

Secaucus
Board of
Education

Computer Programming

Course Codes: 7128 & 7129

Business Department



Born on November 2016

Aligned to the NJSLs for Mathematics (2016), Technology (2014),

& 21st Century Life and Careers (2014)

Adopted by the Secaucus Board of Education on: December 22, 2016

District Equity Statement

The Board of Education directs that all students enrolled in the schools of this district shall be afforded equal educational opportunities in strict accordance with the law. No students shall be denied access to or benefit from any educational program or activity or from a co-curricular or athletic activity on the basis of the student's race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability. The Board directs the Superintendent to allocate faculty, administrators, support staff members, curriculum materials, and instructional equipment supplies among and between the schools and classes of this district in a manner that ensures equivalency of educational opportunity throughout this district. The school district's curricula in the following areas will eliminate discrimination, promote mutual acceptance and respect among students, and enable students to interact effectively with others, regardless of race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability:

1. School climate/learning environment
2. Courses of study, including Physical Education
3. Instructional materials and strategies
4. Library materials
5. Software and audio-visual materials
6. Guidance and counseling
7. Extra-curricular programs and activities
8. Testing and other assessments.

Excerpt from Secaucus Board of Education, Policy 5750, Edited September 2016.

Course Description

This course introduces computer programming using the JAVA programming language with object-oriented programming principles. Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools. Upon completion of this course, students will be able to:

- Design, create, build, and debug Java applications and applets.
- Apply algorithmic thinking to solve programming problems.
- Implement syntax rules in Java programs.
- Explain variables and data types used in program development.
- Apply arithmetic operations for displaying numeric output.
- Write and apply decision structures for determining different operations.
- Write and apply loop structures to perform repetitive tasks.
- Write user-defined methods.
- Identify and implement arrays, array lists, and multidimensional arrays.
- Write Java programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, inheritance, and polymorphism.
- Write programs using graphical user interface (GUI) components and Java's Event Handling Model.

Primary Interdisciplinary Connections

Solving real world problems in the fields of:

Mathematics

Science

Business

Potential Course Modifications (ELLs, Special Education, Gifted and Talented)

The teacher will determine, with the assistance of guidance counselors, teacher assistant/aides, educational specialists and/or special education teachers, what modifications will be made for his/her students. Such examples of modifications can include, but not be limited to:

- Extended time as needed
- Modification of tests and quizzes
- Preferential seating
- Alternative/Formative assessment (projects)
- Effective teacher questioning (ranging from simple recall to higher order critical thinking questions)
- Supplemental materials
- Cooperative learning
- Teacher tutoring
- Peer tutoring
- Differentiated Instruction

Unit 1: Introduction	<i>What is Programming, The Anatomy of a Computer, Translating Human-Readable Programs to Machine Code, The Java Programming Language, Becoming Familiar with Your Computer, Compiling Simple Program, Errors and the The Compilation Process</i>	
Timing:	10 Days	
Standards:	<p><u>NJSLS for Mathematics:</u> Standards for MP 1-7</p> <p><u>NJSLS for 21st Century Life and Careers</u> CRP1, CRP2, CRP4, CRP6, CRP6, CRP7, CRP8</p> <p><u>Collegeboard AP Computer Science Curricular Standards:</u> CR1, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● What is programming? ● What is CPU? ● Why don't we write the codes in machine language? ● What does compiler do? ● Is java case sensitive? ● Why do we need to comment? ● What is string? ● What is syntax error? ● What is logic error? ● What is editor? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● To understand the activity of programming ● To learn about the architecture of computers ● To learn about machine code and high-level programming languages ● To become familiar with your computing environment and your compiler ● To complete and run your first java program ● To recognize syntax and logic errors 	<ul style="list-style-type: none"> ● Projects ● Small codes ● PowerPoint Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

