

No	Topic	Subtopic	Details
1	Getting Started with CPX and CircuitPython	1.1 Recap the CPX	Recap of the CPX board and its features.
		1.2 Installing and using CircuitPython	How to install CircuitPython on CPX and upload sample code.
		1.3 Exploring the Mu editor and Python code structure	Writing and running Python scripts using the Mu editor.
		1.4 Basic electronics	Fundamental concepts of voltage, current, inputs and outputs.
2	Python and CircuitPython Fundamentals	2.1 Python basics	Datatypes, variables, basic I/O, type conversion, adding comments and logs to code.
		2.2 Control structures	Conditional statements, loops (for, while), arithmetic and logical operators, negation.
		2.3 Functions and code blocks	Defining functions, parameters, return values.
		2.4 Exception handling	Using try and except blocks to handle exceptions in code.
		2.5 Arrays	Storing and accessing a collection of values, and using them to drive outputs.
3	Built-in Sensors & Outputs on CPX	3.1 Light sensor (photoresistor)	Detect brightness and trigger outputs based on light levels.
		3.2 Temperature sensor	Read ambient temperature and program conditional actions.
		3.3 Sound sensor (microphone)	Use sound input to trigger lights or motors.
		3.4 Motion sensor (accelerometer)	Detect movement and orientation to control behaviours.
		3.5 Touch pads (capacitive touch)	Trigger inputs by touching conductive surfaces.
		3.6 Push buttons (A & B)	User input for interaction, control modes, or starting actions.
		3.7 Slide switch	Use as a manual mode selector.
		3.8 NeoPixel RGB LEDs	Program colourful feedback and animations.
		3.9 Built-in speaker	Output tones and sound alerts based on sensor input.
4	External Sensors & Actuators with CPX	4.1 Connecting External Components	Explain how to connect sensors and actuators to CPX using alligator clips; clarify analog vs digital signals.
		4.2 IR Tracking / Avoid Sensor	Introduce as a simple digital sensor; detect lines (black/white) or obstacles.
		4.3 Servo Motor	Introduce as a simple actuator to demonstrate controlled motion.
5	Getting Started with Crickit	5.1 Introduction to Crickit	Overview of the Crickit board, its purpose, and how it integrates with CPX for robotics projects.
		5.2 Setting Up Crickit with CPX	How to connect Crickit to CPX and prepare it for CircuitPython.
		5.3 Powering Crickit	How Crickit is powered, and connection to external power sources for high-current devices.
		5.4 Programming Crickit in CircuitPython	Basic CircuitPython code to control motors and servos, read sensors, and use Crickit functions.
		5.5 Using servo, DC, drive, signal I/O and other ports in Crickit	Connect actuators and sensors to Crickit ports.
6	External Sensors with Crickit	6.1 Ultrasonic Distance Sensor	Detect distances for collision avoidance or object tracking.
		6.2 IR Tracking / Avoidance Sensor	Follow lines or avoid obstacles.
		6.3 Joystick Module	Control servo motors or other devices using a joystick.
		6.4 Inductive Proximity Sensor	Magnetic proximity detection.
		6.5 Moisture Sensor	Measure moisture conditions.
		6.6 Rain Sensor	Detect rain drops.
		6.7 Photoresistor (external)	Light-sensor-based control.
		6.8 Force Sensitive Resistor (FSR)	Detect pressure or force applied.
		6.9 Limit Switch	Detect an end position or travel limit in a moving mechanism.
7	Actuators and Outputs	7.1 Servo Motors	Precisely control angles - ideal for arms and joints.
		7.2 DC Motors	Drive continuous rotation - used for wheels or fans.
		7.3 Stepper Motor	Controlled multi-step rotation.
		7.4 Speakers	Play tones and sound notifications.
		7.5.1 Motion Types - Linear	Straight-line movement using rack & pinion, gears, sliders.
		7.5.2 Motion Types - Rotational	Circular path movement using motors.
		7.6.1 External Power for Actuators - Need	Understand why external power is required for high-current devices.
		7.6.2 External Power - Relays	Using relays for control.
		7.6.3 External Power - Wiring & Safety	Safe wiring and distribution practices.
		7.7 Water pump	Powering a water pump.

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8	Project	8.1 Identifying Problems to Automate	Think of everyday tasks or fun challenges that could be solved with a robot.
		8.2 Designing the Robot	Plan and design the robot: movement, sensors, motors, power, and chassis materials.
		8.3 Exploring Sensors and Actuators	Choose the right sensors (ultrasonic, motion, light) and actuators (motors, servos) for tasks.
		8.4 Programming the Robot and Testing It	Write code, test in different situations, and troubleshoot issues.
9	3D Printing	9.1 Introduction to 3D Printing	What 3D printing is and how an object is built up layer by layer.
		9.2 Applications of 3D Printing	Where 3D printing is used in industry, medicine, education and prototyping.
		9.3 Common 3D Model File Formats	The file formats used to describe a 3D model for printing.
		9.4 STL and 3MF File Formats	Understanding the STL and 3MF formats and how they differ.
		9.5 Installing Anycubic Slicer Next	Installing and setting up the slicer software.
		9.6 Understanding the 3D Printing Workflow	The complete workflow from model to printed object.
		9.7 Downloading Models from Printables	Finding and downloading ready-made models.
		9.8 Importing STL Files	Importing an STL file into the slicer.
		9.9 Basic Editing Tools	Scaling, rotating and positioning a model before printing.