Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
RCOE Systems Programming 01

- ✓ New
- ☐ Revised

If revised previous course name if changed

Transcript Course Code/Number:
(To be assigned by Educational Services)

Subject Area:
- ☐ Social Science
- ☐ English
- ☐ Mathematics
- ☐ Laboratory Science
- ☐ World Languages
- ☐ Visual or Performing Arts
- ✓ College Prep Elective
- ☐ Other

Is this classified as a Career Technical Education course?
- ✓ Yes
- ☐ No

PATHWAY: Software and Systems Development - Systems Programming CONCENTRATOR

Grade Level
- ☐ MS
- ☐ HS
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ✓ 9
- ✓ 10
- ✓ 11
- ✓ 12

Required for Graduation:
- ☐ Yes
- ✓ No

Meets UC/CSU Requirements?
- ✓ Yes
- ☐ No

Was this course *previously approved by UC* for PUHSD?
- ✓ Yes
- ☐ No

(Will be verified by Ed Services)

Credentials Required to teach this course:
Designated Subjects
CTE: Information and Communication Technology
Single Subject: Information and Communication Technology

To be completed by Human Resources only.

DocuSigned by:
Mel Hilton 3/12/2021
D0FF500DEAE4460...
Signature **Date**

Meets "Honors" Requirements?
- ☐ Yes
- ✓ No

Meets "AP" Requirements?
- ☐ Yes
- ✓ No

Unit Value/Length of Course:
- ☐ 0.5 (half year or semester equivalent)
- ✓ 1.0 (one year equivalent)
- ☐ 2.0 (two year equivalent)
- ☐ Other:

Submitted by: Dian Martin
Site: Educational Services
Date:03/02/2021

Approvals	Name/Signature	Date
Director of Curriculum & Instruction		3/10/21
Asst. Superintendent of Educational Services		3/17/21
Governing Board		

Riverside County Office of Education – Career Technical Education

RCOE SYSTEMS PROGRAMMING 01

DATE:

INDUSTRY SECTOR: Information and Communication Technologies Sector

PATHWAY: Software and Systems Development - Systems Programming

CALPADS TITLE: Intermediate Systems Programming (Concentrator)

CALPADS CODE: 8131

HOURS:

Total	Classroom	Laboratory/CC/CVE
180	90	90

JOB TITLE	O*NET CODE	JOB TITLE	O*NET CODE
Robotics Engineers	17-2199.08	Logistics Engineers	13-1081.01
Electronics Engineering Technologists	17-3029.04	Industrial Engineering Technologists	17-3029.05

COURSE DESCRIPTION:

The combination of electrical and mechanical engineering where students design, build and program robotic mechanisms. Students will apply C++ and Python coding to direct micro-controller parts. The class focuses on academic, technical skills, and employability practices. Students will develop personal and professional skills in the classroom that will transfer to the workplace. Such technologies include robotics, micro-controllers, microprocessors, computer hardware, programming languages, 3D Modeling, mobile applications, and Unmanned Aerial Systems. Students will learn the basics of each technology group and will learn how to build, program, and use these technologies in new and exciting careers. Additional course topics include computer-based careers and trends, electronic computing issues, terminology, electronic communication skills, ethics, security, and etiquette in today's business computing environment. Technology Fundamentals will provide students with computer knowledge and skills to increase their productivity which will give them a competitive advantage in the job market. After completion of this course, students can then move on to the second year of the Pathway, Technology, and Industrial Automation.

A-G APPROVAL: G

ARTICULATION: None

DUAL ENROLLMENT: None

PREREQUISITES:

Prerequisite
na

METHODS OF INSTRUCTION

- Direct instruction
- Group and individual applied projects
- Multimedia
- Demonstration
- Field trips
- Guest speakers

STUDENT EVALUATION:

- Student projects
- Written work
- Exams
- Observation record of student performance
- Completion of assignment

INDUSTRY CERTIFICATION:

- No

RECOMMENDED TEXTS:

- Automate the Boring Stuff Al Sweigart No Starch Press
- Welcome to Cyber Literacy NICERC National Integrated Cyber Education Research Center

