Elements of Aeronautics Lab		Semester	I/II
Course Code	**1BEAEL107/207**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24	Total Marks	100
Credits	01	Exam Hours	03
Examination type (SEE)	**Practical**		

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Demonstrate practical fabrication skills in wing, fuselage, and glider structures.
2. Evaluate performance characteristics (range, endurance, CG, stability).
3. Conduct simple flight tests and verify theory with experimental results
4. Develop innovative solutions in open-ended experimental setups.

PART – A

FIXED SET OF EXPERIMENTS

1. Create a paper plane model and calculate the range and endurance of the same.
2. Sketching the detailed configuration of an Aircraft (Fighter or Commercial).
3. Fabrication on different types of wing configuration.
4. Fabrication of unpowered gliders by using balsa wood.
5. Calculate the cg and aerodynamic design parameters of modelled glider.
6. Assessing the performance parameters of the modelled glider.

PART – B

OPEN ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. Lighter than Air concepts (Para Gliding)
2. Case studies on Aircraft investigation.
3. A study on sugar candy solid propellant.
4. Design and fabrication of powered glider.
5. Fabrication of aircraft fuselage structures by using sheet metal.
6. Selection and justification of appropriate riveting and joining techniques in aircraft applications.

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. A.C. Kermode, **"Flight without formulae",** Pearson Education India, 1989. ISBN: 9788131713891
2. Lalit Gupta and O P Sharma, **"Fundamentals of Flight Vol-I to Vol-IV",** Himalayan Books. 2006, ISBN:9788170020752

Reference books / Manuals:

1. **"How do Airplanes Fly",** by Madhav Khare
2. **"Model Aircraft Aerodynamics"** by Martin Simons, Wiley Publications, 1994. ISBN 1-85486-121-2

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/watch?v=yVvjuQiACWs
2. https://www.youtube.com/watch?v=rOdTCWzrgmk

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. Hands on Workshop, presentations, Team work-design, build, fly
2. Use of ICT, Virtual labs
3. Interactive Platforms, Flight Simulators, etc

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE Theory component will be 25 marks and CIE Practical component will be 25 marks.

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 20 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous assessment: (30 Marks)

	Superior	Good	Fair	Needs Improvement	Unacceptable
PI-1: Application of Aerodynamic Principles 5M	Applies concepts accurately to calculate range, endurance, CG, stability with innovation	Applies concepts with minor errors	Demonstrates basic understanding with occasional mistakes	Limited understanding; frequent errors	No application of concepts
PI-2: Aircraft Design & Sketching 5M	Produces precise, detailed configurations (fighter/commercial) with proper dimensions	Produces correct sketches with minor omissions	Acceptable sketches but lacks detailing	Incomplete/incorrect sketches	No attempt
PI-3: Fabrication & Model Building 5M	Models fabricated with precision, structural integrity, and material efficiency	Fabrication mostly correct, minor flaws	Acceptable model but structurally weak	Poor fabrication; lacks finish	No fabrication
PI-4: Performance Assessment & Analysis 5M	Accurately measures & interprets glider/plane performance parameters	Correct assessment with minor errors	Basic measurement but weak interpretation	Incomplete or incorrect assessment	No assessment
PI-5: Innovation & Open-Ended Problem Solving 5M	Demonstrates creativity in powered glider, LTA concept, riveting study	Shows good innovation, justified choices	Some creativity but limited justification	Weak attempt, lacks novelty	No attempt
PI-6: Teamwork & Communication 5M	Leads team, contributes effectively, documents & presents clearly	Collaborates well, communicates with clarity	Participates but limited contribution	Rarely participates, weak communication	No teamwork effort

Rubrics for SEE / CIE Test:
(CIE test -To be conducted for 100 marks and the marks obtained shall be reduced to 20) (SEE-To be conducted for 100 marks)

Performance Indicators	Excellent	Very Good	Good	Satisfactory	Poor
Fundamental Knowledge (PO1) **(10)**	The student has well depth knowledge of the topics related to the course (9-10)	Student has good knowledge of some of the topics related to course (7-8)	Student is capable of narrating the answer but not capable to show in depth knowledge (5-6)	Student has not understood the concepts clearly (2-4)	Student do not know the concepts (0-1)
Design Of Experiment (PO2 & PO3) **(15)**	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (13-15)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best (10-12)	Student is capable of discussing single design with its merits and de-merits (6-9)	Student is capable of explaining the design (3-6)	Student is not capable of explaining the design (0-2)
Implementation (PO3 & PO8) **(40)**	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (33-40)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (25-32)	Student is capable of implementing the design with proper explanation. (17-24)	Student is capable of implementing the design. (5-16)	Student is not capable of implementing the design. (0-4)
Result &Analysis (PO4) **(15)**	Student is able to run the program on various cases and compare the result with proper analysis. (13-15)	Student will be able to run the program for all the cases. (10-12)	Student will be able to run the code for few cases and analyze the output. (6-9)	Student will be able to run the program but not able to analyze the output. (3-6)	Student is not able to run the program and not able to analyze the output. (0-2)
Demonstration (PO9) **(20)**	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion). Transitions between sections are smooth. (17-20)	The lab record is organized, with clear sections, but some sections are not well-defined. (12-16)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (9-12)	The lab record is poorly organized, with missing or unclear sections. (3-8)	The lab record is very poorly organized, (0-2)

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.