


Beginners' Course Overview

| Lesson | Topic / Input | Skill | Robot Built | Challenge |
|--------|---|---|----------------------|---|
| 1 | Introduction to Robotics <ul style="list-style-type: none"> • Definition of a robot • Characteristics of robots • Robot applications | <ul style="list-style-type: none"> • Identify rero parts • Assemble & dismantle rero parts | Robot arm with wheel | Build your own robot |
| 2 | Robot Systems and Mobility <ul style="list-style-type: none"> • Anatomy of robot systems • Function of each system • Cube Servo for rero robot's mobility | <ul style="list-style-type: none"> • Daisy chain wiring • Set servo mode and path limit • Use rero TeachMode | Stag beetle robot | Teach your robot to move forward and turn left/right. Game: Grab the bottle and bring it to the victory zone |
| 3 | Robot Locomotion <ul style="list-style-type: none"> • Definition of locomotion • Types of robot locomotion • Applications of various locomotion • Advantages & disadvantages of various locomotion | <ul style="list-style-type: none"> • 4-legged robot crawling mechanism • Download motion file to rero Animator | Tortoise robot | Teach the tortoise robot to move sideways. Modify the robot to make it walk faster. |

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| 4 | Degree of Freedom (DoF) <ul style="list-style-type: none"> • Definition of DoF • Identify DoF of various body parts • Types of movement • Cube Servo and DoF • Advantages and disadvantages of various DoF • Limitation of a joint | <ul style="list-style-type: none"> • Set up zero Animator (Wireless Programming) • Create motion files using zero Animator | Finger robot | Create different hand signs with the finger robot. zero version of Rock-Paper-Scissors Game |
| 5 | zero Animator <ul style="list-style-type: none"> • Introduction to cartoon animation • Concept of animation frame and speed | <ul style="list-style-type: none"> • Simple 2-legged walking mechanism • Change speed using zero Animator | Dwarf robot | Create the fastest walking robot. |
| 6 | Motion Files and zero Remote <ul style="list-style-type: none"> • Concept of remote control and action in video gaming • Concept of motion files | <ul style="list-style-type: none"> • Split motions and assign motions to zero Remote buttons • Connect to a smart phone | Combat Robot | Become the survivor of the robot war arena. |
| 7 | Introduction to Sensors <ul style="list-style-type: none"> • Introduction to cartoon animation • Concept of animation frame and speed • Human-robot interaction using sensors | <ul style="list-style-type: none"> • Use zero Planner to program the robot | Puppy robot | Create a welcoming puppy robot to please your guest. |

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| 8 | Introduction to Programming <ul style="list-style-type: none"> • Definition and the importance of instruction sequencing in programming • Introduction to flow chart • Introduction to basic programming elements - decision and loop | <ul style="list-style-type: none"> • Import motion files to rero Animator • Program with rero Planner • How to read sensor values | Scorpion robot | Make a scorpion king to sting the "enemies". |
| 9 | Infrared (IR) Sensor <ul style="list-style-type: none"> • Introduction to electromagnetic waves • What is IR wave? • Application of IR sensors • Advantages and disadvantages of IR sensors | <ul style="list-style-type: none"> • Use IR sensor | Mobile penguin robot | Obstacle avoidance. Maze Runner Game. |
| 10 | Ultrasonic Sensor <ul style="list-style-type: none"> • Introduction to echolocation • How ultrasonic works? Advantages and disadvantages of ultrasonic sensors | <ul style="list-style-type: none"> • Use ultrasonic sensor | Turtle robot with distance sensing | Tunnel Escape Game |
| 11 | Microphone and Sound Sensing <ul style="list-style-type: none"> • Introduction to microphone • How microphone works? • Sound loudness sensing • Ambient noise and threshold value | <ul style="list-style-type: none"> • Use sound sensor | Orang utan robot | Racing in an 'L' track between 2 utan robots. Start with a whistle. |

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| 12 | <p>Line following</p> <ul style="list-style-type: none"> • Introduction to line following sensor • How line following sensor works? • Concept of line following using mobile robot | <ul style="list-style-type: none"> • Use line following sensor | Line-following mobile robot | Line following race  |
| 13 | <p>Drive Systems</p> <ul style="list-style-type: none"> • Introduction to different drive systems - differential, steering and omni-directional drive systems • How each drive system works? • Advantages and disadvantages of each system | <ul style="list-style-type: none"> • Improve motion files in rero Animator • Omnidirectional drive system | Omni-directional robot | Draw shapes (circle and square) with the omni-directional robot |
| 14 | <p>Wheels and Their Limitations</p> <ul style="list-style-type: none"> • Wheel circumference and moving speed • Wheel diameter and obstacle size • Narrow wheels vs. wide wheels | <ul style="list-style-type: none"> • Caterpillar crawling locomotion | Caterpillar robot | Climb over an obstacle (height ~10cm) |
| 15 | <p>Center of Gravity and Stability</p> <ul style="list-style-type: none"> • Introduction to center of gravity • Center of gravity vs. Stability • How to maintain the stability of a robot | <ul style="list-style-type: none"> • Two-legged kicking mechanism | Biped Soccer Robot | Penalty Kick Game |
| 16 | <ul style="list-style-type: none"> • Robotics Project Planning • Engineering Design Process • Troubleshooting | <ul style="list-style-type: none"> • Design a robot to solve a given situation or problem. | BUILD YOUR OWN ROBOT TODAY! | |