to add functionality to completed robots.

II. Units

Unit 1

Content Area:	Computer Science III	Grade(s)	11
Unit Plan Title:	<p>Unit 1 – Introduction to Python</p> <p>Unit 1 will describes the basic features of an algorithm. Students learn how hardware and software collaborate in a computer’s architecture. A brief history of computing is provided and students will learn how to the process of a simple Python program runs</p> <ul style="list-style-type: none"> I. The Structure of a Modern Computer System (3 days) <ul style="list-style-type: none"> 1. Computer Hardware 2. Computer Software 3. Unit 1 textbook activities II. A Not-So-Brief History of Computing Systems (4 days) <ul style="list-style-type: none"> 1. A Not-So-Brief History of Computing Systems 2. Personal Computing and Networks 3. Mobile Applications and Ubiquitous Computing III. Getting Started with Python Programming (8 days) <ul style="list-style-type: none"> 1. Running Code in the Interactive Shell 2. Input, Processing, and Output 3. Editing, Saving, and Running a Script 4. Behind the Scenes: How Python Work IV. Unit 1 summative <ul style="list-style-type: none"> 1. Unit 1 Quiz 2. Unit 1 Test 		
NJSLS/CCTC Standard(s) Addressed			
<p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP11. Use technology to enhance productivity.</p>			

- 9.3. IT.9** Describe quality assurance practices and methods employed in producing and providing quality IT products and services.
- 9.3. IT.13** Compare key functions and applications of software and determine maintenance strategies for computer systems.
- 9.3. IT-PRG.1** Analyze customer software needs and requirements.
- 9.3. IT-PRG.5** Apply an appropriate software development process to design a software application.

Essential Questions (3-5)

1. What is Python?
2. What are the basic features of an algorithm?
3. How does hardware and software collaborate in a computer's architecture?
4. What is the history of computing?
5. How is a Python program composed?

Anchor Text(s)

Fundamentals of Python: First Programs, 2nd Edition – Kenneth A. Lambert - Cengage Learning 2018.
Python for Everyone - Cay S. Horstmann, Rance D. Nicaise – Wiley 2013.

Short & Informational Texts (3-5)

ARTICLES

“Why Learn Python?”

<http://www.bestprogramminglanguagefor.me/why-learn-python>

“Why Python? Our Success Stories”

<https://www.python.org/success-stories/esr/>

“Python in the Workplace”

<https://www.superdatascience.com/r-and-python-in-the-workplace/>

Expected Proficiencies/Career and Life Skills

- Understand Python
- Learn about different programming languages
- Define functions Python expressions and statements
- Understand the concept of IDLE
- Demonstrate understanding in concepts of hardware devices

- Organize the history of computing
- Undertake the logic of basic Python codes

Formative & Summative Assessments

- Formative
 - Textbook activities Research assignments
 - In-class discussions
 - Quizzes
 - Group activities and presentation
 - Questioning and discussion
 - Journals
- Summative
 - Projects/Presentations
 - End-of-unit or chapter tests
 - End-of-term or semester exams

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Lynda.com
- Canvas LMS
- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame:

15 Days

Unit 2

Content Area:	Computer Science III	Grade(s)	11
Unit Plan Title:	Unit 2 – Software Development, Data Types, and Expressions Unit 2 includes topics related to software development, data types, and expressions. Students learn about the basic phases of the software development process. Next, they learn how to use strings, integer, and floating point numbers in Python. Simple as well as mixed-mode arithmetic expressions are covered. Students will also learn how to initialize and use variables with appropriate names that performs inputs, calculations, and outputs, as well as how to use docstrings to document Python programs. I. The Software Development Process (4 days) A. Software development B. Model types C. Unit 2 textbook activities II. Strings, Assignment, and Comments (13 days) A. Data Types B. String Literals C. Escape Sequences D. String Concatenation E. Variables and the Assignment Statement F. Program Comments and Docstrings III. Numeric Data Types and Character Sets (13 days) A. Integers B. Floating-Point Numbers C. Character Sets D. Expressions E. Arithmetic Expressions IV. Unit 2 summative		

- A. Unit 2 Quiz
- B. Unit 2 Test

NJSLS/CCTC Standard(s) Addressed

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP11. Use technology to enhance productivity.

9.3. IT.9 Describe quality assurance practices and methods employed in producing and providing quality IT products and services.

