MINI PROJECT

ENAM 354

Credit : 1 **Year : III** **Part : II**

Course Objectives

The objective of this course is to bridge the gap between theoretical knowledge and professional automotive engineering practice through collaborative work, learning research methodology, technical tool validation and advanced documentation standards. Learning from the knowledge and technical skills acquired in earlier and this semester, students will solve engineering problems through systematic design, analytical modeling and computational simulation. The course emphasizes integrated optimization workflows, where students apply engineering principles to refine their solutions. As a final output, students may choose to develop either a functional prototype or a refined, non-functional technical model to demonstrate their project's viability.

General Procedures

Under the guidance of the course instructor, students will organize into collaborative groups, generally consisting of 4 members. Each group is responsible for identifying a practical engineering problem within the automotive sector and defining a specific research scope through a systematic literature review. This process may include field visits to automotive workshops, service centers or manufacturing plants to identify technical challenges and industry limitations. Each group will initiate their work by formulating a problem statement, identifying research gaps and establishing clear project objectives. Building on skills from previous and current semesters, groups will enter the conceptual design phase to generate multiple alternatives and perform a functional analysis to evaluate feasibility. During the design and development stage, students apply core engineering principles to refine their chosen solution through iterative cycles of modeling, simulation and optimization. This stage includes material selection and technical tool validation to ensure the accuracy of the design. The process concludes with verification and documentation, where the final functional prototype or technical model is validated against industry standards and compiled into a comprehensive technical report for final presentation.

S.N.	Stage	Timeline (Weeks)	Activities
1	Proposal and Conceptual Design	1-4	Identification of research gaps and submission of a formal proposal. Includes study objectives, methodology, preliminary mathematical modeling or technical framework and an oral presentation to validate project feasibility.
2	Mid-term Progress and Design Validation	8-10	Submission of a progress report detailing the transition from conceptual design to technical setup. Includes material selection, CAD or

			analytical modeling, technical tool validation and an oral progress review.
3	Final Submission and Evaluation	13-15	Submission of the final report by Week 12. Final evaluation includes the instructor's assessment, group presentation and a formal oral examination during Week 15.

Throughout the course, the instructor will serve as a supervisor, providing continuous feedback and conducting regular reviews to ensure that technical viability and professional documentation standards are maintained.

Representative Project Scopes

To illustrate the applications of fundamental automotive concepts and principles, the following examples represent acceptable project scopes (But not limited to):

i. Design and optimization of aerodynamic components in an electric vehicle (EV) to reduce drag and improve range
ii. Performance analysis of a lithium-ion battery cooling system
iii. Kinematic and dynamic simulation of steering linkage mechanisms to optimize Ackermann geometry and reduce tire wear
iv. Digital modeling and stress analysis of vehicle chassis joints to identify weak spots and improve material distribution for crashworthiness
v. Design and fabrication of a regenerative braking test rig to evaluate material selection and energy recovery performance

Evaluation Scheme

Evaluation Methods	Marks	Remarks
Continuous Assessments	10	Evaluation of the literature review, problem formulation and weekly progress log. Focus is on the research gap or industry-specific challenges sourced from industry-specific environments and service centers and the logical transition from theory to technical framework.
Project Documentation	20	Submission of a progress report detailing the transition from conceptual design to technical setup. Includes material selection, CAD or analytical modeling, technical tool validation and an oral progress review. Assessment of the final report based on technical accuracy, analytical or computational validation and optimization results.
Presentation and Defense	20	A comprehensive viva-voce and presentation with focus on the student's ability to justify engineering decisions, explain operational parameters and interpret results from modeling or prototype testing.
Total	**50**	