COURSE TITLE

Coding 201

LENGTH

One Semester
Grades 7-8

DEPARTMENT

Computer Technology
Barbara O'Donnell, Supervisor

SCHOOL

Union Middle School

DATE

September 10, 2018

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

Coding 201

I. Introduction/Overview/Philosophy

In this course, students will explore a programing language(s) more deeply. The students will explore programming concepts and develop programs with graphics, animation, and interactivity. Game design will also be explored. Students must have successfully completed Coding101 to enroll in this course.

II. Objectives

Course Outline:

A. Introduction and Scratch (or similar program) Review
   1. Review previously learned program concepts
   2. Create interactive stories, animations and games through creativity, reasoning and collaboration

B. Alice (or similar program)
   1. Create animations, build interactive narratives and program simple 3D games
   2. Develop creative exploration skills through programming
   3. Develop logic and computational thinking skills
   4. Learn object oriented programming

C. Arduino (or similar platform)
   1. Design and write code to accomplish unique tasks through an Arduino (or similar platform)
   2. Develop troubleshooting and debugging skills

D. Raspberry Pi (or similar program)
   1. Design and write code to create a "mini-computer" that will accomplish a pre-determined task.
   2. Develop troubleshooting and debugging skills

Student Outcomes:

After successfully completing this course, the student will:

- Add backgrounds, sprites and shapes
- Use action commands and events to create animated and interactive projects
- Learn the basic concepts of computer programming (coding), including:
  - Variables
  - Data types
  - Debugging

    - Loops
    - If-statements
    - Nesting
- Extend their knowledge of coding to include more advanced topics, such as:
    - Functions
    - Parameters
    - Returning Values
    - Programming logic
    - Dictionaries
    - Events
- Learn to create and customize popular apps and classic video games.
- Design and create programs utilizing Arduino and Raspberry Pi (or similar) devices to complete pre-determined tasks

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.

CRP 7 Employ valid and reliable research strategies

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

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.

CRP10 Plan education and career paths aligned to personal goals

Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

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.
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

TECHNOLOGY STANDARDS

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.2 Demonstrate an understanding of the relationship between hardware and software.
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 who have successfully completed Coding 101.

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 grades 7 and 8.

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:

- **Computer Coding** by Jon Woodcock, DK Workbooks, 2014.
- **How to Code** by Max Wainewright, QEB Publishing, 2015.
- **Beyond the Hour of Code** http://www.beyondthehourofcode.com/
- http://cty.jhu.edu/ctyonline/courses/computer_science/scratch_programming.html
- https://www.khanacademy.org/computing/computer-programming/programming-games-visualizations
- http://www.bootstrapworld.org/
- Scratch https://scratch.mit.edu/educators/
- Alice https://www.alice.org/
- Arduino https://www.arduino.cc/
- Raspberry Pi https://www.raspberrypi.org/

VIII. Suggested Activities

- Laboratory programming problems
- Game simulated programs
- Cooperative programming projects

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)

- activity choice
- appeal to diverse learning styles
- choice to work with others or alone
- modified hands-on activities
- multimodal activities
- advance organizers
- pre-teaching vocabulary
- visual demonstrations, illustrations, and models
- work with checklists
- peer teaching and support

Differentiation for Enrichment

- more complex tasks and problems
- higher expectations in assessment questioning
- independent extensions based on student interest, curiosity, and choice
- extended research and readings
- curriculum compacting

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
Introduction and review Utilize Scratch (or similar program) to: • Review coding concepts and skills • Develop improved debugging skills	2 weeks	*For Support:* • Activity choice • Appeal to diverse learning styles • Visual demonstrations, illustrations, and models • Peer teaching and support • Advance organizers • Work with checklists *For Enhancement:* • Higher expectations in assessment questioning • Independent extensions based on student interest, curiosity and choice • Curriculum compacting	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP7, CRP8, CRP10, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.1.8.D.4, 8.1.8.F.1, 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.C.6, 8.2.8.D.1, 8.2.8.E.1, 8.2.8.E.2, 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 Student feedback Progress checks Practice programming problems *Summative Assessment:* Conferencing Student demonstration/presentation Written programs Reflection

Unit Topic	**Time Allocated**	**Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students**	**Standards**	**Assessments**
Alice (or similar program) • Use a block-based programming environment used to create animations, build interactive narratives, or program simple games in 3D. • Learn through creative exploration. • Teach logical and computational thinking skills and fundamental principles of programming expose students to object-oriented programming.	4 weeks	*For Support:* • Activity choice • Appeal to diverse learning styles • Modified hands-on activities • Peer teaching and support *For Enhancement:* • More complex tasks and problems • Independent extensions based on student interest, curiosity and choice • Extended research and readings	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP7, CRP8, CRP10, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.1.8.D.4, 8.1.8.F.1, 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.C.6, 8.2.8.D.1, 8.2.8.E.1, 8.2.8.E.2, 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 Student feedback Progress checks Practice programming problems *Summative Assessment:* Conferencing Student demonstration/presentation Written programs Reflection

Unit Topic	**Time Allocated**	**Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students**	**Standards**	**Assessments**
Arduino (or similar platform) • Use an open-source electronics platform based on easy-to-use hardware and software. • Create boards which are able to read inputs - light on a sensor, a finger on a button, etc - and turn it into an output - activating a motor, turning on an LED, publishing something online. • Program a set of instructions through coding to the microcontroller on the board.	7 weeks	*For Support:* • Activity choice • Appeal to diverse learning styles • Modified hands-on activities • Peer teaching and support • Multimodal activities • Choice to work with others or alone *For Enhancement:* • More complex tasks and problems • Independent extensions based on student interest, curiosity and choice • Higher expectation in assessment questioning	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP7, CRP8, CRP10, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.1.8.D.4, 8.1.8.F.1, 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.C.6, 8.2.8.D.1, 8.2.8.E.1, 8.2.8.E.2, 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 Student feedback Progress checks Coding/progress journal Practice programming problems *Summative Assessment:* Conferencing Student demonstration/presentation Coding/progress journal Reflection Does the program achieve the goal? Written programs

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk of School Failure, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Raspberry Pi (or similar mechanism) • Explore computing, and to learn how to program in languages such as Scratch and Python. • Debug and troubleshoot programs	7 weeks	*For Support:* • Activity choice • Appeal to diverse learning styles • Modified hands-on activities • Peer teaching and support • Multimodal activities • 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 • Higher expectation in assessment questioning • Extended research and readings	*Standards:* CRP1, CRP2, CRP4, CRP6, CRP7, CRP8, CRP10, CRP11, 8.1.8.A.3, 8.1.8.D.1, 8.1.8.D.4, 8.1.8.F.1, 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.C.6, 8.2.8.D.1, 8.2.8.E.1, 8.2.8.E.2, 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 Student feedback Progress checks Coding/progress journal Practice programming problems *Summative Assessment:* Conferencing Student demonstration/presentation Coding/progress journal Reflection Does the program achieve the goal? Written programs