9.3. IT.13 Compare key functions and applications of software and determine maintenance strategies for computer systems.

9.3. IT-PRG.1 Analyze customer software needs and requirements.

9.3. IT-PRG.4 Demonstrate the effective use of software development tools to develop software applications.

9.3. IT-PRG.5 Apply an appropriate software development process to design a software application.

9.3. IT-PRG.6 Program a computer application using the appropriate programming language.

9.3. IT-PRG.7 Demonstrate software testing procedures to ensure quality products.

Essential Questions (3-5)

1. How do expressions provide an easy way to perform operations on data values to produce other values?
2. Stressing that the int function converts a float to an int by truncation, not by rounding, how is the round function used in cases when rounding is desirable?
3. What are some of the many useful functions which are organized in libraries of code called modules that Python includes?
4. What is the concept of a default behavior of a function, and explain how this may be changed by calling the function using optional arguments
5. What is a module?

Anchor Text(s)

Fundamentals of Python: First Programs, 2nd Edition – Kenneth A. Lambert - Cengage Learning 2018.

Python for Everyone - Cay S. Horstmann, Rance D. Nicaise – Wiley 2013.

Short & Informational Texts (3-5)

ARTICLES

“Understanding Data Types”

<https://www.digitalocean.com/community/tutorials/understanding-data-types-in-python-3>

“What is data type and why it is important in programming languages?”

<https://www.quora.com/What-is-data-type-and-why-it-is-important-in-programming-languages>

“Computer Programming - Data Types”

https://www.tutorialspoint.com/computer_programming/computer_programming_data_types.htm

Expected Proficiencies/Career and Life Skills

- Describe the basic phases of software development: analysis, design, coding, and testing
- Use strings for the terminal input and output of text
- Use integers and floating point numbers in arithmetic operations
- Construct arithmetic expressions
- Initialize and use variables with appropriate names
- Import functions from library modules
- Call functions with arguments and use returned values appropriately
- Construct a simple Python program that performs inputs, calculations, and outputs
- Use docstrings to document Python programs

Formative & Summative Assessments

- Formative
 - Textbook activities Research assignments
 - In-class discussions
 - Quizzes
 - Group activities and presentation
 - Questioning and discussion
 - Journals
- Summative
 - Projects/Presentations
 - End-of-unit or chapter tests
 - End-of-term or semester exams

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Lynda.com
- Canvas LMS

- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame: 30 Days

Content Area:	Computer Science III	Grade(s)	11
Unit Plan Title:	<p>Unit 3 – Loops and Selection Statements</p> <p>Unit 3 includes topics describes the different control statements available in Python. Students learn how to write for and while loops; students then learn to use these loops to repeat actions, traverse lists, count up and down, and generate random numbers. Selection statements are also covered, including one-way selection statements (if), two-way selection statements (if-else), and multi-way selection statements</p> <ol style="list-style-type: none"> I. The for Loop (15 days) <ol style="list-style-type: none"> A. Count-Controlled Loops B. Augmented Assignment C. Loop Errors: Off-by-One Error D. Traversing the Contents of a Data Sequence E. Specifying the Steps in the Range F. Loops That Count Down G. Unit 3 textbook activities II. if and if-else Statements (15 days) <ol style="list-style-type: none"> A. The Boolean Type, Comparisons, and Boolean Expressions B. if-else Statements C. One-Way Selection Statements 		

- D. Multi-Way if Statements
- E. Logical Operators and Compound Boolean Expressions

- III. Unit 3 summative
 - A. Unit 3 Quiz
 - B. Unit 3 Test

NJSLS/CCTC Standard(s) Addressed

- CRP5.** Consider the environmental, social and economic impacts of decisions.
- CRP6.** Demonstrate creativity and innovation.
- CRP11.** Use technology to enhance productivity.
- 9.3. IT.9** Describe quality assurance practices and methods employed in producing and providing quality IT products and services.
- 9.3. IT.13** Compare key functions and applications of software and determine maintenance strategies for computer systems.
- 9.3. IT-PRG.1** Analyze customer software needs and requirements.
- 9.3. IT-PRG.4** Demonstrate the effective use of software development tools to develop software applications.
- 9.3 .IT-PRG.5** Apply an appropriate software development process to design a software application.
- 9.3. IT-PRG.6** Program a computer application using the appropriate programming language.
- 9.3. IT-PRG.7** Demonstrate software testing procedures to ensure quality products.

Essential Questions (3-5)

1. What do loops do in Python?
2. What does the term “off-by-one error”, referring to pointing out that these are logic errors and not syntax errors?
3. How can a third variant of the range function can be used to specify a step value?
4. What is an iteration?
5. Discuss the different types of “if” and “if-else” statements?

Anchor Text(s)

- Fundamentals of Python: First Programs, 2nd Edition – Kenneth A. Lambert - Cengage Learning 2018.
- Python for Everyone - Cay S. Horstmann, Rance D. Nicaise – Wiley 2013.

Short & Informational Texts (3-5)

ARTICLES

“How does programming make you smarter and sharper?”

