

MINOR PROJECT

ENME 355

Credit : 1

Year : III

Part : II

Course Objectives:

The objective of this course is to bridge the gap between theoretical knowledge and professional engineering practice through collaborative work, learning research methodology, technical tool validation and advanced documentation standards. By developing technical competencies gained in earlier semesters and this semester, students will address these problems through systematic design approach.

General Procedures:

Under the guidance of the course instructor, students will be organized into collaborative groups with generally 4 members. Each group will be responsible for identifying a technically feasible engineering problem within the mechanical engineering sector, defining a specific research scope through a systematic literature review. This process should ideally involve field visits to local production units, industrial sites or workshops to document real-world operational challenges and design related problems. Each project group will initiate their work through problem formulation and scoping, focusing on the identification of specific research gaps and the establishment of clear project objectives within the mechanical engineering sector. Building on the foundational skills acquired in earlier semesters, this phase focuses on the conceptual design process. Students will develop multiple design alternatives and perform functional analyses to determine the feasibility of their ideas. During the development stage, groups apply core engineering principles to refine their chosen solutions through iterative cycles of computational or analytical validation, simulation and optimization. This process includes material selection and technical tool validation to ensure the accuracy and reliability of the final design. Finally, the process concludes with verification and documentation, where the proposed functional or non-functional technical model and its design is validated against established industry standards and compiled into a comprehensive technical report with presentation of the results.

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

			material selection, 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 synthesis of foundational engineering principles from earlier semesters, the following examples represent acceptable project scopes focusing on design, modeling, simulation and optimization (But not limited to):

- i. Design and optimization of heat recovery units for small-scale furnaces to improve fuel efficiency
- ii. Numerical investigation of heat transfer enhancement in cross-flow heat exchangers to optimize fin geometry
- iii. Stress analysis and weight reduction of mechanical components to improve strength-to-weight ratios while maintaining structural integrity
- iv. Design, fabrication and performance testing of semi-automated mechanical systems emphasizing material selection
- v. Design and structural validation of specialized mechanical presses or jigs for local production, focusing on safety standards and durability
- vi. Kinematic and dynamic simulation of multi-bar linkage systems for automation
- vii. Design and simulation of a PID-controlled automated sorting system using sensors and actuators.

Evaluation Scheme:

Evaluation Methods	Marks	Remarks
Continuous Assessments	10	Evaluation of the literature review, problem formulation and weekly progress log. Assessment focuses on the student's ability to identify research gaps or local industrial challenges and the logical transition from theoretical concepts to technical model setup.
Project Documentation	20	Assessment of the final report based on technical accuracy, computational or analytical validation, optimization results and adherence to professional standards (APA 7th edition).
Presentation and Defense	20	A comprehensive viva-voce and presentation. Individual contribution will be assessed during the oral defense.

		Focus is on the student's ability to justify engineering decisions, explain boundary conditions and interpret results from simulation/modeling or prototype testing.
Total	50	