PROGRAM OF STUDY

Grade	Fall	Spring	Year	Course Type	Course Name
9, 10, 11, 12			• •	Concentrator	RCOE Systems Programming 01
10, 11, 12			• •	Capstone	RCOE Systems Programming 02

I.	UNIT 1 - PSEUDOCODE AND FLOWCHARTS	CR	Lab/ CC	Standards
	The focus of this unit is to show students how they can carry out problem-solving; that means, solving different problems using programming. Simply put, we encounter different types of problems continually in our life and some of the problems can be solved using programming. Prior to actually coding the solution to the problem in a language, students must first understand how to solve the programs without actually opening up the programming IDE. We accomplish these tasks with Pseudocode and Flowcharts. During the unit, students will learn how to solve simple, everyday tasks, utilizing only pseudocode and flowcharts. Once they have demonstrated an understanding of these topics, they will learn how to adapt them into actual programming code. **Key Assignment**: • **Student Production**: Students will learn how to use pseudocode and flowcharts to accomplish simple and complex tasks. Students will first attempt to use pseucode code to explain the tasks it took to get them ready for school during the morning. They will then convert the pseudocode to a flowchart. Following this exercise, students will then try to explain how to do more complex tasks, such as robot movements and challenges. They will be allowed to used either pseudocode and/or flowcharts to complete the tasks, but have to use each one at least once. • **Assignment Completion Method**: Students will use visual models, paper models, and programs to create pseudocode and flowcharts. Students will have the opportunity to learn each method and utilize them in the assignments mentioned above. They will also have the opportunity to see what the benefits and drawbacks are of each method. • **Student Learning Outcome**: Students will explain a process utilizing pseudocode and flowcharts which will later be translated into programming code.	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**
II.	UNIT 2 - INTRODUCTION TO COMPUTER PROGRAMMING	CR	Lab/ CC	Standards
	Students will be introduced to Python Programming, which is one of the top programming languages in existence today. Python is an interpreted, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales. Python Programmers are highly sought out by employers and understanding the basics of this language is a great start for the students. Students will be introduced to the Python basics, flow controls, and functions. The knowledge they learn in this unit will allow students to demonstrate a basic understanding of programming and how languages use flow control and functions. These can be expressed in any programming language today, so students can easily transition this knowledge when they are trying to learn other prevalent programming languages. Ultimately, students will be able to demonstrate the information they have learned and compose their own programs to solve simple and intermediate tasks. **Key Assignment**: • **Student Production**: Students will use an online textbook that will introduce them to the Python Programming language. The introductory method will include chapter reading, followed by hands-on programming examples. Students will learn about the Python Interactive shell and create their own Python programs. They will also learn how to check their programs for errors and compile them for use. • **Assignment Completion Method**: Students will create their programs	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**

