CS EXPLORATIONS 3 COURSE SYLLABUS

CS Explorations 3 is an introductory computer science course designed to support the transition from block-based to text-based programming in Python, thorough engaging learning units and projects that explore CS as a medium for creation including app design, LED art, music and more. Students also get a chance to explore innovative tools such as Applab, the Micro:bit Python editor platform and the Earsketch music app, as a means for creative and social expression. The units are designed to build excitement about the skills that students will develop throughout CSE3 by connecting what students are learning to the real world. Students build, remix, and share apps, animations, LED art, and music, in a collaborative environment.

GRADE LEVEL

Grade 7-8+

PREREQUISITES

No prior computer science knowledge or coursework is required.

CS EXPLORATIONS PATHWAY

CSE1: FUNDAMENTALS IN SCRATCH	CSE2: ARTIFICIAL INTELLIGENCE	CSE3: CREATIVE CS
Grade 6+	Grade 7+	Grade 7+

COURSE OBJECTIVES

By the end of this course, students will be able to:

- Create a variety of computer programs using block and text-based programming.
- Apply fundamental computer science concepts to their programs using Python.
- Use computers to solve problems and express themselves.

STANDARDS AND FRAMEWORK

CS Explorations 3 was written using both the K–12 Framework for Computer Science and the CSTA standards as guidance. Lists of connected standards can be found within each lesson where they are addressed.

In addition to the CSTA standards and K–12 Framework, CS Explorations 3 was written with a learning framework, which is written for each unit and outlines the expected student outcomes that are assessed throughout the unit and in that unit's major projects and post-project test. These outcomes are organized into concept clusters to help students and teachers understand the broad goals of each unit.

CORE COURSE STRUCTURE

The CS Explorations 3 core curriculum consists of three 2-unit blocks (Blocks A, B and C) that comprise 6 units of study. CS Explorations 3 core units are sequenced, and build on each other. Schools can choose to teach a single block, two sequential blocks, or all 3 blocks sequentially throughout a school year. Schools will also have access to optional supplemental Intersession lesson resources that can be implemented flexibly in classrooms where additional lessons are needed.

BLOCK A: GETTING STARTED AND CS IN APP DESIGN

Block A of CS Explorations 3 provides students with an introduction to computer science, computing, programming, programming languages and the foundational knowledge to begin using the AppLab programming tool. Students are introduced to the AppLab programming environment and key blocks used to program app interfaces, events and responses. Through independent activities, group explorations, and class discussions, students will learn about trending careers in app design and real world industry practices, as well as advance their programming knowledge.

UNIT 0 WELCOME AND INTRO TO APPLAB

Students explore how computer science is connected to their own lives and computing as a creative means for self expression that can solve real-world problems and impact the world around them. Students will build their identities as computer scientists and use storytelling as a tool for defining problems they want to solve. In the second half of the unit, students are introduced to writing algorithms, learn what a program is and explore the need for programming languages. In the final lessons in the unit, students are introduced to AppLab as a block-based programming tool, and explore the AppLab interface by completing the Introduction to AppLab tutorial. Students then further prepare for the upcoming unit by exploring apps that help others.

- **0.1** What is CS?
- **0.2** Who is CS for? My CS Journey
- **0.3** Storytelling and CS
- **0.4** What is a Computer?
- **0.5** What is a Program?
- **0.6** What is a Programming Language?
- **0.7** Intro to Applab Pt.1
- **0.8** Intro to Applab Pt.2
- **0.9** Intro to Applab Pt.3
- **0.10** Unit Review & Apps for Good

UNIT 1 CS AND APP DESIGN: GOAT AND CAREER EXPLORATIONS

Students make engaging, real-world connections with computer science and have the opportunity to explore different career pathways through a series of design challenges that give students an inside view of GOAT and tasks them with programming various GOAT screens and functionalities, similar to what they

- **1.1** Real-World App Design with GOAT
- **1.2** How do we Interact with Apps? Explore UI Design
- **1.3** Planning an App: Explore Product Management
- **1.4** Managing Risks: Explore Devops
- **1.5** Mid-Unit Review and Check for Understanding

might see in the actual GOAT app. Students will hear first hand from GOAT's founder and CEO, product manager, engineers, and more, and through independent activities, group explorations, and class discussions, students will learn about trending careers in app design and real world industry practices, as well as advance their programming knowledge. Students will use App Lab to design and program some of their own GOAT app screens and tools and the final app design project lets students develop a feature prototype for the GOAT app.