Assessments:	Materials:	Resources:
<ul style="list-style-type: none">● In Class Testing● Multiple Choice AP Computer Science Practice Tests● Projects<ul style="list-style-type: none">-Hello World-Face Printer-TicTacToe Board	<ul style="list-style-type: none">● Eclipse Software● Computer● Interactive Whiteboard● White Board● Textbooks● Websites● Lesson Videos	<ul style="list-style-type: none">● Java Concepts (AP Computer Science, Cay Horstmann, 5th edition)● Java Program Design (James Cohoon, Jack Davidson)● 5 Steps to AP Computer Science.● LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 2: Using Objects	<i>Types and Variables, The Assignment Operator, Objects, Classes, and Methods, Method Parameters and Return Values, Number Types, Constructing Objects, Accessor and Mutator Methods, Implementing a Test Program, The API Documentation, Object References, Graphical Applications and Frame Windows, Drawing on a Component, Ellipses, Lines, Texts, and Color</i>	
Timing:	10 Days	
Standards:	<p><u><i>NJSLS for Technology:</i></u> 8.1.12.A.3</p> <p><u><i>NJSLS for Mathematics:</i></u> 12.A-REI.4, Standards for MP 1-7</p> <p><u><i>NJSLS 21st Century Life and Careers:</i></u> CRP1, CRP2, CRP4, CRP6, CRP6, CRP7, CRP8</p> <p><u><i>Collegeboard AP Computer Science Curricular Standards:</i></u> CR1, CR4, CR5, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● Why does every value has a type in java? ● Why is Java an important programming language? ● How would you explain the java virtual machine and byte code? ● How would you choose an appropriate interface style? ● Describe the structure of a 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Learn about variables. ● Use appropriate variables in their codes variables . ● Understand the concepts of classes and objects. ● Define objects, classes, and methods with their own words. 	<ul style="list-style-type: none"> ● Projects ● Small codes ● PowerPoint Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

<p>simple java program.</p> <ul style="list-style-type: none"> • How do you edit, compile and program using a java development environment? • How would you format a program to give it a pleasing, consistent appearance? • Understand compile-time errors. • What is a short definition for the term “program”? • What is a compile-time error and can you describe examples of them? • What are the steps that you followed to download eclipse? • What is an assignment operator? • How would objects, classes, and methods be defined? • Which number type would you use for storing the area of a circle? 	<ul style="list-style-type: none"> • Be able to call methods. • Learn about parameters and return values. • Be able to browse the API documentation. • Realize the difference between objects and object references. • write programs that display simple shapes. 	
<p>Assessments:</p>	<p>Materials:</p>	<p>Resources:</p>
<ul style="list-style-type: none"> • In Class Testing • Multiple Choice AP Computer Science Practice Tests • Projects <ul style="list-style-type: none"> -BMI calculator -Money Exchange -Quadratic Formula -Celsius to Fahrenheit -Average of 5 numbers -Absolute value 	<ul style="list-style-type: none"> • Eclipse Software • Computer • Interactive Whiteboard • White Board • Textbooks • Websites • Lesson Videos 	<ul style="list-style-type: none"> • Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) • Java Program Design (James Cohoon, Jack Davidson) • 5 Steps to AP Computer Science. • LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 3: Implementing Classes	<i>Levels of Abstraction, Specifying the Public Interface of a Class, Commenting the Public Interface, Instance Fields, Implementing Constructors and Methods, Unit Testing, Categories of Variables, Implicit and Explicit Method Parameters, Shape Classes</i>	
Timing:	15 Days	
Standards:	<p><u><i>NJSLS for Mathematics:</i></u> 12.A-REI.1, Standards for MP 1-7</p> <p><u><i>NJSLS 21st Century Life and Careers:</i></u> CRP1, CRP2, CRP4, CRP6, CRP6, CRP7, CRP8</p> <p><u><i>Collegeboard AP Computer Science Curricular Standards:</i></u> CR1, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● In order to implement a class, what do you need to know first? ● What does method definition contain? ● Why comments are important? ● How can you provide documentation comments for every class, every method, every parameter, and every return value? ● What is encapsulation? ● What is a return 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● To become familiar with the process of implementing classes ● To be able to implement simple methods ● To understand the purpose and use of constructors ● To understand how to access instance fields and local variables ● To appreciate the importance of documentation comments ● To implement classes for drawing graphical shapes 	<ul style="list-style-type: none"> ● Projects ● Small codes ● PowerPoint Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