<https://www.quora.com/How-does-programming-make-you-smarter-and-sharper>

“How Programming Affects Your Brain: 3 Big Truths According to Science”

<https://www.makeuseof.com/tag/how-programming-affects-brain/>

“The 7 Habits of Highly Successful Software Developers”

<https://simpleprogrammer.com/7-reasons-why-you-should-learn-python/>

Expected Proficiencies/Career and Life Skills

- Write a loop to repeat a sequence of actions a fixed number of times
- Write a loop to traverse the sequence of characters in a string
- Write a loop that counts down and a loop that counts up
- Write an entry-controlled loop that halts when a condition becomes false
- Use selection statements to make choices in a program
- Construct appropriate conditions for condition-controlled loops and selection statements
- Use logical operators to construct compound Boolean expressions
- Use a selection statement and a break statement to exit a loop that is not entry-controlled

Formative & Summative Assessments

- Formative
 - Textbook activities Research assignments
 - In-class discussions
 - Quizzes
 - Group activities and presentation
 - Questioning and discussion
 - Journals
- Summative
 - Projects/Presentations
 - End-of-unit or chapter tests
 - End-of-term or semester exams

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Lynda.com

- Canvas LMS
- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame: 30 Days

Unit 4

Content Area:	Computer Science III	Grade(s)	11
Unit Plan Title:	<p>Unit 4 – Strings and Text Files</p> <p>Unit 4 provides an introduction to strings and text files in Python. Students learn how use and manipulate strings, including some of the most useful string methods. Next they learn to create, read from, and write to text files. Finally, they learn how to use library functions to access and navigate a file system</p> <p style="margin-left: 40px;">I. Accessing Characters and Substrings in Strings (5 days)</p> <p style="margin-left: 80px;">A. The Structure of Strings</p> <p style="margin-left: 80px;">B. The Subscript Operator</p> <p style="margin-left: 80px;">C. Slicing for Substrings</p> <p style="margin-left: 80px;">D. Testing for a Substring with the in Operator</p> <p style="margin-left: 80px;">E. Unit 4 textbook activities</p> <p style="margin-left: 40px;">II. Strings and Number Systems (5 days)</p> <p style="margin-left: 80px;">A. The Positional System for Representing Numbers</p> <p style="margin-left: 80px;">B. Converting Binary to Decimal</p> <p style="margin-left: 80px;">C. Converting Decimal to Binary</p> <p style="margin-left: 80px;">D. Conversion Shortcuts</p>		

E. Octal and Hexadecimal Numbers

III. String Methods and Text Files (4 days)

- A. Text Files and Their Format
- B. Writing Text to a File
- C. Writing Numbers to a File
- D. Reading Text from a File
- E. Reading Numbers from a File
- F. Accessing and Manipulating Files and Directories on Disk

IV. Unit 4 summative

- A. Unit 4 Quiz
- B. Unit 4 Test

NJSLS/CCTC Standard(s) Addressed

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP11. Use technology to enhance productivity.

9.3. IT.9 Describe quality assurance practices and methods employed in producing and providing quality IT products and services.

9.3. IT.13 Compare key functions and applications of software and determine maintenance strategies for computer systems.

9.3. IT-PRG.1 Analyze customer software needs and requirements.

9.3. IT-PRG.4 Demonstrate the effective use of software development tools to develop software applications.

9.3. IT-PRG.5 Apply an appropriate software development process to design a software application.

9.3. IT-PRG.6 Program a computer application using the appropriate programming language.

9.3. IT-PRG.7 Demonstrate software testing procedures to ensure quality products.

Essential Questions (3-5)

1. What is the syntax of the subscript operator?
2. How is the subscript operator useful when working with a count controlled loop?
3. What is a brief introduction to more complex encryption methods?
4. How can methods expect arguments and return a value?
5. How are for and while loops used to read the contents of a file?

Anchor Text(s)

Fundamentals of Python: First Programs, 2nd Edition – Kenneth A. Lambert - Cengage Learning 2018.
Python for Everyone - Cay S. Horstmann, Rance D. Nicaise – Wiley 2013.

Short & Informational Texts (3-5)

ARTICLES

“Manipulating Strings in Python”

<https://programminghistorian.org/en/lessons/manipulating-strings-in-python>

“The Hello World Program”

<https://thehelloworldprogram.com/python/python-string-methods/>

“Why are we so interested in working with text?”

