Introduction to Mechatronics

Quark Summer Technical Project, 2020

BITS Pilani, K.K. Birla Goa Campus

Logistics

- **Instructors:** Tanmay Bhonsale, Abhishek Dixit
- **Mentors:** Advait Kulkarni, Anirudha Shrinivas, Rohan Kunjir, Mohit Chaudhari
- **Duration:** 6 weeks
- **Discussion forum:** Initially WhatsApp would be used, however the discussions would be shifted to another platform, Slack, link for which would be provided once the course starts.

Course Description

Mechatronics is a multidisciplinary field, encompassing electronics, robotics, computer and control system engineering. It has far reaching applications in fields such as manufacturing, automotives and medical devices. The goal of this course is to familiarise you with the basic tools and concepts fundamental to the development of mechatronic devices.

We start with teaching simple electronics and Arduino programming. All demos and exercises will be done on an online circuit simulator called TinkerCAD, so there is no need to have an actual Arduino with you. Further, we will teach how to use Fusion360 - a 3D CAD modelling software in which we will design parts of our final project, the robotic arm.

Finally, we will learn the basics of MATLAB and Simulink. Instructions on using these softwares from scratch will be given. We will then use these softwares to simulate a 3D model of a robotic arm capable of performing simple tasks.

Software Requirements

1. TinkerCAD is an online, free for all circuit simulator.
2. MATLAB and Simulink (Mathworks products) have free students' licenses for a few universities. If you are unable to download large files, you may use the online version of MATLAB, and Xcos instead of Simulink.
3. If your university/college does not have a free student's license available for Mathworks products, you can use alternative softwares like Scilab and Xcos.
4. Autodesk Fusion 360 also has free student's access here.

Timeline

Weeks	Topics	Task Description
Week 1	Introduction to Electronics and Arduino programming.	Using TinkerCAD to create simple electronic circuits, basic Arduino programming.
Week 2	Electronic devices, Advanced Arduino programming.	Timers and interrupts, motor control, other peripherals (like LCD display). Simulating Arduino code for robotic arm.
Week 3	Introduction to Autodesk Fusion 360 and mechanical linkages.	Modelling of basic models and required linkages in 3D.
Week 4	Assembly of joints and linkages in Fusion 360, constraint equations in robots.	Modelling the components of a robotic arm in 3D.
Week 5 and Week 6	Introduction to MATLAB, Simulink and kinematics. Final Project	Code and simulate the construct linkages. Final project of a robotic arm.

Evaluation

A *Certificate of Completion* will be awarded to those who complete all weekly assignments and the final project. Moreover, the top 5-10 participants shall be awarded a *Certificate of Excellence*. Participants displaying considerable interest and aptitude in this course will also be considered for induction into the Electronics and Robotics Club.

Notes

1. Don’t refrain from asking even the most basic doubts. We are all here to help you learn and enjoy this course.
2. Please don’t try to cheat, since the skills and knowledge you learn here will be useful in some way or another.
3. Regular feedback forms would be circulated to gauge your thoughts about the course, the mentors and instructors and your doubts.