INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad-500043

STANDARD OPERATING PROCEDURE

for

Engineering Design Project

(Selection – Conduction – Evaluation – Report)

01 December, 2025

1. INTRODUCTION

Engineering Design Project is a student-centric, outcome-based learning approach in which students learn by designing and developing solutions to real-world engineering problems. It emphasizes a *"learn-by-doing"* methodology where students actively engage in problem identification, design, implementation, and validation of engineering systems or prototypes.

2. SCOPE

This SOP applies to all undergraduate engineering programs implementing:

- Engineering Design Projects
- Project-Based Learning (PBL) Courses
- Interdisciplinary and Industry-Oriented Projects

3. OBJECTIVES

- Promote experiential and hands-on learning
- Develop analytical and problem-solving skills
- Foster innovation and design thinking
- Enhance teamwork and communication skills
- Align learning outcomes with Program Outcomes (POs) and Course Outcomes (COs)

4. Outcomes:

- Apply engineering knowledge to solve real-world problems
- Design and develop innovative solutions and prototypes
- Analyze problems and use appropriate tools and techniques
- Work effectively in teams with good communication skills
- Demonstrate project management and lifelong learning abilities

5. PROCESS FLOW

The Five main phases during the engineering design project were identified in the team's collaborative work:

1) Identification of the project/problem

- Identify real-world, industry, or societal problems
- Define objectives and expected outcomes

2) Identification of tools for collaboration in the design phase

- Review research papers, journals, and existing solutions
- Identify gaps and scope for innovation

3) Design specifications and developing the prototype

- Develop system architecture/design

- Prepare project plan with timelines and milestones
- Select appropriate tools and technologies

4) Testing the prototype

- Develop prototype/model/system
- Perform coding, fabrication, simulation, or integration

5) Technical solution for the learning design tool

- Conduct testing and performance evaluation
- Validate results with expected outcomes

Along the above:

Documentation

- Maintain project report
- Prepare technical report

Presentation and Review

- Demonstrate working model
- Present project outcomes through viva and presentations

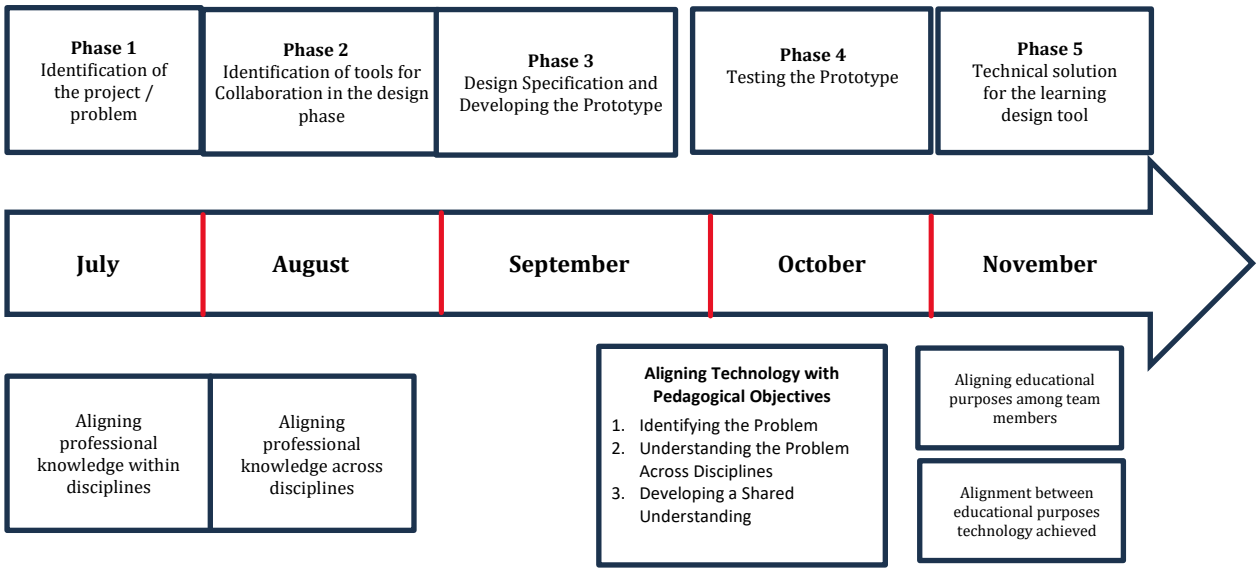

Figure. 1. Timeline for Engineering design project phases.

Aligning Technology with Pedagogical Objectives

1. **Identifying the Problem**
   Recognizing and clearly defining the issue to be addressed.
2. **Understanding the Problem Across Disciplines**
   Analyzing the problem from multiple professional perspectives.
3. **Developing a Shared Understanding**
   Bringing together insights to form a common and clear understanding of the problem.

6. ROLES AND RESPONSIBILITIES

6.1 Students

- Execute project tasks effectively
- Work collaboratively in teams
- Adhere to timelines and deliverables

6.2 Faculty Mentor

- Guide students in project selection and execution
- Monitor progress and provide technical support
- Evaluate project performance

6.3 Department

- Provide infrastructure and necessary resources
- Ensure alignment with curriculum and outcomes
- Conduct periodic reviews and assessments

7. ASSESSMENT AND EVALUATION

Evaluation shall be based on:

- Problem identification and innovation
- Design and development methodology
- Functionality of prototype/model
- Quality of documentation
- Presentation and viva performance
- Teamwork and project management

8. OUTCOME ALIGNMENT

The PBL activities are aligned with:

- Program Outcomes (POs)
- Program Specific Outcomes (PSOs)
- Course Outcomes (COs)

9. EXPECTED OUTCOMES

Upon completion, students will be able to:

- Apply engineering knowledge to real-world problems
- Design and develop innovative solutions
- Work effectively in multidisciplinary teams
- Communicate technical ideas clearly
- Demonstrate project management skills

10. RECORDS AND DOCUMENTS

- Project Proposal
- Design Documents
- Progress Reports
- Final Project Report
- Evaluation Rubrics

11. REVIEW AND CONTINUOUS IMPROVEMENT

- Periodic review of project outcomes
- Feedback collection from stakeholders
- Continuous improvement based on outcome attainment

PRINCIPAL