| COURSE CODE | COURSE TITLE | L | T | P | C |
|---|---|---|---|---|---|
| 1152AE128 | LIGHTER THAN AIR SYSTEMS | 3 | 0 | 0 | 3 |

**Course Category:**

Programme elective

**a. Preamble :**

The course aims at introducing basic knowledge on Lighter Than Air(LTA) systems and their configurations. Thecoursehas its emphasis on presenting the students with the concepts ofaerostatics and the design of various lighter than air vehicles.

**b. Prerequisite Courses:**

- Nil

**c. Related Courses:**

- Nil

**d. Course Educational Objectives :**

- To discuss in general the history of LTA systems and their configurations
- To understand the principles of aerostatics and their application in designing the airships and aerostats
- To know about the current challenges and future developments of lighter than air systems

**e. Course Outcomes :**

Upon the successful completion of the course, students will be able to:

| CO Nos. | Course Outcomes | Knowledge Level (Based on revised Bloom's Taxonomy) |
|---|---|---|
| CO1 | Tell the evolution of lighter than air systems and identify the various components of such vehicles. | K2 |
| CO2 | Describe the properties and structure of atmosphere, and state the aerostatic principles | K2 |
| CO3 | Apply the aerostatics principles in the design of airships and solve typical numerical problems | K3 |
| CO4 | Apply the aerostatics principles in the design of aerostats and solve typical numerical problems | K3 |
| CO5 | Relate the present and future developments of lighter than air systems. | K3 |

**f. Correlation of COs with POs:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | H | | | | | | | | | | | |
| CO2 | H | | | | | | | H | | | | |
| CO3 | H | | | | | M | | H | | | M | |
| CO4 | H | | | | | M | | H | | | M | |
| CO5 | H | | | | | | | | | M | | |

H- High; M-Medium; L-Low

**f. Course Contents :**

**UNIT I - INTRODUCTION & HISTORICAL PERSPECTIVES L-9**

Introduction to LTA Systems, Types of LTA vehicles-Airship, Aerostat, Hot Air balloonHistorical Developments, Key Subsystems and Components of LTA Systems.

**UNIT II - PRINCIPLES OF AEROSTATICS L-9**

Variation of Atmospheric Properties, Static Lift Prediction, Effect of ambient conditions on Static Lift, Climb, Descent and Pressure Height, Numerical problems

**UNIT III -AIRSHIP TECHNOLOGY L-9**

Methodology for airship conceptual design, Aerodynamics & Stability analysis of Airships,Ground Handling and Mooring systems, Case Studies in Airship Operations, Design& Development of Remotely Controlled Airships, Numerical problems

**UNIT IV - AEROSTAT TECHNOLOGY L-9**

Methodology for sizing of Aerostat sub-systems, Equilibrium and Stability analysis of aerostats, Design and Development of Tethered Aerostats, Numerical problems

**UNIT V - CURRENT AND FUTURE DEVELOPMENTS L-9**

Challenges in design of LTA Systems, Hybrid LTA Systems, Stratospheric Airships, Current Trends and Recent Developments.

**Total periods: 45**

**g. Learning Resources**

**i. Text Books:**

1. Pant, R. S., Course Material for Design and Development of LTA systems, Curriculum Development Program, IIT Bombay, 2010.

**ii. References:**

1. Taylor, J. A., Principles of Aerostatics, The Theory of Lighter-Than-Air Aircraft, ISBN13:978-1-49481-053-5, 2014.
2. Khoury, G., Ed., Airship Technology, 2nd Edition, Cambridge Aerospace Series, Cambridge University Press, 2012.
3. Carichner, G. E., and Nicolai, L. M., Fundamentals of Aircraft and Airship Design, Volume 2 – Airship Design and Case Studies, AIAA Education Series, 2013.