COURSE TITLE

Coding 101

LENGTH

One Semester
Grades 7-8

DEPARTMENT

Computer Technology
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SCHOOL

Union Middle School

DATE

September 10, 2018

Initial BOE Approval Date (Born on): 4/4/2016

Coding 101

I.   Introduction/Overview/Philosophy

In this course, students will explore a variety of software programming languages and coding concepts. The students will use coding to develop games, digital stories, and other interactive designs. Students will be introduced to coding apps, graphics, games, and websites and will design, test, and refine their creations. Digital literacy will also be reviewed with an emphasis on the recognition and prevention of cyberbullying.

II.   Objectives

Course Outline:
  A. Code.org
      1. Algorithms
      2. Loops
      3. Conditionals
      4. Functions
  B. Bloxels
      1. Creative video game building
      2. Topics emphasized:
          a. design logic
          b. computer science
          c. cross-curricular topics
  C. CS-First
      1. Introduction to computer science and the programming language Scratch or similar program
      2. Exploration of career areas with engaging educational activities
  D. Code Combat
      1. Utilize formal syntax of coding with Python, JavaScript, or similar program in a realistic environment
      2. Focus on debugging skills
  E. Code HS
      1. Introduce applicable computer science skills
      2. Develop problem solving and computational thinking skills
      3. Develop the conceptual understanding necessary to learn new programming languages
  F. Code Academy
      1. Independent exploration to a variety of programming languages including, but not limited to:
          a. Ruby
          b. Alexa
          c. JavaScript
          d. HTML
          e. CSS

       2. Technical programming skills taught through interactive lessons including practice projects

  G. Lightbot/Blockly
       1. Lightbot – puzzle game based coding
           a. Sequencing
           b. Overloading
           c. Procedures
           d. Recursive loops
           e. Conditionals
       2. Blockly – series of educational games that teach programming logic
           a. Loops
           b. Conditionals
           c. Functions

  H. 3D Printing/TinkerCAD
       1. 3D design and printing skills
       2. Creative project design from paper to actual 3D object creation

  I. Self-Guided Independent Project
       1. Students will dig deeper into previous platform of their choice
       2. Develop a presentation outlining independent study project

Student Outcomes:

After successfully completing this course, the student will:

- Create interactive scenes with actors, scenes and sound demonstrating an understanding of events and interactions
- Design animations using loops
- Program motion along x- and y-axes
- Build algorithms using conditional logic
- Understand local and global variables, functions, and object cloning
- Understand scripts running in parallel
- Use advanced conditional logic with math and Boolean operators
- Create different scenarios and effects in games
- Troubleshoot and debug simple programs on a variety of platforms
- Publish projects

New Jersey Student Learning Standards

CAREER READY PRACTICES

CRP1   Act as a responsible and contributing citizen and employee

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2   *Apply appropriate academic and technical skills*
Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP4   *Communicate clearly and effectively and with reason.*
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP6   *Demonstrate creativity and innovation*
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP8   *Utilize critical thinking to make sense of problems and persevere in solving them*
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP11   *Use technology to enhance productivity*
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

TECHNOLOGY STANDARDS

STANDARD 8.1: EDUCATIONAL TECHNOLOGY: ALL STUDENTS WILL USE DIGITAL TOOLS TO ACCESS, MANAGE, EVALUATE, AND SYNTHESIZE INFORMATION IN ORDER TO SOLVE PROBLEMS INDIVIDUALLY AND COLLABORATE AND TO CREATE AND COMMUNICATE KNOWLEDGE.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
8.1.8.D.1 Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.

STANDARD 8.2: TECHNOLOGY EDUCATION, ENGINEERING, DESIGN, AND COMPUTATIONAL THINKING – PROGRAMMING: ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE NATURE AND IMPACT OF TECHNOLOGY, ENGINEERING, TECHNOLOGICAL DESIGN, COMPUTATIONAL THINKING, AND THE DESIGNED WORLD AS THEY RELATE TO THE INDIVIDUAL, GLOBAL SOCIETY, AND THE ENVIRONMENT.
8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.
8.2.8.C.2 Explain the need for optimization in a design process.
8.2.8.C.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
8.2.8.C.4 Identify the steps in the design process that would be used to solve a designated problem.
8.2.8.C.5 Explain the interdependence of a subsystem that operates as part of a system.
8.2.8.C.6 Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.
8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.
8.2.8.E.1 Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
8.2.8.E.3 Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.
8.2.8.E.4 Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).

STANDARD 9.2: CAREER AWARENESS, EXPLORATION, AND PREPARATION
9.2.8.B.4 Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
9.2.8.B.6 Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.

STANDARD 9.3 CAREER AND TECHNICAL EDUCATION
PATHWAY: PROGRAMMING & SOFTWARE DEVELOPMENT (IT-PRG)
9.3.IT-PRG.6 Program a computer application using the appropriate programming language.

III.   Proficiency Levels

This course is open to grades 7 and 8.

IV.   Methods of Assessment

Student Assessment
The teacher will provide a variety of assessments during the course of the year. Among these are: homework, laboratory exercises, weekly projects, teacher-made tests and quizzes, and long-term projects.

