PROPOSAL NUMBER: 99- 430

CURRICULUM PROPOSAL FORM

DEADLINES:

REGULAR COURSE PROPOSALS: OCTOBER 23, 1998 FOR FALL, 1999 AND FEBRUARY 19, 1999 FOR SPRING, 2000
SHORT-TERM COURSE PROPOSALS: DECEMBER 11, 1998 FOR FALL, 1999 AND MARCH 26, 1998 FOR SPRING 2000

PROPOSAL TITLE: Gas Dynamics

SPONSOR/S: [illegible]

DEPARTMENT: Mechanical Engineering

0910.521

CHECK ALL THAT APPLY:

____ UNDERGRADUATE ✓ GRADUATE

COLLEGE: Engineering

If LAS: ____ History/Humanities
____ Math/Sciences
____ Social/Behavioral Sciences

* * * * * * * * * *

TYPE OF PROPOSAL *(Check ALL that Apply)*

____ General Education
___ *New Course in* ________ *Bank*
___ *Existing course, Add To* ________ *Bank*
___ *Multicultural/Global Designation*
___ *Writing Intensive Designation*

____ New Minor/Concentration/Specialization
____ New Major/Degree Program
Short Term Course Proposal

✓ New Course (NOT Gen. Ed.)
____ Name Change (Dept., School, Major)
____ Changes in Degree Requirements
___ *Changes Involve Gen. Ed. requirements*

____ Minor Changes to Existing Courses
___ *Course is NOT General Education*
___ *Course IS General Education*

DEPARTMENT
(SIGNATURE INDICATES APPROVAL)

[signature] ________
DEPT. CURRICULUM CHAIR / DATE

[signature] 10/22/98
DEPT. CHAIRPERSON / DATE

COLLEGE CURRICULUM COMMITTEE
DATE OF OPEN HEARING (if necessary) ________

X APPROVED

— NOT APPROVED

COMMENTS:

[signature] 2/16/99
SIGNATURE DATE

ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)

✓ APPROVED

— NOT APPROVED

COMMENTS:

[signature] 10/23/98
SIGNATURE (Academic Dean) DATE

SIGNATURE (Graduate Dean) DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 2/10/99 (College Level only)

✓ APPROVED

— NOT APPROVED

COMMENTS:

Lauretta Reeves 4/1/99

SIGNATURE DATE

SENATE

Date announced at Senate 3/23/99

Voted upon at Senate: Approved Not Approved Date:

EXECUTIVE VICE PRESIDENT/PROVOST

____APPROVED

____NOT APPROVED If no, reasons are as follows:

STUDENT CREDIT HOURS ______ FACULTY LOAD HOURS ________ EQUALIZED CREDIT HOURS ______

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): ____

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST [signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED ___________

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED 0910.521

DATE/SIGNATURE OF REGISTRAR Robert A. Kulat 4/8/99

NOTIFICATION FORWARD:

✓ SENATE CURRICULUM COMMITTEE CHAIRPERSON

✓ DEPARTMENT CHAIRPERSONS

✓ ACADEMIC DEAN(S)

✓ REGISTRAR

SPONSOR(S)

TM 4/23/99

curricul/curfrms.989/9899prop.wpd

Course Proposal

1. Details:

a) Course Title:	Gas Dynamics (0910.521)
b) Sponsor:	Dr. Anthony J. Marchese, Department of Mechanical Engineering, College of Engineering
c) Credit Hours:	3 credit hours
d) Course Level:	Graduate
e) Curricular Effect:	Graduate level course for graduate students with specialization in Mechanical Engineering or Chemical Engineering.
f) Prerequisites:	Engineering Thermodynamics II (910.312) and Fluid Mechanics II (910.313), or equivalent courses.
g) Suggested Time/ Scale of Implementation	Fall 1999 One section

h) Resources:

Faculty is in place to teach the course within the Dept. of Mechanical Engineering. A supersonic nozzle flow apparatus has been purchased in support of this course. The supersonic nozzle apparatus has been installed in the 1130 square foot thermodynamics and engine laboratory, which will be used in support of this course. Library resources are in place. Computer hardware resources are available in the Henry M. Rowan Hall to support this course. No new software resources are required.

