Course Syllabus

utilized to break the process down into manageable steps, and to develop experience in documenting and communicating the design progress according to professional engineering standards.

5) Projects should be complex enough that the nature of modern engineering endeavors can be experienced, where cooperation within large teams is needed, and a wide range of skills must be brought to bear to produce a viable solution. Accordingly, projects should be multidisciplinary, requiring a breadth of expertise covering mechanical, electrical, and software engineering aspects, distinct roles to be identified on the team, and significant organization and cooperation within the team.
6) Provide a significant opportunity for all students to develop leadership and technical communication skills.

This set of learning goals touches on the ABET knowledge categories K1-K3, and all eight of the ABET Abilities (Section 2.2). Specific knowledge sub-categories under K4 that Senior Projects fulfills have been defined based on input from industry leaders as follows:

K4.1 - Development of engineering specifications from system level requirements.
The design process, phases and approach
Setting system goals and requirements
Defining function, concept and architecture
K4.2 - Engineering design trades and system compromises
Tradeoffs, judgment, risk and balance in resolution
Disciplinary, multidisciplinary and multi-objective design
Prioritization and focus
System modeling to ensure goals can be met
K4.3 - Design and development of mechanical drawings and specifications
K4.4 - Design and development of software diagrams and specifications
K4.5 - Design and development of electrical schematics and specifications
K4.6 - Fabrication techniques and manufacturing processes
K4.7 - Development of fabrication and integration plans
K4.8 - Experimental measurement techniques & instrumentation
K4.9 - Development of experimental test and verification plans
K4.11 - Development of project management plans
K4.10 - Project management techniques and practices
K4.12 - Technical presentations and documentation

All students are expected to have a basic level of proficiency, defined as "*an ability to participate and contribute to*", all of the topics listed above at the completion of the AES senior projects sequence. Additionally, students should also gain a depth of knowledge, defined as "*skilled in the practice or implementation of*" one or more of these topics.

By the completion of senior projects, students are expected to be able to participate in and contribute to the core knowledge area (K4) in addition to K1-K3 and A1-A8 that constitute the learning goals for the course.
These learning goals are based on input from leaders of industry and academia that represent the skills a practicing engineer will require to be competitive over the next decade in any discipline of engineering.

ASEN 4018/4028 provides a hands-on experiential learning process where students are guided through an end-to-end process to conceive, design, manufacture, verify and validate an aerospace related system to satisfy a customer-defined need.
AES students have had some experience working on design cases studies in previous courses, where the objective is to show how a particular technical concept or method can be applied. The objective of senior projects is to design a solution to a larger problem (prescribed need), where the engineering concepts/technologies/methods are not known in advance, and must be determined by the design team based on sound engineering reasoning/modeling/analysis. Also, the course intends to go beyond theory to develop practical solutions that can be manufactured, operated, and tested to directly measure the appropriateness of the chosen approach and quantify its capabilities relative to the prescribed need.
Project ideas can be of two types: design of a new device, vehicle, or system to solve a particular problem, or design of an experimental testbed to characterize new technologies or physical processes. Both of these projects utilize established technology and design principles; they are not,

3.2.1 Project Definition Document (PDD)

Written document
Define specific project objectives and scope

3.2.2 Preliminary Design Review (PDR)

Oral team presentation based on a PowerPoint document
Show functional requirements, system interdependencies, and identify risks
Present trade studies with analyses completed to select a baseline approach
Propose initial baseline design
Present plan for prototyping and modeling

3.2.3 Critical Design Review (CDR)

Oral team presentation based on a PowerPoint document
Identify and address critical project elements for success
Preliminary prototyping and testing results
Feasibility analyses and models
Proposed detailed design
Test planning
Costing and program planning

3.2.4 Fall Final Report (FFR)

30-page written

Details about the financial requirements and expectations for senior projects can be found in the **Financial Management Requirement Document** which is available through the course website. A brief overview is provided below.

4.4.1 Budget

All projects are allotted a budget of $4,000 (AY 2022/2023) for project purchases. The budget will come from funds committed by a customer. Customers may provide additional operational funding as delineated in the **Customer Requirements Document**ument

6 Course Faculty and Staff

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Expectations of professional practice, communications, project management, and organizational skills

Specific technical expertise in various areas, and suggestions where additional expertise may be found.

The student team runs the project. Faculty will provide feedback and will ask teams to defend their decisions with engineering arguments in an effort to help them make the informed design choices that lead to a successful project.

All faculty members in the AES department are committed to providing students in senior projects with technical guidance in their area of expertise, if provided with reasonable requests. Contact information and a short overview on the technical interests of each faculty member can be found on the AES department webpage. Additional information can be found on the research center and individual faculty web pages.

If you have difficulties reaching a faculty member whom you would like to meet with you, contact the CC for your section or your faculty advisors who can help to coordinate this effort.

7 Grades

The requirements for each graded product in the course are specified in the corresponding assignment document. These are provided on the course Canvas web site. The grades are determined based on the criteria found there.

All grades are determined by your faculty advisor in agreement with the Project Advisory Board (PAB) as a whole, along with the CC. In the event that consensus cannot be reached, the CC has the final authority in setting grades.

The final semester grades are determined from a group grade basis on each assignment, with differential adjustments, based on individual contributions to the group effort, to obtain individual student grades. Grading in Senior Projects is necessarily somewhat subjective, but grades are normalized over the whole class in PAB grading meetings to maintain consistency and fairness. The CC keeps the grades on file, and will post them on Canvas web site for individual student access only. The team adviser will provide feedback to individual students about their grade outcomes upon request. The weighted contribution to the total grade for each element

7.2.1 ASEN 4018 assignment weighting (Fall)

Product	Weight
Project Definition Document	10%
Preliminary Design Review	25%
Critical Design Review	25%
Fall Final Report	20%
Student Professionalism Evaluation	10%
Student Performance Evaluation	

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