<https://pythonforbiologists.com/printing-and-manipulating-text/>

Expected Proficiencies/Career and Life Skills

- Access individual characters in a string
- Retrieve a substring from a string
- Search for a substring in a string
- Convert a string representation of a number from one base to another base
- Use string methods to manipulate strings
- Open a text file for output and write strings or numbers to the file
- Open a text file for input and read strings or numbers from the file
- Use library functions to access and navigate a file system

Formative & Summative Assessments

- Formative
 - Textbook activities Research assignments
 - In-class discussions
 - Quizzes
 - Group activities and presentation
 - Questioning and discussion
 - Journals

- Summative
 - Projects/Presentations
 - End-of-unit or chapter tests
 - End-of-term or semester exams

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Lynda.com
- Canvas LMS
- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame: 14 Days

Unit 5

Content Area:	Computer Science III	Grade(s)	11
Unit Plan Title:	<p>Unit 5 – Lists and Dictionaries</p> <p>Unit 5 describes lists and dictionaries. Students learn to construct, use, and manipulate lists. They also learn to define simple functions that expect parameters and return values. Finally, they learn to construct, use, and manipulate dictionaries.</p> <ul style="list-style-type: none"> I. Accessing Characters and Substrings in Strings (3 days) <ul style="list-style-type: none"> A. The Structure of Strings B. The Subscript Operator C. Slicing for Substrings D. Testing for a Substring with the in Operator E. Unit 5 textbook activities 		

- II. Strings and Number Systems (6 days)
 - A. The Positional System for Representing Numbers
 - B. Converting Binary to Decimal
 - C. Converting Decimal to Binary
 - D. Conversion Shortcuts
 - E. Octal and Hexadecimal Numbers

- III. String Methods and Text Files (6 days)
 - A. Text Files and Their Format
 - B. Writing Text to a File
 - C. Writing Numbers to a File
 - D. Reading Text from a File
 - E. Reading Numbers from a File
 - F. Accessing and Manipulating Files and Directories on Disk

- IV. Unit 5 summative
 - A. Unit 5 Quiz
 - B. Unit 5 Test

NJSLS/CCTC Standard(s) Addressed

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP11. Use technology to enhance productivity.

9.3. IT.9 Describe quality assurance practices and methods employed in producing and providing quality IT products and services.

9.3. IT.13 Compare key functions and applications of software and determine maintenance strategies for computer systems.

9.3. IT-PRG.1 Analyze customer software needs and requirements.

9.3. IT-PRG.4 Demonstrate the effective use of software development tools to develop software applications.

9.3. IT-PRG.5 Apply an appropriate software development process to design a software application.

9.3. IT-PRG.6 Program a computer application using the appropriate programming language.

9.3. IT-PRG.7 Demonstrate software testing procedures to ensure quality products.

Essential Questions (3-5)

1. What are some examples of real-life lists?

2. How are lists printed, both by printing the whole list at once and by iterating through the list in a loop that prints each element individually?
3. What is the difference between the "list" extend and append methods?
4. Why do mutator methods usually do not return a value?
5. How dictionary literals created in Python?

Anchor Text(s)

Fundamentals of Python: First Programs, 2nd Edition – Kenneth A. Lambert - Cengage Learning 2018.

Python for Everyone - Cay S. Horstmann, Rance D. Nicaise – Wiley 2013.

Short & Informational Texts (3-5)

ARTICLES

“Introducing Lists”

https://www.tutorialspoint.com/python/python_lists.htm

“Python Tutorial: Defining New Types”

<https://docs.python.org/3/extending/newtypes.html?highlight=def>

“Improving the Usability of the Thonny Integrated Development Environment”

https://comserv.cs.ut.ee/home/files/ilp_infotehnoloogia_2015.pdf?study=ATILoputoo&reference=07589F58FF93629E5A7D12376A420B00A28D0D64

Expected Proficiencies/Career and Life Skills

- Construct lists and access items in those lists
- Use methods to manipulate lists
- Perform traversals of lists to process items in the lists
- Define simple functions that expect parameters and return values
- Construct dictionaries and access entries in those dictionaries
- Use methods to manipulate dictionaries
- Determine whether a list or a dictionary is an appropriate data structure for a given application

Formative & Summative Assessments

- Formative
 - Textbook activities
 - Research assignments

- In-class discussions
- Quizzes
- Group activities and presentation
- Questioning and discussion
- Journals
- Summative
 - Projects/Presentations
 - End-of-unit or chapter tests
 - End-of-term or semester exams

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Lynda.com
- Canvas LMS
- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame: 15 Days

Unit 6

Content Area:	COMPUTER SCIENCE II	Grade(s)	10
Unit Plan Title:	Unit 6 – Introduction to Robotics Programming – 23 days In the final unit of the course, students will explore principles of engineering as well as the exciting world of robotic development and programming to construct and program robotic devices using Lego Mindstorms and Vex Robotics Programming. A visual programming environments (LabVIEW EV3) and RobotC coding language will be utilized to add functionality to completed robots.		

