Mechatronics for a Mobile Manipulator

Quark Summer Technical Project, 2021

BITS Pilani, K.K. Birla Goa Campus

Logistics

- **Instructors:** Archit Rungta, Avinandan Nag and Yash Jangir
- **Duration:** 6 weeks
- **Discussion forum:** WhatsApp Groups

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 Fusion360 - a 3D CAD modelling software in which we will design parts of our final project, the mobile manipulator.

Further, we will teach 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.

Software Requirements

1. TinkerCAD is an online, free for all circuit simulator.
2. Autodesk Fusion 360 also has free student's access here.

Timeline

Weeks	Topics	Task Description
Week 1	Introduction to Autodesk Fusion 360 and mechanical linkages.	Modelling of basic models and required linkages in 3D.
Week 2	Assembly of joints and linkages in Fusion 360, constraint equations in robots.	Modelling the components of a mobile manipulator in 3D.
Week 3	Finishing the mechanical design.	Complete the mechanical design of the mobile manipulator in Fusion360.
Week 4	Introduction to Electronics and Arduino programming.	Using TinkerCAD to create simple electronic circuits, basic Arduino programming.
Week 5	Electronic devices, Advanced Arduino programming.	Timers and interrupts, motor control, other peripherals (like LCD display). Simulating Arduino code for robotic arm.
Week 6	Finishing the electronics design.	Complete the electronics system design and Arduino programming of the mobile manipulator.

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 instructors and your doubts.