# NIRMA UNIVERSITY
# INSTITUTE OF TECHNOLOGY, SCHOOL OF ENGINEERING
# B Tech in Mechanical Engineering

**(Department Elective)**

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| **Course Code** | **2MEDE02** |
| **Course Title** | **Basics of Flight and Aerodynamics** |

**Course Outcomes (CO):**

After successful completion of the course, the student will be able to -

1. explain the evolution of aircraft and aircraft industry,
2. infer the basics of flight and aircraft systems,
3. apply the basic principles of aerodynamics,
4. summarize the mechanics of flight and its performance.

**Syllabus** **Teaching Hours: 45**

**UNIT I** **Overview of Aircraft Industry** **04 hours**

The historical evolution of flight; aircraft industry, aircraft manufacturing and materials, industry supply chain; global and Indian scenario.

**UNIT II** **Basics of Flight and Aircraft Systems** **14 hours**

Earth's atmosphere and International Standard Atmosphere. Basic principles of flight, basic components of an aircraft, structural members, aircraft axis system, aircraft motion, control surfaces and high lift devices, tail unit arrangements, landing gear arrangements, cockpit and instruments, structural concepts, stability and control. Aircraft propulsion systems- IC Engine, propeller and jet engines. Fuel systems. Hydraulic and Pneumatic systems.

**UNIT III** **Principles of Aerodynamics** **12 hours**

Viscous flows; generation of lift, drag, pitching moments, types of drag, lift curve, drag curve, lift/drag ratio curve, factors affecting lift and drag, Center of Pressure and its effects. pressure distribution and flow separation, airfoils and airfoil nomenclature,

finite wings, pressure distribution over a wing section, compressibility, Mach waves, Mach angles, Critical Mach number.

**UNIT IV** **Flight Mechanics and Performance** **15 hours**

Introduction to flight mechanics, Horizontal flight performance,

Power curves, maximum and minimum speeds of horizontal flight, range, endurance, effects of changes of engine power, effects of altitude on power curves. Climbing and descending flight. The flight envelope. Sonic and Supersonic flight.

**Self -Study** The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Suggested Readings:**

1. Kermode A. C., Barnard R H, Philpott D R, Mechanics of Flight, Pearson.
2. Anderson J., Introduction to Flight, McGraw Hill.
3. Kermode A. C., Flight without Formulae, Pearson.
4. Moir I., Seabridge A., Aircraft Systems, Wiley.

L=Lecture T= Tutorial P=Practical, C=Credit