- I. **Introduction to Robotics Programming (23 days)**
 - A. Introduction to Robotics
 - B. Impact of Modern Computing on Robotics
 - C. The Role of Automation in the Modern Economy
 - D. Overview: Automation in Manufacturing
 - E. Overview: Automation in Banking
 - F. Overview: Automation in Retail
 - G. Overview: Automation in Other Areas
 - H. RobotC Syntax Rules
 - I. RobotC Movement Fundamentals
 - J. RobotC Navigation
 - K. RobotC Variables and Control Structures
 - L. RobotC Joystick Programming
 - M. LabVIEW EV3 Data Types
 - N. LabVIEW EV3 Controls, Indicators and Constants
 - O. LabVIEW EV3 Functions
 - P. LabVIEW EV3 Input Port Properties
 - Q. LabVIEW EV3 Output Port Properties
 - R. LabVIEW EV3 Sound Playback Methods
 - S. LabVIEW EV3 Bluetooth Communications
 - T. LabVIEW EV3 NXT Display Methods
 - U. Project Presentations
 - V. Unit Test

NJSLS/CCTC Standard(s) Addressed

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.3. IT.6 Describe trends in emerging and evolving computer technologies and their influence on IT practices.

9.3. IT.4 Demonstrate positive cyber citizenry by applying industry accepted ethical practices and behaviors.

9.3. IT-SUP.1 Provide technology support to maintain service.

9.3. IT-SUP.3 Apply appropriate troubleshooting techniques in resolving computer hardware, software and configuration problems.

Essential Questions (3-5)

1. What is the current impact of robot based automation on our daily activities?
2. What industries have seen the greatest level of automation?
3. How is automation increasing the level of efficiency in various production settings?
4. What are the main benefits of automating manual human activities?

Anchor Text(s)

LabVIEW™ LEGO® MINDSTORMS® NXT Module Programming Guide, National Instruments Corporation 2009

Short & Informational Texts (3-5)

ARTICLES

V. Song: “Friend or Foe? Our View of Robots Will Determine Their Future” **PC Magazine**, January 10, 2018

WWW.PCMAG.COM/NEWS/358448/FRIEND-OR-FOE-OUR-VIEW-OF-ROBOTS-WILL-DETERMINE-THEIR-FUTUR

S. Gaudin: “With robots on the job it won’t be IT as usual”, **Computerworld Magazine**, April 13th 2017

<https://www.computerworld.com/article/3188889/robotics/with-robots-on-the-job-its-not-going-to-be-it-as-usual.html>

E. Dashevsky: “Do Robots and AI Deserve Rights?” **PC Magazine**, February 16, 2017

<https://www.pcmag.com/article/351719/do-robots-and-ai-deserve-rights>

Expected Proficiencies/Career and Life Skills

- Develop robotics based programming solutions to daily lab assignments as well as review projects and tests.
- Develop strategies and plans for course based instructor defined technology projects.
- Develop algorithms and flowcharts for upcoming programs based on problem statements
- Conduct regular data and file backups
- Access the Canvas online system to submit and obtain project data

Formative & Summative Assessments	
<ul style="list-style-type: none"> • Weekly Lab Projects (Formative) • Weekly Quizzes (Formative) • Chapter Review and Case Projects (Summative) • Chapter/Unit Test (Summative) 	
Resources (Websites, LMS, Google Classroom, documents, etc.)	
<ul style="list-style-type: none"> • Canvas LMS • Microsoft PowerPoint • Microsoft Word • Canvas/Docs/Slides • YouTube • RobotC for VEX Cortex http://www.robotc.net/tutor/Cortex/cortexunits.php?platform=Cortex • LabVIEW EV3 Programming Platform 	
Suggested Time Frame:	23 days

Unit 7

Content Area:	Computer Science III	Grade(s)	11
Unit Plan Title:	<p>Unit 7 – Mindstorm NXT/NAO Project</p> <p>Unit 7 will include group assignments in developing and creating activities with Lego Mindstorm and NAO robot. Students will utilize their project management and programming skills in planning, designing, and implementation of the group’s goals in creating a concept from beginning to end. Time is spent on enhancing interaction with other members of the Computer Science team while developing one’s own knowledge with independence learning in most common issues on how to solve them. The timeframe of this activity is integrated with units 4-6.</p> <p style="margin-left: 40px;">I. Lego NXT (15 days)</p> <p style="margin-left: 80px;">A. Team distribution and guidelines</p> <p style="margin-left: 80px;">B. Roles and duties for members</p>		

- C. Project development
- D. Concept building
- E. Test and implement
- F. Complete and compile
- G. Review and discuss