- **1.6** Designing with Empathy: Understanding Users
- **1.7** Understanding Users with Data: Explore Data Science
- **1.8** Build a Personalized Homepage Feature Pt. 1
- **1.9** Build a Personalized Homepage Feature Pt. 2
- **1.10** Build a Personalized Homepage Feature Pt. 3

BLOCK A FINAL PROJECT "MY PAPER PROTOTYPE"

To conclude their study of the Block A units, students will propose an app designed to meet a need or solve a real world problem of their choosing. This project will be completed across multiple days and will result in students creating a poster or presentation highlighting the features of their app that they will present to their classmates. A project guide provides step by step instructions for students and helps them organize their thoughts. The project is designed to be completed in pairs though it can be completed individually.

BLOCK B: CS AND LED ART WITH MICRO:BIT

In Block B of CS Explorations 3, students will explore computer science concepts and gain familiarity with Python by programming a virtual microcomputer — the Micro:bit. Students will learn to use code to control the various output devices on the Micro:bit, such as the LED grid display and the speakers, while expanding their knowledge of key CS and programming concepts.

UNIT 2 CS AND ART: MICRO:BIT AND INTRO TO PYTHON (PART 1)

In this unit, students are introduced to computer science concepts of loops, conditionals, randomness and variables. Students will start by working through projects to create their own art, games and animations with a focus on how to control the LED display and use the button inputs. Students are then introduced to for loops and program their own version of the popular game Dance, Dance Revolution and explore the concept of randomness to program their Micro:bit to become a dice. Students are introduced to variables to create a Magic 8-Ball program, and begin to apply concepts focused on conditional statements, "IF" and "IF-ELSE" and how to use

- **2.1** Hello, Micro:bit!
- **2.2** Micro:bit LED Art
- **2.3** Micro:bit Animation
- **2.4** Dance, Dance Micro:bit
- **2.5** Mid-Unit Review and Debugging
- **2.6** Micro:bit Emotion Indicator
- **2.7** Roll the Micro:bit Dice
- **2.8** Micro:bit Magic 8 Ball
- **2.9** Goodnight, Micro:bit
- **2.10** Unit Review and Debugging

them to code more decisions into their programs.

UNIT 3 CS AND ART: MICRO:BIT AND INTRO TO PYTHON (PART 2)

Students learn how to use arithmetic operators to perform calculations that help them build a variety of Python programs for Micro:bit. They'll start by building code to do calculations that power a smart thermometer on the Micro:bit. Students explore variables and different data types as they create count- and score-keeping programs. They will then explore new ways to use while and for loops to program stopwatches and timers. Students will write a FizzBuzz program that uses sounds to identify multiples of numbers. After learning about lists in programming, students will use lists to create music. They will also use lists to make an activity-picker program to help choose an activity when they're bored. Finally, students will use functions and parameters to create a Micro:Bit jukebox complete with animations and music.

- **3.1** Micro:bit Math
- **3.2** Counting
- **3.3** More Variables
- **3.4** Variables and Loops
- **3.5** Mid-Unit Review and Debugging
- **3.6** FizzBuzz
- **3.7** Micro:bit Music
- **3.8** Activity Array
- **3.9** Micro:bit Jukebox
- **3.10** Unit Review and Debugging

BLOCK B FINAL PROJECT "CHOOSE YOUR OWN ADVENTURE"

Using conditional statements, booleans, and loops, students will design and program an animated "choose your own adventure" game to be played and shared with classmates. Students will create a narrative that changes and adapts based on decisions made in the program, to result in a creative storytelling adventure that changes each time the program is run.

BLOCK C: CS AND MUSIC WITH EARSKETCH - YOUR VOICE IS POWER

Block C of CS Explorations 3 familiarizes students with the Earsketch platform for creating music and exploring equity, social change and entrepreneurship with code. Students will be able to review their knowledge of Python and CS concepts while learning about music production and CS in the music industry. Students will extend their knowledge of programming by writing their own functions in Python which they will use to structure their own musical compositions.

UNIT 4 CS AND MUSIC: PROGRAMMING WITH EARKSETCH - PART 1

Students are introduced to music production and coding their own music in Python with the Earsketch platform. They will learn about the impact that CS has had on the music industry,

- **4.1** What is a DAW?
- **4.2** Sampling & Remixing
- **4.3** Reusing Code and Music
- **4.4** Key and Tempo
- **4.5** Mid-Unit Review and Debugging

especially the use of Digital Audio Workstations (DAW) for music production. They will discover the techniques of sampling/remixing and begin to explore and build a library of sound-clip assets, then use the fitMedia function from Earsketch's Python module to layer their clips on different tracks to create their own remixes. Students will also explore the effect of changing tempo in music. In the second half of the unit students will look at the use of the console and print statements in Python for program information and debugging. They will create their own custom beats using specially formatted strings in Earsketch. After reviewing the use of for loops in Python, students will use these to repeat their beats in Earsketch. Finally students will use lists to improve their beats using multiple sounds.