Curriculum/Teacher Assessment
The teacher will provide the subject area supervisor with suggestions for changes on an ongoing basis.

V.   Grouping

This is a middle school elective course offered to students in grade 7 and grade 8. There is no prerequisite for this course.

VI.   Articulation/Scope & Sequence/Time Frame

Course length is one semester and is offered to students in grades 7 and 8.

VII.   Resources

Resources include but are not limited to:
- Khan Academy: Intro to JavaScript https://www.khanacademy.org/computing/computer-programming/programming
- https://code.org/ Accelerated Intro to CS Course including unplugged activities
- https://www.codeacademy.com/
- https://www.codeschool.com/
- http://www.inc.com/larry-kim/7-more-places-to-learn-to-code-for-free.html
- https://codecombat.com/
- https://codehs.com/
- http://lightbot.com/
- https://blockly-games.appspot.com/
- https://www.tinkercad.com/
- https://csfirst.withgoogle.com/en/home

VIII.   Suggested Activities

Exploration on the following platforms, but not limited to:
- code.org
- cs-first
- bloxels
- code combat
- code hs
- code academy
- lightbot
- blockly
- 3D printing/tinkerCAD

IX.   Methodologies

The following methods of instruction are suggested: lecture, group projects, demonstration, hands-on applications, and class presentations.

X.   Interdisciplinary Connections

Connections are made to mathematics by using a variety of arithmetic formulas. Connections are also made to the disciplines of business, art and English, by means of incorporation of these ideas into programming projects.

XI.   Differentiating Instruction for Students with Special Needs: Students with Disabilities, Students at Risk, English Language Learners, and Gifted & Talented Students

Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways as they celebrate students' prior knowledge. By providing appropriately challenging learning, teachers can maximize success for all students.

Differentiating in this course includes but is not limited to:

Differentiation for Support (ELL, Special Education, Students at Risk)
- peer mentoring
- differentiated teacher feedback on assignments
- activity choice
- appeal to diverse learning styles
- choice to work with others or alone
- hands-on activities
- pre-teaching vocabulary

- visual demonstrations, illustrations, and models
- work with checklists
- peer teaching and support

Differentiation for Enrichment
- more complex tasks and problems
- independent extensions based on student interest, curiosity, and choice
- adjusting the pace of lessons
- independent study
- higher-order thinking skills
- student-driven

XII.   Professional Development

The teacher will continue to improve expertise through participation in a variety of professional development opportunities.

XIII. Curriculum Map/Pacing Guide

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments
code.org • Algorithms • Loops • Conditionals • Functions	2 weeks	*For Support:* • peer teaching and support • differentiated teacher feedback on assignments • appeal to diverse learning styles • pre-teaching vocabulary • work with checklists • peer mentoring *For Enhancement:* • more complex tasks and problems • adjusting the pace of lessons • student-driven • higher-order thinking skills	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP8, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.2.8.C.6, 8.2.8.E.1, 8.2.8.E.4, 9.2.8.B.4, 9.2.8.B.6, 9.3.IT-PRG.6	*Formative Assessment:* Teacher Observation Classwork Teacher/student discussion *Summative Assessment:* Course Benchmark Completion provided on Teacher Dashboard in code.org Oral Presentation sharing challenges and achievements (rubric)

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments

Bloxels
 	
• hands-on, creative video game building
• Topics covered:
  design logic
  computer science
  cross-curricular topics
	2 weeks	*For Support:*
		• peer mentoring
		• choice to work with others or alone
		• activity choice
		• visual demonstrations, illustrations, and models
		• hands-on activities
		
		For Enhancement:
		• more complex tasks and problems
		• independent extensions based on student interest, curiosity, and choice
		• independent study
		• student-driven
			Standards:
			CRP1, CRP2, CRP4, CRP6, CRP8, CRP11, 8.2.8.C.1, 8.2.8.C.2, 8.2.8.C.3, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.D.1, 8.2.8.E.3
				Formative Assessment:
				Teacher Observation
				Classwork
				Teacher/student discussion
				
				Summative Assessment:
				Bloxels Game Room Completion
				Oral Presentation sharing/demonstrating game created with the class

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments
CS-First Introduction to computer science and the programming language Scratch. A variety of themes attract and engage students to a number of career areas with engaging educational activities.	2 weeks	*For Support:* • peer mentoring • appeal to diverse learning styles • peer teaching and support • activity choice • pre-teaching vocabulary • work with checklists *For Enhancement:* • more complex tasks and problems • adjusting the pace of lessons • independent study • higher-order thinking skills • student-driven	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP8, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.2.8.C.2, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.C.6, 8.2.8.E.3, 8.2.8.E.4, 9.2.8.B.4, 9.2.8.B.6, 9.3.IT-PRG.6	*Formative Assessment:* Teacher Observation Self-guided structured online lesson content includes videos and activities. Projects will be shared for teacher and classmates to view Reflection/discussion both individually and group *Summative Assessment:* Coursework completed as indicated in the CS-First Teacher Dashboard Showcase of student projects (do the projects meet the project objectives)