- II. NAO robot (15 days)
 - A. Team distribution and guidelines
 - B. Roles and duties for members
 - C. Project development
 - D. Concept building
 - E. Test and implement
 - F. Complete and compile
 - G. Review and discuss

NJSLS/CCTC Standard(s) Addressed

- CRP2.** Apply appropriate academic and technical skills.
- CRP4.** Communicate clearly and effectively and with reason
- CRP6.** Demonstrate creativity and innovation.
- CRP7.** Employ valid and reliable research strategies.
- CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP11.** Use technology to enhance productivity.
- CRP12.** Work productively in teams while using cultural global competence.
- 9.3. IT.1** Demonstrate effective professional communication skills and practices that enable positive customer relationships.
- 9.3. IT.2** Use product or service design processes and guidelines to produce a quality information technology (IT) product or service
- 9.3. IT-PRG.1** Analyze customer software needs and requirements.
- 9.3. IT-PRG.2** Demonstrate the use of industry standard strategies and project planning to meet customer specifications.
- 9.3. IT-PRG.5** Apply an appropriate software development process to design a software application.
- 9.3. IT-PRG.6** Program a computer application using the appropriate programming language.
- 9.3. IT-PRG.7** Demonstrate software testing procedures to ensure quality products.
- 9.3. IT-PRG.8** Perform quality assurance tasks as part of the software development cycle.
- 9.3. IT-PRG.10** Design, create and maintain a database.
- 9.3. IT-WD.1** Analyze customer requirements to design and develop a Web or digital communication product.

- 9.3. IT-WD.2** Apply the design and development process to produce user-focused Web and digital communications solutions.
- 9.3. IT-WD.3** Write product specifications that define the scope of work aligned to customer requirements.
- 9.3. IT-WD.4** Demonstrate the effective use of tools for digital communication production, development and project management.
- 9.3. IT-WD.6** Design, create and publish a digital communication product based on customer needs.

Essential Questions (3-5)

1. What roles do people play within teams that lead to success?
2. How do communication skills contribute to team effectiveness?
3. What is project management and how does it affect completion?
4. How does a timeline set the development of a project?
5. Why is reviewing important in team activities?

Anchor Text(s)

LabVIEW™ LEGO® MINDSTORMS® NXT Module Programming Guide, National Instruments Corporation 2009
An Introduction to Robotics with NAO. Mike Beiter, Brian Coltin, Somchaya Liemhetcharat. 2012

Short & Informational Texts (3-5)

ARTICLES

“How Lego Is Constructing the Next Generation of Engineers”

<https://www.smithsonianmag.com/innovation/how-lego-is-constructing-the-next-generation-of-engineers-37671528/>

“Teaching STEM Skills with NAO Robots”

<https://thejournal.com/articles/2016/03/17/teaching-stem-skills-with-nao-robots.aspx>

“The use of LEGO Mindstorms NXT Robots in the Teaching of Introductory Java Programming to Undergraduate Students”

https://www.tandfonline.com/doi/full/10.11120/ital.2010.09010002_portfolio.pdf

Expected Proficiencies/Career and Life Skills

- Gain an in-depth understanding of the LEGO Mindstorm and Nao robot by designing, building, and programming complex robots to do intricate challenges.
- Learn about the role of project managers and duties of members.
- Have an introduction and discussion of past and current issues that have arisen.

- Gain an understanding and competency with basic hand tools and building robots and mechanisms by hand.
- Learn constructive critique techniques for evaluating robot motion and programming through teamwork.
- Learn how to determine a problem to solve and brainstorm solutions to that problem. Design, build, and test those solutions to see how well they solve the problem.

Formative & Summative Assessments

- Formative
 - In-class discussions
 - Group activities and presentation
 - Questioning and discussion
 - Journals
- Summative
 - Projects/Presentations

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Choregraphe
- RobotC for VEX Cortex
- LabVIEW EV3 Programming Platform
- Lynda.com
- Canvas LMS
- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame:

30 Days

Unit 8

Content Area:	Computer Science III	Grade(s)	11
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Unit Plan Title:	<p>Unit 8 – Advance topics in Computer Science</p> <p>Unit 8 will focus on individual participation in Computer related competitions such as FBLA (Future Business Leaders of America) and others. Students will focus on learning experiences that enable them to achieve success through effective participation in career related activities designed to reach professional goals. The goals of competition will help students become better at Enhancing Social and Emotional Learning, Strengthening Academic Self-Concept, Building Mental Toughness, and Improving Risk Analysis. The timeframe of this activity is integrated with units 1-3.</p> <ul style="list-style-type: none"> I. Competition Development(15 days) <ul style="list-style-type: none"> A. Surveying the Possibilities B. Understanding goals and rules C. Choosing a competition D. Develop a pacing learning chart E. Structure and set achievable goals II. Competition Focus (15 days) <ul style="list-style-type: none"> A. Practice terms and definitions B. Achieve goals for competition C. Evaluation, modification and submission D. Reflection 		
NJSLS/CCTC Standard(s) Addressed			
<p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP4. Communicate clearly and effectively and with reason</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p> <p>9.3. IT.1 Demonstrate effective professional communication skills and practices that enable positive customer relationships.</p> <p>9.3. IT.2 Use product or service design processes and guidelines to produce a quality information technology (IT) product or service</p>			

