FUNDAMENTALS OF ROBOTICS

Robotics continues to grow, and so will the demand for people who work with them. This competency-based course is designed to provide students with the fundamentals of electronics, computer programming, and engineering design that will lay a foundation on which to build a solid knowledge base about robotics. Students will become immersed in topics that include Ohm's Law, series and parallel circuits, direct and alternating current, DC motors, robot sensor operation, and much more! The students will use interactive video and virtual reality to learn how to program a robot. Upon completion of this course, students will be equipped with the knowledge and skills to earn a digital badge in Fundamentals of Robotics, and will be better prepared for the certification exam.

Title	Objective
Introduction to Robotics	Explore the robotics field and the different applications for Robots.
Promobot Applications	Introduce Promobot and explain some of its applications
Charge: The Basis of Electricity	Explain charge
Voltage	Explain voltage
Current	Explain current
Electronic Components – Resistor	Identify resistor explain resistance
Ohm's Law	Explain Ohm's Law and its usefulness
Electronic Components – Capacitor	Identify capacitor and explain capacitance
Electronic Components – Inductor	Identify inductor and explain inductance
Schematic Drawing of Electronic Circuitry	Explain the basic schematic drawings of electronic circuitry.
Series Circuits	Explain series circuits and their uses.
Parallel Circuits	Explain parallel circuits and their uses

FUNDAMENTALS OF ROBOTICS

Title	Objective
Direct and Alternating Current	Describe the difference between alternating and direct current.
DC Motors	Describe a DC Motor and how it works/is used.
Speed, Torque, and Power in DC Motors	Describe how speed, torque, and power are controlled in DC motors.
Servo Motors	Describe how servos are used in robotics (e.g., robot arms, legs, steering, et al).
Servo Motor Control	Describe how speed, position, and torque are controlled in servo motors.
Prototyping Boards	Demonstrate how a breadboard works and why it is used.
ProtoBoard Construction	Demonstrate basic breadboard construction techniques.
Electronic Test Equipment – DC Power Source	Explain DC Power Source and describe operation
Electronic Test Equipment – Multimeter	Describe Digital Multimeter (DMM) and Operation
Printed Circuit Boards	Explain a printed circuit board and demonstrate schematics
Soldering Techniques	Demonstrate basic soldering techniques
Magnetics in Robotics	Describe magnetics and its use and implications in robotics.
Robot Sensor Operation	Explain the basic operation of robot sensors.
Active and Passive Sensors	Differentiate between active and passive sensors relative to their use.
Sensors in Robotics	Describe different types of sensors used in robotics and how they work.
The Engineering Design Process	Describe the engineering design process and the activities performed in each step.
Introduction to Computer Programming	Describe fundamental elements of a computer program.
Effective Program Planning	Explain the importance of a planning a program and programming design review.
Writing Computer Programs	Explain the writing of code, compiling, levels of programming languages, and types of error.
Introduction to Boolean Logic	Describe Boolean Logic
Boolean Laws and Logic Operators	Explain important Boolean laws and logic operators
Programming Concepts and Applied Logic	Describe digital logic.

FUNDAMENTALS OF ROBOTICS

Title	Objective
Algorithms and the Flow of Data	Define the term "algorithm," and explain how it relates to problem-solving, design, and data flow.
Programming Design	Identify programming language design approaches. (procedural vs. object oriented)
Data Types and Variables	Explain different data types and their uses as variables in programming, including naming conventions.
Programming Structure	Describe the structure of a simple program, and explain why sequencing is important.
Selection Structures	Describe selection programming structures (e.g. if/else, switch) and explain the logic used for if statements.
Repetition Structures	Describe iterative programming structures (e.g. for, while, do/while) and how they are used in programming.
Debugging Programs	Troubleshoot and debug errors in code.
Diagnostics and Troubleshooting	Describe the role of diagnostics and troubleshooting to the engineering design process.
Introduction to Databases	Define a database, and identify basic components of databases.
Database Information Management	Describe how fields and records in different tables are related.
Database Rules	Describe database rules and their importance.
Programming Flow Charts	Analyze the use of flowcharts and pseudocode in designing a computer program.
Software Development Cycle	Describe the software development cycle.
Robot Applications	Explain Promobot and Applications
Artificial Intelligence Applications	Identify how artificial intelligence is used in the Robot. (Machine Learning)
The Robot Coding Environment	Explain the Robot Coding Environment
Creating Cases in Robot	Create Robot case
Instructing Actions in Robot	Create keyword phrase in Robot (dance)
Question & Answer Sequence Using Robot	Create Question/Answer Sequence in Robot