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Code Combat • Utilize formal syntax of coding in a realistic environment • Focus on debugging skills	2 weeks	*For Support:* • peer mentoring • appeal to diverse learning styles • peer teaching and support • activity choice *For Enhancement:* • more complex tasks and problems • adjusting the pace of lessons • independent study • higher-order thinking skills • student-driven	*Standards:* CRP1, CRP2, CRP4, CRP8, 8.1.8.A.3, 8.2.8.C.2, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.C.6, 8.2.8.E.3, 8.2.8.E.4, 9.3.IT-PRG.6	*Formative Assessment:* Teacher Observation Classwork Teacher/student discussion Good and welfare discussions *Summative Assessment:* Course Benchmark Completion provided on Teacher Dashboard in Code Combat Oral presentation featuring progress and achievements
Code HS • Introduce applicable computer science skills • Develop problem solving and computational thinking skills • Develop the conceptual understanding necessary to learn new programming languages	2 weeks	*For Support:* • differentiated teacher feedback on assignments • visual demonstrations • work with checklists • peer teaching and support *For Enhancement:* • independent extensions based on student interest, curiosity, and choice • student-driven • adjusting the pace of lessons	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP8, CRP11, 8.1.8.D.1, 8.2.8.C.3, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.C.6, 8.2.8.E.3, 8.2.8.E.4, 9.3.IT-PRG.6	*Formative Assessment:* Teacher Observation Classwork Teacher/student discussion *Summative Assessment:* Course Benchmark Completion as shown in Teacher Dashboard in Code HS Oral Presentation sharing achievements with the class

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments

Code Academy
• Independent exploration to a variety of programming languages including, but not limited to:
   o Ruby
   o Alexa
   o JavaScript
   o HTML
   o CSS
• Technical programming skills taught through interactive lessons including practice projects.
	2 weeks	*For Support:*
		• peer mentoring
		• activity choice
		• work with checklists
		
		For Enhancement:
		• more complex tasks and problems
		• independent study
		• student-driven
		• higher-order thinking skills
			Standards:
			CRP1, CRP2, CRP4, CRP6, CRP8, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.2.8.C.2, 8.2.8.C.3, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.C.6, 8.2.8.E.3, 8.2.8.E.4, 9.3.IT-PRG.6
				Formative Assessment:
				Teacher Observation
				Classwork
				Teacher/student discussion
				
				Summative Assessment:
				Course Benchmark Completion as displayed in the Teacher Dashboard in Code Academy
				Oral Presentation and progress log displaying course progress

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments

Lightbot/Blockly
• Lightbot – puzzle game based coding
    Skills taught:
      o Sequencing
      o Overloading
      o Procedures
      o Recursive loops
      o Conditionals
• Blockly – series of educational games that teach programming logic
    Skills taught:
      o Loops
      o Conditionals
      o Functions
	2 weeks	*For Support:*
		• Activity choice
		• Choice to work with others or alone
		• Peer teaching and support
		
		For Enhancement:
		• More complex tasks and problems
		• Independent extensions based on student interest, curiosity, and choice
		• Student-driven
		• Independent study
			Standards:
			8.1.8.A.3,
			8.1.8.D.1,
			8.2.8.C.2,
			8.2.8.C.3,
			8.2.8.C.4,
			8.2.8.C.5,
			8.2.8.C.6,
			8.2.8.E.3,
			8.2.8.E.4,
			9.3.IT-PRG.6
				Formative Assessment:
				Teacher Observation classwork
				Teacher/student discussion
				Good and welfare discussions
				
				Summative Assessment:
				Oral Presentation and Progress Log showing evidence of progress and accomplishments

3D Printing/TinkerCAD • 3D design and printing skills • Creative project design from paper to actual 3D object creation	2 weeks	*For Support:* • Activity choice • Choice to work with others or alone • Visual demonstration, illustrations and models *For Enhancement:* • More complex tasks and problems • Independent study • Student-driven	*Standards:* 8.1.8.A.3, 8.1.8.D.1, 8.2.8.C.2, 8.2.8.C.3, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.C.6, 8.2.8.E.3, 8.2.8.E.4, 9.3.IT-PRG.6	*Formative Assessment:* Teacher Observation Classwork Teacher/student discussion *Summative Assessment:* Final 3D printed object (examples: cell phone case, keychain or other object) Is the object fully functional and purposeful?

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Self-guided/Independent Projects • Students will delve into a previous platform of their choice • Develop a presentation outlining independent study project	4 weeks	*For Support:* • Peer mentoring • Activity choice • Differentiated teacher feedback on assignments • Progress checks *For Enhancement:* • More complex tasks and problems • Independent study • Student-driven	*Standards:* 8.1.8.A.3, 8.1.8.D.1, 8.2.8.C.2, 8.2.8.C.3, 8.2.8.C.4, 8.2.8.C.5, 8.2.8.C.6, 8.2.8.E.3, 8.2.8.E.4, 9.3.IT-PRG.6	*Formative Assessment:* Teacher Observation Classwork Progress Checks Teacher/student discussions *Summative Assessment:* Course Benchmark (if applicable) Student progress log Oral Presentation featuring progress and accomplishments