statement? <ul style="list-style-type: none"> • What is unit testing? • How would you explain implicit parameter? 		
Assessments:	Materials:	Resources:
<ul style="list-style-type: none"> • In Class Testing • Multiple Choice AP Computer Science Practice Tests • Projects <ul style="list-style-type: none"> -Bank Account Tester Balance code -Student Score Average -Employee Tester -Roach Population -Bull's eyes -Olympic Ring Viewer 	<ul style="list-style-type: none"> • Eclipse Software • Computer • Interactive Whiteboard • White Board • Textbooks • Different Websites • Lesson Videos 	<ul style="list-style-type: none"> • Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) • Java Program Design (James Cohoon, Jack Davidson) • 5 Steps to AP Computer Science. • LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 4: Fundamental Data Types	<i>Number Types, Constants, Assignment, Increment, and Decrement, Arithmetic Operations and Mathematical Functions, Calling Static Methods, Strings and Reading Input</i>	
Timing:	20 Days	
Standards:	<p><u><i>NJSLS for Technology:</i></u> 8.1.12.A.3</p> <p><u><i>NJSLS for Mathematics:</i></u> 12.A-SSE.3, 12.A-CED.1, 12.F-BF.1, Standards for MP 1-7</p> <p><u><i>NJSLS 21st Century Life and Careers:</i></u> CRP1, CRP2, CRP4, CRP6, CRP7, CRP8</p> <p><u><i>Collegeboard AP Computer Science Curricular Standards:</i></u> CR1, CR4, CR5, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● How do you explain Primitive Types? ● When does rounding errors occur? ● What does Math.round do? ● How do you convert a value to different type? ● A final variable is constant. When do we 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● To understand integer and floating -point numbers ● To recognize the limitations of the numeric types ● To become aware of causes for overflow and roundoff errors ● To understand the proper use of constants 	<ul style="list-style-type: none"> ● Projects ● Small codes ● PowerPoint Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

<ul style="list-style-type: none"> ● use final variable? ● How would you explain assignment, increment and decrement? ● If both arguments of the / operator are integers and the result is an integer, what is the remainder? ● What does % operator do? ● What Math.sqrt do? ● How would you explain String? ● How String can be concatenated? 	<ul style="list-style-type: none"> ● To write arithmetic expressions in Java ● To use the String type to define and manipulate character strings ● To learn how to read program input and produce formatted output 	
Assessments:	Materials:	Resources:
<ul style="list-style-type: none"> ● In Class Testing ● Multiple Choice AP Computer Science Practice Tests ● Projects <ul style="list-style-type: none"> -Cash register -Ice cream cone surface area and volume -Arithmetic operations -Sum and average of numbers -Get largest/Get smallest -Measurement converter -Square area and perimeter -Giving change 	<ul style="list-style-type: none"> ● Eclipse Software ● Computer ● Interactive Whiteboard ● White Board ● Textbooks ● Different Websites ● Lesson Videos 	<ul style="list-style-type: none"> ● Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) ● Java Program Design (James Cohoon, Jack Davidson) ● 5 Steps to AP Computer Science. ● LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 5:	<i>The if statement (if-else statement), Comparing Values, Multiple Alternatives, Using Boolean Expressions, Test Coverage</i>	
Timing:	20 Days	
Standards:	<p><u>NJSLS for Mathematics:</u> 12.A-SSE.3, 12.A-CED.1, 12.A-REI.4, 12.F-BF.1, Standards for MP 1-7</p> <p><u>NJSLS 21st Century Life and Careers:</u> CRP1, CRP2, CRP4, CRP6, CRP6, CRP7, CRP8</p> <p><u>Collegeboard AP Computer Science Curricular Standards:</u> CR1, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● What does if statement do? ● What are the differences between if and if-else statement? ● Explain the importance of Boolean statements for conditions. ● What do we use to compare values? ● What does == do? ● What is null? ● How do we evaluate complex decisions? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● To be able to implement decisions using if statement ● To understand how to group statements into blocks ● To learn how to compare integers, floating-point numbers, strings, and objects ● To recognize the correct ordering of decisions in multiple branches. ● To program conditions using Boolean operations and variables 	<ul style="list-style-type: none"> ● Projects ● Small codes ● Power Point Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

