INTRODUCTION TO AERODYNAMICS AND AVIATION

COURSE OVERVIEW:

This course is an introduction to the basic ideas and principles revolving around Aerodynamics and Aviation with hands-on practical knowledge through aeromodelling. The course is supposed to familiarize the students with the laws governing flight and then moves towards explaining the parts of the aircraft and how they control flight dynamics. The course explores different designs and the motivation behind them, focusing on fixed-wing aircraft and then transitioning into a quad-rotor too. The course will include the building of RC planes along with a hands-on session with flying drones.

Towards the end, the course would deal with the concept of modern-day civil aviation, communication, and navigation technologies, along with rules governing them, before ending with case studies of Crashes and Aviation accidents.

INSTRUCTORS:

Kshitij Chhabra	2017A8PS0691G	+91-9161676222
Harshwardhan Shirodkar	2017AAPS0169G	+91-9768281214
Pranay Mathur	2017A8PS0487G	+91-9999843090

MENTORS:

Bharat Gupta	2018A3PS0446G	+91-9873011180
Shambhavi Singh	2018B5PS0276G	+91-8698666632
Jaskaran Bhatia	2018A7PS0230G	+91-9560358314

Week	Session	Topic	Description
1	Lecture	Introduction	• HIstory • Basics to aviation and aerodynamics • Demo of models to be built
	Lecture	Basic Principles	• Requirements flight • LTA and HTA • Control surfaces • Thrust • Will it fly?

2	Lecture	Design Theory 1: Parts of a Plane	• Basics of design • Aeromodelling designs and other aspects • Introduction to parts of a plane
	Lecture and Build	Design Theory 2: Wings and Control surfaces	• Wings • Airfoil • Ailerons • Flaps and Slats • Build session of Fuselage
3	Lecture and Build	Design Theory 3: Tail section	• Vertical Stabilizer • Elevator • Rudder • Build session of Wing
	Lecture and Build	Design Theory 4: Electronics	• Electronics in RC • Connections and Troubleshooting
	Flying	Flying	• Flying session of the model built
4	Lecture	Drones 1: Dynamics and Control theory	• Geometry and Mechanics • Rigid Body Dynamics • Quadrotor Controllers
	Lecture	Drones 2: Hardware	• Frames, Motors, and ESCs • Flight Controllers • Common Attachments • Advanced Applications
5	Lecture	Drones 3: Applications and recent advancements	• Methods of Localisation-SLAM, Vicon Arena, Mocap, Optical Flow • Automation using Dronekit and ROS (MAVROS)
	Flying	Flying	• Flying session of Drones

6	Lecture	General Aviation 1: Aero outside aviation	• Aero in F1, automobiles • Hydrodynamics • Principles of drag and flow
	Lecture	General Aviation 2: Terminologies, ATC and communications	• Aviation jargons and terminologies
7	Lecture	General Aviation 4: Aviation accident case studies	• Case studies of famous accidents • Repercussions • Safety motivation

EVALUATIONS:

- Group Build Sessions 10%
- Quizzes 20%
- Tech-Weekend Competition 25%
- Comprehensive Exam 35%