- **4.6** Using the Console
- **4.7** Your Own Beat
- **4.8** More Beats
- **4.9** Drum Kits and Lists
- **4.10** Unit Review and Debugging

UNIT 5 CS AND MUSIC: PROGRAMMING WITH EARKSETCH - PART 2

Students will learn more about music production techniques and advance their Python knowledge through coding more complex compositions with Earsketch. Students will learn about mixing, panning, effects and envelopes in music production and use more functions in Earsketch to add these effects alongside a review of parameters. They will explore how some of this mixing can be automated through the use of conditionals in Python. In the second half of the unit students will look at common song structures. They will create their own custom functions in Python for the first, including adding their own parameters. Additionally students will consider how decomposing a program into functions can help them write code, focusing on the structure and different elements of a composition in Earsketch.

- **5.1** Mixing and Balancing
- **5.2** Effects
- **5.3** Envelopes
- **5.4** Automatic Balancing
- **5.5** Mid-Unit Review and Debugging
- **5.6** Make Your Own Functions
- **5.7** Decomposition
- **5.8** Variations and Transitions
- **5.9** Decomposing a Composition
- **5.10** Unit Review and Debugging

BLOCK C FINAL PROJECT "YOUR VOICE IS POWER"

Students will create their own original remix of a song that reflects on issues of equity and expresses their own voice using the EarSketch platform. Students will use their Python coding skills and work from the block units analyzing music production techniques to create their remix. Students will first plan their messages and songs. Students will create custom functions to structure their songs. Students will then use their skills with creating custom beats and setting effects to add these things to their song. Students' completed code will use loops and conditionals

to accomplish tasks such as adding effects to multiple tracks or repeating a beat. Students will write their own reflection on their messages and songs and provide feedback on each other's songs.

EXTENSIONS STRUCTURE AND FLOW

INTERSESSIONS

The Intersessions are designed to explore the non-programming and non-coding aspects of computer science. Teachers can choose Intersession units based on time and student interest. Students can make real-world connections with what they are learning in their computer science coursework in Intersession A: Virtual Guest Speaker, Intersession B: Virtual Field Trip, and complete additional Micro:bit activities in Intersession C: Micro:bit Supplemental Mini-lessons.

INTERSESSION A VIRTUAL GUEST SPEAKER Students will hear from a guest speaker from the Amazon Future Engineer team to learn more about careers in computer science and the applications of programming to the real world.	• **A.1** Class Chat
INTERSESSION B VIRTUAL FIELD TRIP Students will prepare for a virtual field to explore careers of the future. Current virtual interactive tours include a visit to a robotics fulfillment center, a Callisto space innovation tour that brings students onboard the Orion spacecraft as part of NASA's Atremis flight test and more coming soon.	• **B.1** Robotics Fulfillment Center Tour • **B.2** Alexa in Space - Hour of AI
INTERSESSION C MICRO:BIT SUPPLEMENTAL MINI-LESSONS Students can continue to explore Micro:bit and complete supplemental activities using the Micro:bit Python environment. These mini-lessons are designed to extend Block B lessons and guidance for recommended lesson alignment will be provided.	• **C.S1** Sensing - Compass • **C.S2** Sensing - Spirit level • **C.S3** Sensing - Step counter • **C.M1** Music - Guitar • **C.M2** Music - Walkman • **C.H1** Smart home - Clap lights • **C.H2** Smart home - Energy saver • **C.R1** Radio - Secret message • **C.R2** Radio - Intruder alarm

ADDITIONAL COURSE INFO

COURSE MATERIALS

PROVIDED MATERIALS

The CSE3 curriculum provides all learning materials necessary for the successful completion of the course. These materials include classroom slides, lesson plans, activity guides and project walkthroughs, assessments, and more, designed to support the instruction of the course.

SUPPLIES NEEDED

In addition to standard school supplies, such as paper and pen or pencils, students will need access to a device (such as a chromebook, laptop, or desktop) with a reliable internet connection to complete the work required in this course.

TECHNICAL REQUIREMENTS

In order to complete the CSE3 coursework, students will need to be able to access a computer with reliable internet connection each time they work. Wherever possible, student-facing resources will be available digitally, but teachers with access to printers may choose to print handouts and activity guides for students. A few activities may require some specific supplies and a list of these resources will be detailed in the relevant CSE 3 lesson plan.

Note on Micro:bit in CSE 3: CSE 3 lessons using the Micro:bit Python editor do not require physical devices, as the platform features a robust simulator that students can use to visualize and test their programs. Schools that already have access to or plan to procure these devices can readily extend these activities to enable students to run their programs on the physical Micro:bit device.