Mechanical Engineering Dept. Department

Syllabus
ME 422: Propulsion Systems (3-0-3)

Course Catalog Description:

Aerothermodynamics of aerospace vehicle engines, combustion, thrust and efficiency. Gas turbine engines: turbojet, turbofan, turboprop; ramjet and scramjet, typical engine performance. Aerothermodynamics of inlets, combustors and nozzles. Introduction to propellers, turbo compressors and turbines. Introduction to rockets and performances of rocket vehicle engines. Chemical and electrical driven rocket engines.

Course Pre-requisites:

- ME 204: Thermodynamics II
- ME 311: Fluid Mechanics

Course Objectives:

1. Teach students the basic concepts in the propulsion systems through the law of fluid mechanics and thermodynamics, the means by which the energy transfer is achieved in the main types of jet engines, compressors, turbines together with the differing behavior of individual types in operation as related to solving engineering problems in propulsion systems.
2. Provide students with a working knowledge of practical applications of propulsion systems, RAM jets, air breathing engines, compressors, turbines, combustors and related problems.
3. Provide design experience trough introducing the geometric configuration of the intakes, compressors, turbines, kinematics relations, and work and power estimations.

Course Learning Outcomes:

CLO1. Understand the concept of combustion and thrust

CLO2. Understand engineering problems related with Propulsion systems

CLO3. Solve engineering problems related with Propulsion systems.

CLO4. Think as an engineer for solving problems that may arise in the areas of Propulsion systems..

Learning Resources:

- Hill, P., and Peterson, C., Mechanics and Thermodynamics Of Propulsion Systems, Addison-Wesley Pub. Ltd., 1992.
- Archer, R. D., and Saarlas, M., An Introduction to Aerospace Propulsion, Prentice Hall Publisher, 1996.
- Oates, G. C., Aerothermodynamics of Gas Turbine and Rocket Propulsion. AIAA, 1997.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Exam 2	12	20.0%
Exam 1	6	20.0%
Final exam	End of semester	35.0%
Project and assignments	various	10.0%
Quizzes	Various	15.0%

Lecture Weekly Schedule:

Week#	Topics
1	Mechanics and thermodynamics of fluid properties.
2	Thermodynamics of aircraft jet engines
3	Thermodynamics of aircraft jet engines (Continue)
4	Aerothermodynamics of inlets, combustors, and nozzles
5	Axial compressors
6	Axial compressors (Continue)
7	Axial compressors (Continue)
8	Axial turbines
9	Axial turbines (Continue)
10	Centrifugal compressors.
11	Centrifugal compressors. (Continue)
12	Performance of rocket vehicles.
13	Performance of rocket vehicles. (Continue)
14	Chemical rocket thrust chambers and chemical rocket propellants
15	Applications of propulsion systems to engineering problems