	using Python, but will upload the code to Google Classroom and have a screen-shot of their program output. Examples of the coding will include basic input-output commands, such as; arithmetic, variable use, flow-control, and print commands. • **Student Learning Outcome**: Students will analyze, evaluate, and apply learned concepts to create Python programs. Such programs include, but are not limited to; math calculators, mad libs, and input/output questions.			
III.	**UNIT 3 - ROBOTICS AND TEXT-BASED PROGRAMMING**	**CR**	**Lab/ CC**	**Standards**
	Between 2018 and 2021, it is estimated that almost 2.1 million new industrial robots will be installed in factories around the world. Robotics is starting to take on remedial tasks that were typically done by humans. During this unit, students will build and program a robot with a group of their peers. Students will demonstrate knowledge following instructions on paper and in videos through working with teammates. Once the robot is completed, students will learn how to program the robot, utilizing a text-based programming language, to facilitate a vast number of tasks. Utilizing knowledge obtained through smaller lessons, students will modify existing programs to complete a wide range of tasks and present it to the instructor. Students will model analytical and program-solving skills which is a requirement in the workforce. **Key Assignment**: • **Student Production**: Working in small groups, students will build the Board of Education robot (BOE-bot). They will then go through a guided set of lessons that will teach them how to program the BOE-bot using the Basic Stamp Editor programming language acquired from the NICERC website (National Integrated Cyber Education Research Center). • **Assignment Completion Method**: Students will use Google classroom for necessary assignment materials, videos, and/or files. They will use their build BOE-Bots and the Basic Stamp Editor software to control their robots. They will then add their code to Google Docs and submit them through Google Classroom. • **Student Learning Outcome**: Students will analyze, evaluate, and apply learned concepts to help their BOE-Bots complete predefined tasks. Once they have learned how to use all the servos and sensors that accompany their BOE-Bots, they will ultimately formulate a program that will have them navigate an elaborate maze.	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**
IV.	**UNIT 4 - ROBOTICS AND VISUAL (BLOCK) PROGRAMMING**	**CR**	**Lab/ CC**	**Standards**
	Students will construct a robot, operating in the group environment. They will learn how to adapt their skills and strengths to build the robot in a shorter amount of time than the previous unit. Once complete, students will program the robot utilizing a Visual-Based (Drag and Drop) programming language. Such a programming language will show students the differences they will encounter in today's workforce. Utilizing the knowledge they have learned in previous units, students will be able to adapt from a text-based programming language to a visual-based language. They will demonstrate the same problem solving as practiced within the unit. **Key Assignment**: • **Student Production**: Working in small groups, students will build the LEGO EV3 robot. Once all robots are completed and approved by the instructor, they will then be assigned a robot and iPad that will be theirs for the remainder of the lesson. The instructor can have students work individually or in groups of 2. The student will then learn how to program their robots using the EV3 software, which is a Visual (Block) type of programming language. • **Assignment Completion Method**: Once all the robots have been built	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**

	and assigned to the students, they will begin each class by getting their robots and iPads. Students will then open Google Classroom to get their current assignment. Once they have completed the task that was assigned to them, they will attach a screenshot of their code and a video of their program outcome (robot actually conducting the program) to a Google Doc file. • **Student Learning Outcome**: Student will analyze, describe, and interpret the differences in a text-based programming language versus a visual-based (block) programming language. Additionally, they will differentiate the Pros and Cons of each programming language types and use and/or recommend them for any type of working environment.			
V.	**UNIT 5 - EMBEDDED SYSTEMS AND MICROCONTROLLERS**	**CR**	**Lab/ CC**	**Standards**
	Embedded systems and microcontrollers are becoming prevalent in today's connected "Smart" world. For example, many homes have internet cameras, smart TVs, smart security systems, and connected climate controls systems. This module provides a hands-on introduction to embedded systems using the Arduino Starter Kit. Students will wire circuits and program the Arduino embedded board to read switches, potentiometers, photocells, and temperature sensors; and send signals to LEDs, speakers, motors, servos, and LCD displays. Students will wire a circuit that when triggered by a switch, potentiometer threshold, interruption of a light source, or excess heat will sound an alarm, rotate a servo, flash the LED, and display a warning message. **Key Assignment**: • **Student Production**: Students will learn how to use an Arduino Microcontroller. They will use a Starter Kit, such as the Elegoo Complete Starter Kit. The Kit includes a PDF Textbook that will guide them through each item. They will learn what a microcontroller is and how to program it to respond to sensors and servos. Students will work on just a few of the basic items during this unit. They will complete the remainder of the kit during the 2nd year of the pathway • **Assignment Completion Method**: After students have learned how to use LEDs and some of the basic sensors, they will work in teams and create a proposal for a project that will utilize what they have learned. They will present their projects in a presentation and then work on creating the project with their teams. When they are complete, they will be displayed throughout the classroom. • **Student Learning Outcome**: Students will be able to describe what a Microcontroller is and how they are used in the workforce. They will also be able to differentiate from an input and output device and how they affect each other. They will also be able to differentiate between different programming languages and understand the appropriate uses for such programming languages.	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**
VI.	**UNIT 6 - MICROCOMPUTERS**	**CR**	**Lab/ CC**	**Standards**
	A microcomputer is a complete computer on a small scale, designed for use by one person at a time. An antiquated term, a microcomputer is now primarily called a personal computer (PC), or a device based on a single-chip microprocessor. Common microcomputers include laptops and desktops. Beyond standard PCs, microcomputers also include some calculators, mobile phones, notebooks, workstations, and embedded systems. During this unit, students will learn the components of a standard desktop computer. They will then learn about much smaller microcomputers, such as the Raspberry Pi, and understand the benefits and uses for both platforms. **Key Assignment**: • **Student Production**: Students will learn about a couple of different Microcomputers during this lesson; Personal Computer (PC) and a Raspberry Pi (Credit-Card sized computer). During this lesson, students	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**

