SEMESTER 6

ANALYSIS AND SIMULATION LAB

Course Code	**PCAOL607**	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	**ESE Marks**	50
Credits	2	**Exam Hours**	2 Hrs. 30 Min
Prerequisites (if any)	High Speed Aerodynamics,Computational Fluid dynamics	**Course Type**	Practical

Course objectives:

- To provide practical knowledge in use of analysis softwares like Ansys for fluid flow analysis, structural analysis, and thermal analysis

Details of Experiment

Expt. No	Experiment
1	Simulation of flow over sphere, cone & cylinder.
2	Simulation of flow over a flat plate at various angle of attack.
3	Simulation of flow over symmetric airfoil.
4	Simulation of flow over unsymmetrical airfoil
5	Simulation of supersonic flow over a wing of bioconvex cross section
6	Simulation of flow over boat-tail configuration.
7	Simulation of flow through a converging duct.
8	Simulation of flow through a divergent duct.
9	Simulation of flow through CD Nozzle.
10	Simulation of flow through subsonic and supersonic diffusers.
11	Simulation of Flow around a wing with aerodynamic twist and Geometric twist.
12	Structural analysis of a tapered wing.

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13	Structural analysis of a fuselage structure
14	Structural analysis of landing gear
15	Analysis of a composite laminate structure.
16	Thermal Stress and Heat Transfer analysis of plates.
17	Thermal stress analysis of cylindrical shells.
18	Thermo structural analysis of a composite laminate structures

Course Assessment Method (CIE: 50 Marks, ESE 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Exam	Total
10	**20**	**20**	**50**

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End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	**15**	**10**	**10**	**5**	**50**

- Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.
- Endorsement by External Examiner: The external examiner shall endorse the record.

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Analyze the flow over 2-D bodies such as cylinders and airfoils.	**K4**
CO2	Analyze the flow over 3-D bodies such as Sphere, cones and wings with and without Twist.	**K4**
CO3	Analyse flow through various ducts like convergent, divergent and Convergent-Divergent(CD)	**K4**
CO4	Analyse structural properties of aircraft component like wing, fuselage and Landing Gear	**K4**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	1	1	-	2
CO2	3	3	3	3	3	-	-	-	1	1	-	2
CO3	3	3	3	3	3	-	-	-	1	1	-	2
CO4	3	3	3	3	3	-	-	-	1	1	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	An Introduction to ANSYS Fluen	John E. Matsson	SDC Publication	
2	Ansys Workbench Tutorial Release 14: Structure & Thermal Analysis Using The Ansys Workbench Release 14 Environment	Kent Lawrence	SDC Publication	2012
3	Computational fluid dynamics- An introduction	John F. Wendt	Springer Verlag	2009
4	Analysis and Design of Flight Vehicles Structures	Bruhn. E	Tri-state-off-st Company	1985
5	Computer simulation of flow and heat transfer.	P. S. Ghoshdasidar	McGraw -Hill Book Co	1998

Continuous Assessment (20 Marks)

1. **Preparation and Pre-Lab Work (5 Marks)**
    - Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
    - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.
2. **Conduct of Experiments (5 Marks)**
    - Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
    - Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
    - Teamwork: Collaboration and participation in group experiments.
3. **Lab Reports and Record Keeping (5 Marks)**
    - Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
    - Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.
4. **Viva Voce (5 Marks)**
    - Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

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Final Marks Averaging: *The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.*

Evaluation Pattern for End Semester Examination (50 Marks)

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**
    - Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
    - Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
    - Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
    - Creativity and logic in algorithm or experimental design.

2. **Conduct of Experiment/Execution of Work/Programming (15 Marks)**
    - Setup and Execution: Proper setup and accurate execution of the experiment or programming task.
3. **Result with Valid Inference/Quality of Output (10 Marks)**
    - Accuracy of Results: Precision and correctness of the obtained results.
    - Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.
4. **Viva Voce (10 Marks)**
    - Ability to explain the experiment, procedure results and answer related questions
    - Proficiency in answering questions related to theoretical and practical aspects of the subject.
5. **Record (5 Marks)**

    Completeness, clarity, and accuracy of the lab record submitted

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