Course alpha, number, title: ME 440 Aerospace Engineering Fundamentals

Required or elective: Elective

Course (catalog) description: Aerodynamics, propulsion, air breathing engine ideal and real cycle analysis. Propulsion engine performance and design characteristics.

Prerequisite(s): ME 201 and ME 332 or concurrently

Textbook(s) and/or other required material: Class Notes

Class/Lab schedule: Total Credits: 3 Lecture/Laboratory/Discussion Hours: 3/0/0

Topics covered:

a. 1-D Compressible flow aerodynamics
b. Air breathing Propulsion Cycles Basics
c. Turboprop, Turbojet, Turbofan, Ducted Fan & Ramjet
d. Diffusers & Nozzles
e. Propulsion: Performance & Analysis
f. Engine selection

Course learning objectives: Upon successful completion of this course, students can:

1. Develop an understanding of how an air-breathing propulsion engine produces thrust.
   [L: Application] [M: Question in Exams]
2. Apply basic thermo-fluid laws to determine engine cycle analysis and to components energy transfer and transformation calculations.
   [L: Application] [M: Question in Exams]
   [L: Application] [M: Question in Homework & Exams]
4. Develop basic skill in propulsion-engine cycle analysis, performance estimation and engine selection.
   [L: Application] [M: Question in Homework & Exams]
5. Perform preliminary aerodynamic engine design.
   [L: Synthesis, Evaluation] [M: Question in Homework & Exams]
6. Enhance engineering problem solving skills.
   [L: Synthesis, Evaluation] [M: Question in Homework & Exams]
7. Improve design skills in thermal systems.
   [L: Synthesis, Evaluation] [M: Question in Homework & Exams]

Key: L – Level of Learning, M – Method of Measurement

Relationship of course to ME program outcomes: The following measurement standard is used to evaluate the relationship between the course outcomes and the educational-program outcomes:

2 = Strong Emphasis, 1 = Some Emphasis, 0 = Little or No Emphasis.

(a) an ability to apply knowledge of mathematics, science, and engineering—2
(b) an ability to design and conduct experiments, as well as to analyze and interpret data—0
(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—1
(d) an ability to function on multidisciplinary teams—1
(e) an ability to identify, formulate, and solve engineering problems — 1
(f) an understanding of professional and ethical responsibility — 1
(g) an ability to communicate effectively — 2
(h) the broad education necessary to understand the impact of engineering solutions in a
global, economic, environmental, and societal context — 0
(i) a recognition of the need for and the ability to engage in life-long learning — 0
(j) a knowledge of contemporary issues — 0
(k) an ability to use the techniques, skills, and modern engineering tools necessary for
engineering practice — 1

Contribution to professional component: 75% Engineering Science 25% Engineering Design

Person(s) who prepared this description: Abraham Engeda

Date of Preparation: 2014