	will tear down and construct a personal computer. They will be able to illustrate the different parts of a PC and describe their intended uses. They will then learn about a Raspberry Pi and examine its uses in society. They will then be able to compare the advantages and disadvantages of each Microcomputer and explain how they can be effectively used in the workforce. • **Assignment Completion Method**: Working in groups of 3-4 students, the instructor will assign each group a personal computer (PC). The lesson will begin with a scenario that the computer needs to be rebuilt because it is experiencing issues. First, students will be required to gather information on the computer and then take several pictures prior to taking it apart. Second, students will remove the components of the computer as if they are being replaced with new or repaired parts. Third, students will complete the rebuild of the PC using the photos taken in the initial phase of the lesson and install an Operating System (Linux). Fourth, students will connect the rebuilt computer to a monitor, keyboard, and mouse and start the computer. Any issues that arise during the start-up of the PC must be addressed until the computer is restored or students must document why it cannot be fixed. After the PC rebuild project, the students will then learn completely the same steps on a Raspberry Pi and the opportunity to run Python programs on them. Such programs will contain but are not limited to Sensor use, servo movement, video games, and/or everyday tasks. • **Student Learning Outcome**: Students will differentiate the differences between Microcomputers in the world today and will formulate which system will be sufficient based on the needs of their customers. Students will also compare the different components of a personal computer and their intended use for the system.			
VII.	**UNIT 7 - 3D MODELING**	**CR**	**Lab/ CC**	**Standards**
	3D printing is a current trend of instructors in higher education. Three-dimensional (3D) printing technology involves using computer-aided design (CAD) software to develop a model, or obtaining a 3D print file from a database or other source, and then using a 3D printer to produce a physical object. Three-dimensional printers create models from a variety of materials, most commonly with the plastic PLA, a plant-based material made from starch. There are several pedagogical advantages of 3D printing in the classroom. Primarily, students can observe features of 3D objects that are more difficult to visualize on paper or other 2D formats. Students can examine replicas of artifacts and artwork of which originals are otherwise inaccessible or fragile. Three-dimensional models also increase the accessibility of course material to non-visual learners. **Key Assignment**: • **Student Production**: Students will use a web-based 3D Modeling sire called TinkerCAD to create their own 3D Models. Students will learn the basics of 3D Modeling and the basics of TinkerCAD. The final project will require students to create a keychain that is "school-themed." Classmates will vote for the best keychain created by their peer and the winner will have their model printed. Each student will be able to keep the keychain they make • **Assignment Completion Method**: Students will use Google Classroom for assignment information and submission and TinkerCAD to develop their projects. They will be guided through a number of introductory assignments that will model how to create elaborate objects which can eventually be printed on a 3D printer. Some examples will be the creation of tools, such as Nuts, Bolts, and Wrenches. Students will submit a screenshot of their object to the instructor in a Google Doc through Google Classroom. • **Student Learning Outcome**: Students will analyze, evaluate, and apply	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**

