ME 4315 Energy Systems Analysis and Design (Either ME 3180 or ME 4315 is required)

Catalog Description: ME 4315 Energy Systems Analysis and Design (3-0-3)

Prerequisites: ME 2110 Creative Decisions and Design and ME 3345 Heat Transfer

Integrated concepts, laws, and methodologies from thermal sciences are used to analyze, model, and design energy systems and to predict system performance for fixed designs.

Textbook: The required textbooks will be the textbooks for the thermodynamics, fluid mechanics, and heat transfer courses taken by the students in the normal schedule entering this course.

Topics Covered:

1. Integration of thermal sciences principles.
2. Analysis, modeling, and design of representative subsystems.
3. Analysis and modeling of thermal and fluid systems.
4. Evaluation of system performance.
5. Consideration of system economics.
   a) Capital and operating cost estimation.
   b) Evaluation of investment opportunities.
6. System design optimization.

Course Outcomes:

Outcome 1: Integrate the concepts, laws, and methodologies from fluid mechanics, heat transfer, and thermodynamics, and when feasible including mass transfer and psychrometrics, into a set of practical tools for energy systems analysis.

1.1 Students will demonstrate understanding of the integrated concepts, laws, and methodologies of fluid mechanics, heat transfer, and thermodynamics in tests and homework examples.

Outcome 2: Exercise analytical tools to model typical subsystems such as pipelines, heat exchangers, and pumps.

2.1 Students will demonstrate in practice the ability to model typical subsystems and interpret the results of such models in tests and homework examples.

Outcome 3: Further develop modeling tools by enhancement and integration to predict total system performance for a fixed design and to support simple trade-off studies.

3.1 Students will demonstrate understanding of the economic concepts used to estimate and assess capital and operating costs and to evaluate investment alternatives.

Outcome 4: Introduce economic concepts to estimate and assess capital and operating costs and to evaluate investment alternatives.

4.1 Students will demonstrate combined economic considerations with performance evaluation in introductory practical design trade-off studies and system design optimization.

Outcome 5: Combine economic considerations with performance evaluation to provide a basis for design trade-off studies and system design optimization.

5.1 Students will demonstrate teamwork, leadership, and collaboration in advanced projects combining economic considerations with performance evaluation and involving practical design trade-off studies and system design optimization.

Outcome 6: Plan and execute individual and group design projects assigned to prepare students for professional practice and to further develop their ability to organize and work in teams.

6.1 Students and student groups will address comprehensive advanced design and optimization projects including appropriate formal reports incorporating functional and economic considerations.

Correlation between Course Outcomes and Student Outcomes:

ME 4315											
	Mechanical Engineering Student Outcomes										
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Outcome 1.1	X		X		X			X	X		X
Course Outcome 2.1	X		X		X			X	X		X
Course Outcome 3.1	X		X		X			X	X		X
Course Outcome 4.1	X		X		X			X	X	X	X
Course Outcome 5.1	X		X	X	X	X		X	X	X	X
Course Outcome 6.1	X		X	X	X	X	X	X	X	X	X

GWW School of Mechanical Engineering Student Outcomes:

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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