<ul style="list-style-type: none"> • What does switch statement do? • What is the meaning of &&, and ! ? 		
Assessments:	Materials:	Resources:
<ul style="list-style-type: none"> • In Class Testing • Multiple Choice AP Computer Science Practice Tests • Projects <ul style="list-style-type: none"> -Finding errors in the if statement. -Completing truth table -Schedule code (switch statement) -Tax code -Quadratic formula (real and imaginary solutions) -Letter grade to number grade -Combination lock 	<ul style="list-style-type: none"> • Eclipse Software • Computer • Interactive Whiteboard • White Board • Textbooks • Different Websites • Lesson Videos 	<ul style="list-style-type: none"> • Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) • Java Program Design (James Cohoon, Jack Davidson) • 5 Steps to AP Computer Science. • LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 6:	<i>While Loops, For Loops, Nested Loops, Processing Sentinel Values, Random Numbers and Simulations, Using Debugger, A Sample Debugging Session</i>	
Timing:	20 Days	
Standards:	<p><u>NJSLS for Technology:</u> 8.1.12.F.2</p> <p><u>NJSLS for Mathematics:</u> 12.F-BF.1, 12.F-BF.2 Standards for MP 1-7</p> <p><u>NJSLS 21st Century Life and Careers:</u> CRP1, CRP2, CRP4, CRP6, CRP6, CRP7, CRP8</p> <p><u>Collegeboard AP Computer Science Curricular Standards:</u> CR1, CR3 CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> • What does loops do? • What is the difference between for loop and while loop? • Explain do-while loop. • Explain the importance of inclement and decrement? • What is off-by-one error? • Explain nested loop. 	<p>Students will be able to:</p> <ul style="list-style-type: none"> • To be able to program loops with the while and for statements • To avoid infinite loops and off-by-one errors • To understand nested loops • To learn how to process input • To implement simulations • To learn about the debugger 	<ul style="list-style-type: none"> • Projects • Small codes • Power Point Presentations • Lesson Videos • Group work/ Cooperative Learning • Discussions • Multiple choice AP Computer Science practice problems

<ul style="list-style-type: none"> • How do you control the loop with Boolean variable? Give an example. • What is debugger? 		
Assessments:	Materials:	Resources:
<ul style="list-style-type: none"> • In Class Testing • Multiple Choice AP Computer Science Practice Tests • Projects <ul style="list-style-type: none"> -Currency conversion. -Patterns -Fibonacci Sequence -Powers of a Number -Prime Factorization. -Factors of a Number -Mean and Standard Deviation -Prime Numbers 	<ul style="list-style-type: none"> • Eclipse Software • Computer • Interactive Whiteboard • White Board • Textbooks • Different Websites • Lesson Videos 	<ul style="list-style-type: none"> • Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) • Java Program Design (James Cohoon, Jack Davidson) • 5 Steps to AP Computer Science. • LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 7: Arrays and Array Lists	<i>Arrays, Array Lists, Wrappers and Auto-boxing, The Enhanced for Loop, Simple Array Algorithms, Two-Dimensional Arrays, Copying Arrays, Regression Testing</i>	
Timing:	20 Days	
Standards:	<p><u>NJSLS for Technology:</u> 8.1.12.A.3, 8.1.12.B.1, 8.1.12.F.1, 8.1.12.F.2</p> <p><u>NJSLS for Mathematics:</u> 12.F-BF.1, 12.F-BF.2, 12.A-CED.1, 12.A-SSE.3, Standards for MP 1-7</p> <p><u>NJSLS 21st Century Life and Careers:</u> CRP1, CRP2, CRP4, CRP6, CRP7, CRP8</p> <p><u>Collegeboard AP Computer Science Curricular Standards:</u> CR1, CR2, CR3, CR4, CR5, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● What is an array? ● How do we know the length of the array? ● How do you access array elements? ● Explain ArrayList class. ● How do we know array length and size ? ● How do we find the minimum and maximum value of an array list? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● To become familiar with using arrays and array lists. ● To learn about wrapper classes, auto-boxing, and the enhanced for loop. ● To study common array algorithms ● To Learn how to use two-dimensional arrays. 	<ul style="list-style-type: none"> ● Projects ● Small codes ● PowerPoint Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