	concepts of 3D modeling. Students will visualize models using the X, Y, Z planes and develop the ability to compose 3D Models that can be used in society. Students will demonstrate how ideas and concepts that would typically be displayed in a 2D environment can be moved into a 3D environment.			
VIII.	**UNIT 8 - SQL PROGRAMMING**	**CR**	**Lab/ CC**	**Standards**
	This unit engages students to analyze complex business scenarios and create a data model - a conceptual representation of an organization's information. Participants implement their database design by creating a physical database using SQL (Structured Query Language). Basic SQL syntax and the rules for constructing valid SQL statements are reviewed. This unit culminates with a project that challenges students to design, implement, and demonstrate a database solution for a business or organization. **Key Assignment**: • **Student Production**: Using online tutorials, such as Codecademy and Google Sheets, students will learn about how data can be useful to companies in the workforce. Students will go through a 7-hour course in Codecademy and then use that knowledge in a real-world database that will be set up by the instructor. Students will also be introduced to how data can be used within a spreadsheet environment, using Google Sheets • **Assignment Completion Method**: Keys assignments will be designing financial and inventory database systems and then use data analysis tools, such as Google Sheets and SQL queries to retrieve data for reporting. • **Student Learning Outcome**: Students will analyze, evaluate, and apply concepts learned in the Codecademy and Google Sheets. They will then be able to create and modify queries and spreadsheets. Students will be able to understand how data is used and the importance of analysis and the science behind real-world data.	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**
IX.	**UNIT 9 - UNMANNED AERIAL SYSTEMS**	**CR**	**Lab/ CC**	**Standards**
	The rapid proliferation of commercial Unmanned Aerial Systems (UAS) has created tremendous demand for hundreds of thousands of new jobs in multiple industries which include construction, manufacturing, landscaping, photography, videography, and military just to name a few. Students will be introduced to the safety and risk management practices associated with UAS. This unit will expose the students to the rules and operation of UAS in the industry. In a safe environment, students will follow a complex multi-step procedure to fly the UAS demonstrating how to legally operate them. **Key Assignment**: • **Student Production**: Students will learn the rules and restriction of operating an Unmanned Aerial System (drone) in today's society. They will learn where to find information regarding the legalities of drone flight and how to get permission to operate their drones in a given location. Students will then be able to operate a drone in a confined and controlled space (drone net). • **Assignment Completion Method**: Students will use the internet and complete an Unmanned Aerial System flight status page in Google Docs and will cite all rules and regulations for a particular area (each group will have a different location). Students will then research information on how to obtain appropriate permission to operate their drone at a certain location. Following the initial lesson, students will then fly a drone in a controlled environment, create a document to explain drone use and what they have learned from this lesson. Students will submit all assignments through Google Classroom. • **Student Learning Outcome**: Students will analyze, evaluate, and apply concepts for Unmanned Aerial System (drone) operation. Students will	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**

	demonstrate the legal operation of drones and how to acquire permission to operate drones in restricted airspace.			
X.	**UNIT 10 - EMPLOYMENT PORTFOLIO**	**CR**	**Lab/ CC**	**Standards**
	Whether you want a good job, a better job, or your dream job, you need to stand out from the competition and display your education, skills, and experience to a potential employer. In "Guerrilla Marketing for Job Hunters 3.0," Levinson and Perry emphasize that the candidates who best market themselves win the jobs. You have to show employers how and why you're different and better than all the other candidates vying for the position you want (work.chron.com). The Employment Portfolio unit will provide students with the tools for building their portfolio which will give them a competitive advantage in the job market. **Key Assignment**: • **Student Production**: Students will use critical thinking skills to create a competitive professional portfolio. • **Assignment Completion Method**: Students will research how to create a competitive professional portfolio. The student will then create their portfolio which will showcase their best professional level of work, a completed job application, a professional resume, and a reference list. • **Student Learning Outcome**: Students will analyze, evaluate, and apply concepts to create a competitive professional portfolio. Learned Concepts: Creating a professional and competitive resume; Creating a professional and competitive reference list; Completing a competitive job application; Showcasing the best professional level of work.	9	9	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:**
XI.	**COURSE NOTES:**	**CR**	**Lab/ CC**	**Standards**
	Course Notes: Completed by ASG 4/12/19 – Added to CTE s drive. **Former Course Title**: RCOE Technology Fundamentals	0	0	**Academic:** LS: 11-12.1 **CTE Anchor:** Communications: 2.1 **CTE Pathway:** C1.1

Entered by:

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