**AE 6020 High Speed Aerodynamics**

**Catalog Description:** AE 6020: High Speed Aerodynamics 3-0-3. Prerequisite:AE 6050

Transonic small disturbance theory. Transonic potential flow modeling. Supercritical airfoil design. Physics of hypersonic flow. Newtonian flow. Modeling of hypersonic viscous and inviscid flow.

**Text:** At the level of Hypersonic and High Temperature gas Dynamics by John D. Anderson, Jr., McGraw Hill Book Co., 1989. Typed Notes.

**Coordinator:** Lakshmi N. Sankar, Regents’ Professor

**Learning Objectives**

The student will learn how to model transonic and hypersonic flow phenomena over airfoils and wings, and reentry vehicles. The student will also learn to design supercritical airfoils.

**Prerequisites:** AE 3030 or equivalent.

**Lecture Topics**

Transonic Aerodynamics (20 Lectures)

I. Introduction

II. Derivation of the Transonic Small Disturbance (TSD) Equations

III. Numerical Solution of the TSD Equation

IV. Derivation of the Full Potential Equation (FPE) on a Curvilinear Coordinate System

V. Numerical Solution of the Full Potential Equation

VI. Supercritical Airfoil Design

VII. Influence of Boundary layer on Transonic Airfoil Aerodynamics

IX. Unsteady Transonic Flow

Hypersonic Aerodynamics (20 lectures)

I. Introduction to hypersonic flow

II. Hypersonic shock and expansion relations

III. Local surface inclination methods

IV. Hypersonic small disturbance theory and applications

V. CFD methods for hypersonic inviscid flow

VI. Hypersonic boundary layer theory

VII. CFD methods for hypersonic viscous flow

VIII. High temperature effects

Exams and Computer Project Tutorials (5 lectures)