- 9.3. IT-PRG.1 Analyze customer software needs and requirements.
- 9.3. IT-PRG.2 Demonstrate the use of industry standard strategies and project planning to meet customer specifications.
- 9.3. IT-PRG.5 Apply an appropriate software development process to design a software application.
- 9.3. IT-PRG.6 Program a computer application using the appropriate programming language.
- 9.3. IT-PRG.7 Demonstrate software testing procedures to ensure quality products.
- 9.3. IT-PRG.8 Perform quality assurance tasks as part of the software development cycle.
- 9.3. IT-PRG.10 Design, create and maintain a database.
- 9.3. IT-WD.1 Analyze customer requirements to design and develop a Web or digital communication product.
- 9.3. IT-WD.2 Apply the design and development process to produce user-focused Web and digital communications solutions.
- 9.3. IT-WD.3 Write product specifications that define the scope of work aligned to customer requirements.
- 9.3. IT-WD.4 Demonstrate the effective use of tools for digital communication production, development and project management.
- 9.3. IT-WD.6 Design, create and publish a digital communication product based on customer needs.

Essential Questions (3-5)

1. What does competition promote?
2. How does one think creatively about opportunity?
3. How does pacing chart improve learning?
4. How are goals related to your career?
5. What is a reflection?

Anchor Text(s)

FBLA Competitive Events Topics, <https://www.fbla-pbl.org/fbla/competitive-events/topics/>

Short & Informational Texts (3-5)

ARTICLES

“10 Ways Competitions Enhance Learning”

<https://www.competitionsciences.org/2016/07/04/10-ways-competitions-enhance-learning/>

“The Value of Competition in the Classroom”

<https://owlcation.com/academia/studentrivalry>

“Examining the Use of Competition in the Classroom”

<https://web.calstatela.edu/faculty/jshindl/cm/Chapter18competition-final.htm>

Expected Proficiencies/Career and Life Skills

- Explain how to think creatively about opportunity
- Thinking critically and making judgments
- Creativity and entrepreneurial thinking
- Making innovative use of knowledge, information and opportunities
- Exhibit logic and systematic understanding
- Display effective decision-making and problem-solving skills

Formative & Summative Assessments

- Formative
 - In-class discussions
 - Questioning and discussion
 - Journals
- Summative
 - Projects/Presentations

Resources (Websites, LMS, Google Classroom, documents, etc.)

- Lynda.com
- Canvas LMS
- Microsoft Office (Word, Excel, PowerPoint, Access)
- Instructional Videos
- Google Drive/Docs/Slides
- Knowledgebase
- YouTube videos
- w3schools.com

Suggested Time Frame:

30 Days

III. Instructional Strategies:

- Lectures
- Cooperative learning
- Hands-on learning
- Researching information
- Homework and practice
- Debating
- Discussions
- Project-based learning
- Instructional videos (YouTube, Lynda.com)
- Technical writing
- Student goal setting
- Differentiated instruction
 - Assess students' learning using formative assessment
 - Recognition of diverse learners
 - Create a PowerPoint presentation summarizing the lesson.
 - Ongoing, formative assessment
 - Write to explore, think, learn, and improve comprehension.

IV. Methods of Student Evaluation:

Assessment in a vocational area can be divided into four general categories—formal (graded), informal (ungraded), certification, and practical application.

