VGURU TECH ACADEMY

Robotics

Course Syllabus

Level: Beginner

Part 1: Course Description

This beginner course introduces kids to the exciting world of robotics. They'll learn about basic electronic components, and simple electrical circuits, and get a first look at microcontrollers. Through hands-on activities, students will explore the basics of building and programming robots, using tools like Arduino and simple sensors. The course is designed to spark curiosity and lay the groundwork for future robotic explorations.

Part 2: Student Learning Outcomes & Objectives

Student Learning Outcomes

- Understand basic electronics and electrical circuits
- Familiarity with simple microcontrollers
- Ability to assemble basic robotic components

Course Objectives

To introduce young learners to the basics of robotics, including simple electronics components, basic electrical circuits, and an introduction to microcontrollers.

Part 3: Topic Outline

Prerequisites
- Basic computer skills
- Curiosity about how things work

→ Session 1: Introduction to Robotics
   ◆ Basics of Electronics components and sensors
   ◆ Kit unboxing and verification

→ Session 2: Exploring Electrical Circuits
   ◆ Basic Electrical circuits
   ◆ Simple circuit building

→ Session 3: Microcontroller Magic
   ◆ Introduction to microcontrollers
   ◆ Understanding Arduino & IDE installation

→ Session 4: Let's Get Interactive
   ◆ Interfacing with computers and controllers
   ◆ Basic programming concepts

→ Session 5: Fun with LEDs and Switches
   ◆ Slide switch and basic If-else programming
   ◆ RGB LED and slide switch activities

→ Session 6: Controlling LED Brightness
   ◆ LED brightness control using a potentiometer and Arduino UNO
   ◆ Understanding analog and digital signals

→ Session 7: Sensing the World
   ◆ Introduction to sensors like IR and temperature sensors
   ◆ Simple sensor-based activities

→ Session 8: My First Robot Project
   ◆ Building a simple microcontroller-based project
   ◆ Review and showcase projects

Level: Intermediate

Part 1: Course Description

Designed for students with a foundational understanding of robotics, this intermediate course delves deeper into the subject. Students will engage with more complex components like servo motors, ultrasonic sensors, and IR sensors. They'll learn advanced programming techniques in Arduino, tackle problem-solving and puzzles, and work on projects that include building a digital thermometer and a simple jackpot machine. This course aims to enhance their problem-solving skills and understanding of robotics.

Part 2: Student Learning Outcomes & Objectives

Student Learning Outcomes
- Proficiency in using various sensors and components
- Ability to design and program intermediate-level robotic projects
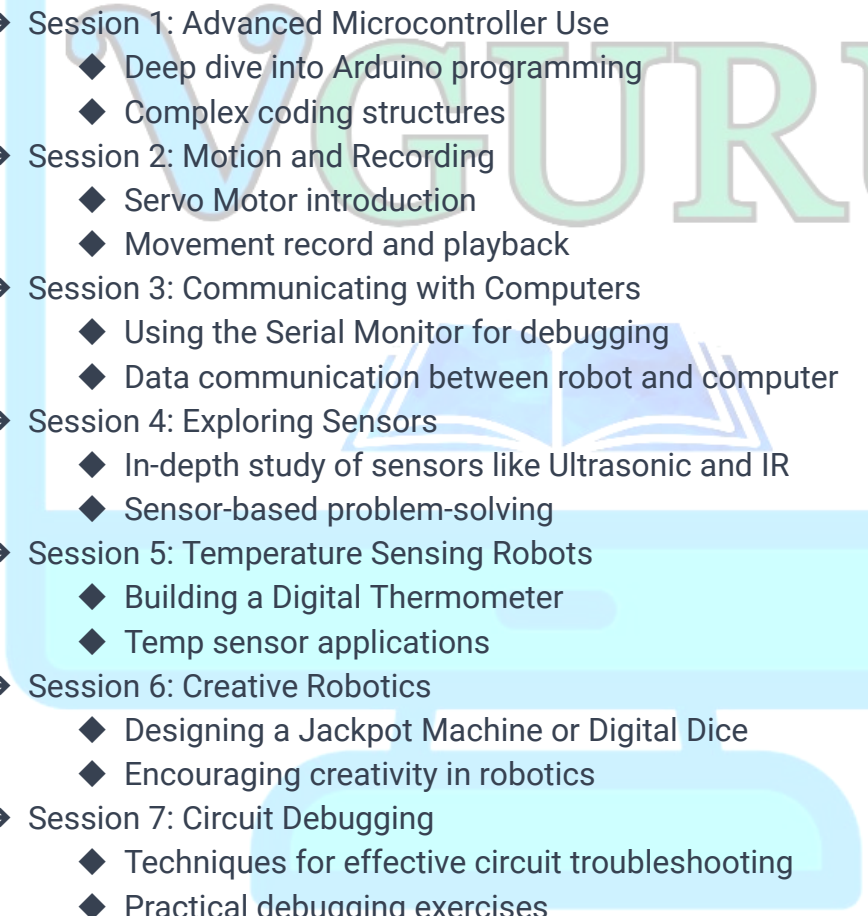- Enhanced problem-solving and debugging skills

Course Objectives
To build upon foundational robotics knowledge, introducing more complex components and programming techniques.

