Introduction to Applied Science and Robotics 101

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1 Course Overview

The course *Introduction to Applied Science and Robotics* is designed to introduce freshman students to the exciting world of STEM and robotics. It will cover fundamental principles of physics, basic engineering concepts, and hands-on experiences in building and programming Robots.

2 Course Objective

The main objective of this course is to ignite students' curiosity and passion for STEM fields while also introducing them to foundational principles of applied science and robotics. Students will gain exposure to programming, electronics, mechanics, and teamwork through engaging and interactive projects.

3 Course Outline

3.1 Introduction: 8 weeks(Module I)

3.1.1 Week 1-2: Introduction to STEM and Robots

- Course overview, expectations, and safety guidelines.
- Introduction to four robots and their capabilities.
- Teamwork and collaboration in scientific projects.

3.1.2 Week 3-4: Introduction to Applied Sciences

- Overview of the scientific method and experimental design.
- Introduction to key scientific disciplines: Physics, Chemistry, Math, Biology.
- Conduct simple experiments using robots. (Robomaster S1, Sphero bolt)

3.1.3 Week 5-6: The World of Robotics

- Brief description of robot's hardware components (sensors, actuators, controllers).
- Demonstration and hands-on with each robot.

3.1.4 Week 7-8: Robot Programming - Foundations

- Fundamental concepts of programming.
- Hands-on activities with block-based programming for each robot.

3.2 Projects: 8 weeks (Module II)

3.2.1 Week 9-10: Exploring Mechanics — Project Begins

- Concepts of forces, motion, and equilibrium.
- Definition of kinematics and its importance in robotics.
- Describing motion using position, velocity, and acceleration.
- One-dimensional, two-dimensional, and three-dimensional motion.
- Newton's laws of motion and their application in robotics.
- Basic understanding of forces and torques.

3.2.2 Week 11-12: Robot Programming — Python

- Introduction to a text-based programming language i.e., Python for each robot.
- Implementation of linear motion on each robot using Python.

3.2.3 Week 13-14: In-class Project Activities

- Student-led project activities.

3.3 Week 15-16: In-class Project Activities and Presentation

- Student-led project activities and presentation.

4 Assessment

Assessment for this course will include quizzes, project evaluations, and group presentations. Emphasis will be placed on hands-on experiences, teamwork, communication and problem-solving skills.

5 Resources

For this course, students will utilize robotics kits, online tutorials, open-source software, and STEM-themed literature. The following robots will be used:

- DJI Robomaster S1
- Sphero Bolt
- CoDrone
- Robolink Zumi

6 Conclusion

This course aims to create a strong foundation in applied science and robotics for freshman students. By providing hands-on experiences with diverse robot platforms, students will be well-equipped to explore further opportunities in STEM fields. By providing hands-on experiences with four diverse and cutting-edge robot platforms - DJI Robomaster S1, Sphero Bolt, CoDrone, and Robolink Zumi - the course aims to ignite the spark of curiosity within each student. As they tinker, build, and program these intelligent machines, students will unlock their potential as creative problem solvers and innovative thinkers.

Note: This course is not merely about learning theories and equations; it is about transforming knowledge into action. Through real-world projects and teamwork, students will gain practical skills that transcend

the classroom and empower them to make a positive impact on the world around them and be prepared for industry-level technologies.