Formal Assessments:

- Module quizzes
- Do-Now quizzes
- Section assignments or activities
- Lab Reports

- Oral presentations
- Tests

Some of the informal assessments include, but are not limited to:

- Portfolio
- Project-based assignments
- Comprehension
- Capstone

V. Scope and Sequence:

I = Introduce D = Develop R = Reinforce M = Master	
Act as a responsible and contributing citizen and employee.	D, R
Apply appropriate academic and technical skills.	D, R
Communicate clearly and effectively and with reason.	D, M
Consider the environmental, social and economic impacts of decisions	I, D
Demonstrate creativity and innovation.	D, R
Employ valid and reliable research strategies	D, R
Utilize critical thinking to make sense of problems and persevere in solving them.	D, R
Use technology to enhance productivity.	R, M
Work productively in teams while using cultural global competence.	I, D, R
Demonstrate effective professional communication skills and practices that enable positive customer relationships.	D, R

Use product or service design processes and guidelines to produce a quality information technology (IT) product or service	D, R
Demonstrate positive cyber citizenry by applying industry accepted ethical practices and behaviors.	D, R
Describe trends in emerging and evolving computer technologies and their influence on IT practices	D, R
Describe quality assurance practices and methods employed in producing and providing quality IT products and services.	D, R
Compare key functions and applications of software and determine maintenance strategies for computer systems.	D, R
Analyze customer software needs and requirements.	I, D, M
Demonstrate the use of industry standard strategies and project planning to meet customer specifications.	D, R
Demonstrate the effective use of software development tools to develop software applications.	D, R
Apply an appropriate software development process to design a software application	D, R, M
Program a computer application using the appropriate programming language.	I, D
Demonstrate software testing procedures to ensure quality products.	D, R
Perform quality assurance tasks as part of the software development cycle.	I, D

VI. Course Textbooks, Instructional Resources & Software

Adobe Dreamweaver CS5: Comprehensive, 1st Edition

Author: Gary B. Shelly, Dolores J. Wells

Publisher: Course Technology

ISBN-13: 9780538473941

ISBN-10: 0538473940

New Perspectives on Adobe Dreamweaver CS5

Author: Gary B. Shelly, Dolores Wells, and Jennifer T. Campbell

Publisher: Course Technology

ISBN-13: 978-0538467148

ISBN-10: 0538467142

Fundamentals of Python: First Programs, 2nd Edition

Author: Kenneth A. Lambert

Publisher: Course Technology

ISBN-13: 978-1337560092

ISBN-10: 133756009X

Python for Everyone

Author: Cay S. Horstmann, Rance D. Necaise

Publisher: Wiley

ISBN-13: 978-1118645208

ISBN-10: 1118645200

RobotC for VEX Cortex

Author:

Publisher: Robomatter, Inc.

Website: <http://www.robotc.net/tutor/Cortex/cortexunits.php?platform=Cortex>

VII. Student Handout

Computer Science III is a full year course for students continuing in the Academy of Information Technology. The main aspect of this third-year course is to provide an introduction to the theory and practice of computer programming and problem solving skills using Python, and an introduction to Automation and Robotic programming with RobotC and LabVIEW EV3. Topics include basic strategies for problem solving, conditional, repetition, function and other constructs that control the flow of execution of a program and the use of high level data types such as lists, strings, dictionaries in problem representation, automation, movement fundamentals, variables and control structures, data types, and port properties. Hands-on laboratory work will be done to solidify each concept.

PROFICIENCIES

- Understand Python
- Learn about different programming languages
- Define functions Python expressions and statements
- Understand the concept of IDLE
- Demonstrate understanding in concepts of hardware devices
- Organize the history of computing
- Undertake the logic of basic Python codes
- Describe the basic phases of software development: analysis, design, coding, and testing
- Use strings for the terminal input and output of text
- Use integers and floating point numbers in arithmetic operations
- Construct arithmetic expressions
- Initialize and use variables with appropriate names
- Import functions from library modules
- Call functions with arguments and use returned values appropriately
- Construct a simple Python program that performs inputs, calculations, and outputs
- Use docstrings to document Python programs
- Write a loop to repeat a sequence of actions a fixed number of times

- Write a loop to traverse the sequence of characters in a string
- Write a loop that counts down and a loop that counts up
- Write an entry-controlled loop that halts when a condition becomes false
- Use selection statements to make choices in a program
- Construct appropriate conditions for condition-controlled loops and selection statements
- Use logical operators to construct compound Boolean expressions
- Use a selection statement and a break statement to exit a loop that is not entry-controlled
- Access individual characters in a string
- Retrieve a substring from a string
- Search for a substring in a string
- Convert a string representation of a number from one base to another base
- Use string methods to manipulate strings
- Open a text file for output and write strings or numbers to the file
- Open a text file for input and read strings or numbers from the file
- Use library functions to access and navigate a file system
- Construct lists and access items in those lists
- Use methods to manipulate lists
- Perform traversals of lists to process items in the lists
- Define simple functions that expect parameters and return values
- Construct dictionaries and access entries in those dictionaries
- Use methods to manipulate dictionaries
- Determine whether a list or a dictionary is an appropriate data structure for a given application
- Perform basic RobotC programming
- Perform basic LabVIEW based EV3 programming for Lego Mindstorms
- Develop robot based automated programming solutions to daily lab assignments as well as review projects and tests.