<ul style="list-style-type: none"> • What is a two dimensional array? • How would you explain the clone method to copy arrays? 	<ul style="list-style-type: none"> • To understand when to choose array lists and arrays in your programs • To implement partially filled arrays. • To understand the concept of regression testing. 	
Assessments:	Materials:	Resources:
<ul style="list-style-type: none"> • In Class Testing • Multiple Choice AP Computer Science Practice Tests • Projects <ul style="list-style-type: none"> -Polygon perimeter and area -Patterns -Tic-Tac-Toe Board -Permutation 	<ul style="list-style-type: none"> • Eclipse Software • Computer • Interactive Whiteboard • White Board • Textbooks • Different Websites • Lesson Videos 	<ul style="list-style-type: none"> • Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) • Java Program Design (James Cohoon, Jack Davidson) • 5 Steps to AP Computer Science. • LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm

Unit 8: Designing Classes	<i>Choosing Classes, Cohesion and Coupling, Accessors, Mutators, and Immutable Classes, Side Effects, Preconditions and Postconditions, Static Methods, Static Fields, Scope, Packages, Unit Test Frameworks</i>	
Timing:	20 Days	
Standards:	<p><u><i>NJSLS for Technology:</i></u> 8.1.12.A.3, 8.1.12.F.2, 8.2.12.G.1</p> <p><u><i>NJSLS 21st Century Life and Careers:</i></u> CRP1, CRP2, CRP4, CRP6, CRP7, CRP8</p> <p><u><i>Collegeboard AP Computer Science Curricular Standards:</i></u> CR1, CR4, CR6</p>	
Essential Questions:	Objectives:	Activities, Investigation, and Student Experiences:
<ul style="list-style-type: none"> ● When does class depend on another class? ● Why do we need to minimize coupling between classes? ● Is the substring method of the String class an accessor or a mutator? ● Is the Rectangle class immutable? ● What type of method is any externally observable data modification? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Learn how to choose appropriate classes to implement ● Understand the concepts of cohesion and coupling ● Minimize the use of the side effects ● Document the responsibilities of methods and their callers with preconditions and postconditions ● Understand the difference between instance methods and static methods ● To introduce the concept of static fields 	<ul style="list-style-type: none"> ● Projects ● Small codes ● PowerPoint Presentations ● Lesson Videos ● Group work/ Cooperative Learning ● Discussions ● Multiple choice AP Computer Science practice problems

<ul style="list-style-type: none"> • Why might you want to add a precondition to a method that you provide for other programmers? • Suppose Java had no Static methods. Then all methods of the Math class would be instance methods. How would you compute the square root of x? 	<ul style="list-style-type: none"> • Understand the scope rules for vocal variables and instance fields • Learn about packages 	
<p>Assessments:</p>	<p>Materials:</p>	<p>Resources:</p>
<ul style="list-style-type: none"> • In Class Testing • Multiple Choice AP Computer Science Practice Tests • Projects <ul style="list-style-type: none"> -Paycheck that deducts federal and Social Security taxes. -Encoding 5 digit bar codes. -Angle 	<ul style="list-style-type: none"> • Eclipse Software • Computer • Interactive Whiteboard • White Board • Textbooks • Different Websites • Lesson Videos 	<ul style="list-style-type: none"> • Java Concepts (AP Computer Science, Cay Horstmann, 5th edition) • Java Program Design (James Cohoon, Jack Davidson) • 5 Steps to AP Computer Science. • LearnersTv Website http://learnerstv.com/Free-Computer-Science-Video-lectures-ltv162-Page1.htm