ARDUINO EDUCATION

ENGINEERING KIT R2

CURRICULUM GRID

Objective Number	KEY LEARNING OUTCOMES	Chapters				
		Getting Started	Intro to Mechatronics	Drawing Robot	Webcam Controlled Rover	Self-balancing motorcycle
Mechatronics						
1	Basics of the Arduino environment	■				
2	Introduction to microcontrollers with the Nano 33 IoT board and Nano Motor Carrier	■				
3	Characteristics of different types of motors: DC motors and servo motors		■			
4	H-bridge fundamentals: Driving and controlling the speed of a DC motor		■			
5	Motor Characterization: dead zone and saturation		■			
6	Application of encoders for speed and position monitoring		■	■	■	■
7	Use of Pulse Width Modulation (PWM) for speed control of DC motors		■	■	■	■
8	Acceleration and angular rotation measures using IMU Sensor		■			■
9	Working with li-ion batteries		■	■	■	■
10	Communicate with the robots´various sensors and actuators to analyze data or control			■	■	■
11	Use of wireless communication to control robots				■	■
12	Integration of different subsystems to build a complex project			■	■	■
13	Dynamic system modeling with Simscape					■
14	Proportional Derivative control				■	■
15	Real time data visualization and monitoring				■	■
Engineering Skills						
1	Application of geometry, physics, calculus, symbolic math, and image processing concepts			■	■	■
2	Development of a complete application workflow from start to finish			■	■	■
3	Collaboration and team work for speed up development			■	■	■
4	Troubleshooting and problem solving skills	■	■	■	■	■
5	Application of safety mechanisms in your design					■
6	Familiarity with professional softwares used in many fields of engineering		■	■	■	■
7	Work with datasheets		■	■		■
8	Embedded software design	■	■	■	■	■
9	Learn good coding practices		■	■	■	■
MATLAB						
1	Introduction to MATLAB user interface	■	■			
2	Basics of MATLAB programming language	■	■			
3	Connect to an Arduino and Arduino-based robots from MATLAB	■	■	■	■	
4	Control robots by writing MATLAB apps, functions, and scripts		■	■	■	
5	Understand and use complex MATLAB functions to control de robot			■	■	
6	Real time image adquisition from webcam				■	
7	Convert, filter, and analyze images using image processing functions			■	■	

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8	Data conversion from pixels to physical distances			■	■	
9	Calculating distance and motor position using trigonometry			■	■	
10	Conditionals and loops			■	■	
11	Manipulate data in a cell array			■		
Simulink						
1	Introduction to visual programming with Simulink	■	■			
2	Basics of creating Simulink models	■	■			■
3	Visualizing simulation data in the Simulink environment	■			■	■
4	Visualizing deployed data in embedded hardware in the Simulink environment	■			■	■
5	Use Simulink for rapid prototyping and controller design		■		■	■
6	Control robots through Simulink		■		■	■
7	Reading values from encoders and IMU sensor		■		■	■
8	Open-loop and closed-loop motor control	■	■		■	■
9	Applying geometry and physics concepts to code				■	■
10	Modelling basic mathematical functions in blocks				■	■
11	Simulate motion using kinematic equations					■
12	Performing calibration procedures				■	■
13	State logic design: model reactive systems via state machines and flow charts with Stateflow				■	■
14	Design feedback control algorithms				■	■