Part 3: Topic Outline

Prerequisites

- Completion of Beginner Level or basic understanding of robotics
- Ability to assemble and program simple robots

➔ Session 1: Advanced Microcontroller Use
  ◆ Deep dive into Arduino programming
  ◆ Complex coding structures
➔ Session 2: Motion and Recording
  ◆ Servo Motor introduction
  ◆ Movement record and playback
➔ Session 3: Communicating with Computers
  ◆ Using the Serial Monitor for debugging
  ◆ Data communication between robot and computer
➔ Session 4: Exploring Sensors
  ◆ In-depth study of sensors like Ultrasonic and IR
  ◆ Sensor-based problem-solving
➔ Session 5: Temperature Sensing Robots
  ◆ Building a Digital Thermometer
  ◆ Temp sensor applications
➔ Session 6: Creative Robotics
  ◆ Designing a Jackpot Machine or Digital Dice
  ◆ Encouraging creativity in robotics
➔ Session 7: Circuit Debugging
  ◆ Techniques for effective circuit troubleshooting
  ◆ Practical debugging exercises
➔ Session 8: Intermediate Robotics Project
  ◆ Developing a complex microcontroller-based project
  ◆ Presentation and peer review

Level: Advanced

Part 1: Course Description

Aimed at students with a solid robotics background, this advanced course covers sophisticated topics in robotics. Students will explore complex microcontroller applications, integrate multiple sensors, and delve into basic AI concepts. They'll learn about real-world robotics applications, advanced programming techniques, and mechanical design. The course culminates in a capstone project where students design and build a multifunctional robotic system, showcasing their advanced skills in robotics.

Part 2: Student Learning Outcomes & Objectives

Student Learning Outcomes
- Master advanced robotics concepts and components
- Develop complex, multifunctional robotic systems
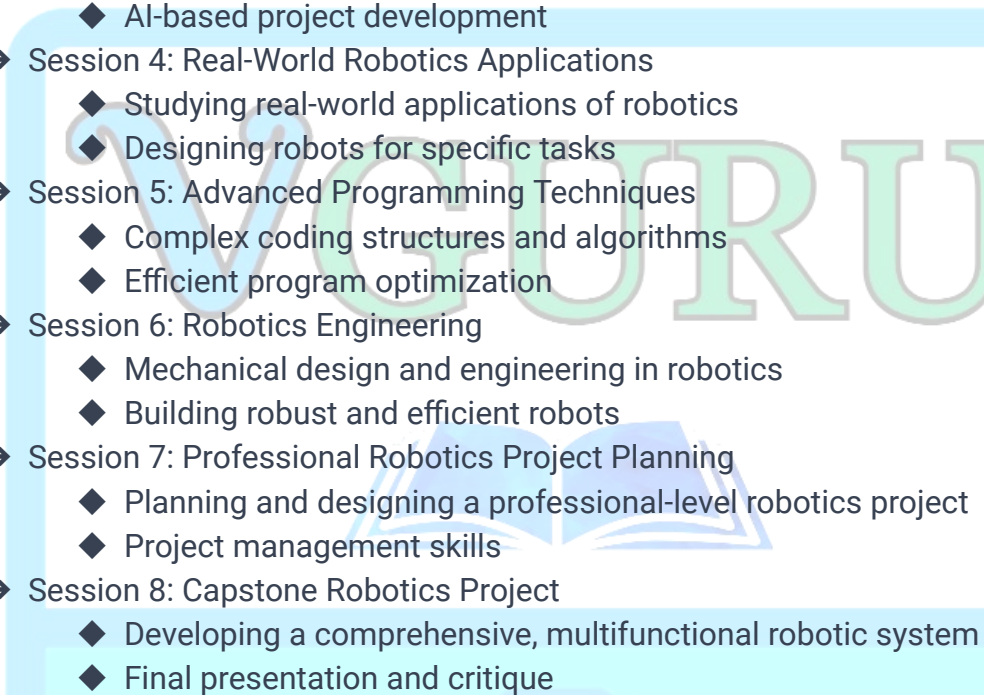- Gain an understanding of real-world robotics applications

Course Objectives
To refine and expand robotics skills, focusing on advanced programming, complex project development, and real-world applications.

Part 3: Topic Outline

Prerequisites
- Completion of Intermediate Level or strong understanding of robotics concepts
- Experience in programming and assembling complex robots

→ Session 1: Advanced Robotics Concepts
  ◆ Exploring advanced microcontrollers and components
  ◆ Complex algorithm development
→ Session 2: Sophisticated Sensor Integration
  ◆ Integrating multiple sensors for complex tasks
  ◆ Advanced sensor programming
→ Session 3: Robotics and AI
  ◆ Introduction to basic AI concepts in robotics
  ◆ AI-based project development
→ Session 4: Real-World Robotics Applications
  ◆ Studying real-world applications of robotics
  ◆ Designing robots for specific tasks
→ Session 5: Advanced Programming Techniques
  ◆ Complex coding structures and algorithms
  ◆ Efficient program optimization
→ Session 6: Robotics Engineering
  ◆ Mechanical design and engineering in robotics
  ◆ Building robust and efficient robots
→ Session 7: Professional Robotics Project Planning
  ◆ Planning and designing a professional-level robotics project
  ◆ Project management skills
→ Session 8: Capstone Robotics Project
  ◆ Developing a comprehensive, multifunctional robotic system
  ◆ Final presentation and critique