2. Rationale:

The proposed course is part of the Engineering Curriculum Proposal approved by the College Senate in December 1994. The proposed course is consistent with the establishment of the School of Engineering approved by the Board of Trustees in February 1995.

Mechanical Engineering is broadly split between the study of mechanical systems and thermal/energy systems. The proposed course is a graduate level thermal/energy systems elective for students with a specialization in Mechanical Engineering . Gas Dynamics introduces Mechanical Engineering students to the important area of compressible fluid mechanics. Knowledge of compressible fluid mechanics is vital for many career paths in the aerospace industry or energy services industry.

3. Essence of the Course:

a) Objectives:

The main objective of the course Gas Dynamics, is to provide students with insight into many applications of one-dimensional compressible flow and to introduce students to solution techniques for two-dimensional compressible flow. Graduate students enrolled in this course will complete a semester-long numerical analysis project.

The following are the specific objectives of this course:

Solve problems in one -dimensional steady compressible flow including: isentropic nozzle flow, constant area flow with friction (Fanno flow) and constant area flow with heat transfer (Rayliegh flow).

Derive the conditions for the change in pressure, density and temperature for flow through a normal shock.

Determine the strength of oblique shock waves on wedge shaped bodies and concave corners.

Determine the change in flow conditions through a Prandtl-Meyer expansion wave.

Use the Method of Characteristics to solve problems in two-dimensional compressible flow.

Complete a numerical analysis project to solve an unsteady one-dimensional flow problem.

b) Topical Outline:

The topical outline of the course may vary to some extent depending on the interests of the instructor and the students, and the advances in engineering technology. The topics to be covered will include the following:

1. Review of Fundamental Principles
    - 1.1 Compressibility
    - 1.2 Fundamental Assumptions
    - 1.3 Conservation Laws
2. Equations of Steady One-Dimensional Compressible Fluid Flow
    - 2.1 Continuity Equation
    - 2.2 Momentum Equation
    - 2.3 Energy Equation
    - 2.4 Equation of State
    - 2.5 Entropy Considerations
    - 2.6 Use of One-Dimensional Flow Equations
3. Fundamental Aspect of Gas Dynamics
    - 3.1 Isentropic Flow in a Stream Tube
    - 3.2 Speed of Sound
    - 3.3 Mach Waves
4. One-Dimensional Isentropic Flow
    - 4.1 Stagnation Conditions
    - 4.2 Critical Conditions
    - 4.3 Maximum Discharge Velocity
    - 4.4 Isentropic Relations
5. Normal Shock Waves

c) Evaluation and Grading Procedure of Students:

Student grades will be determined on the basis of examinations, homework and/or projects, laboratory projects and reports.

d) Course Evaluation:

The proposed course will be evaluated on the basis of student evaluations and curriculum review by appropriate faculty.

4. Results of Consultations:

The proposed course is part of the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994. Consultations were submitted with original proposal as specified by the Curriculum Committee. Additional curriculum consultations were performed with outside consultants including, Professor Skip Fletcher of Texas, A&M. Professor Fletcher is a fellow of the American Society of Mechanical Engineers.

Catalog Description:

Gas Dynamics (0910.521)

Prerequisites: *Engineering Thermodynamics II (910.312) and Fluid Mechanics II (910.313), or equivalent.*

This course emphasizes application of the conservation equations of mass, momentum and energy to solve problems in one-dimensional and two-dimensional compressible flow. Specific applications of one-dimensional compressible flow include one-dimensional isentropic flow, flow with area change, adiabatic flow with friction, normal shock waves and flow with heat addition. The method of characteristics is introduced to solve two-dimensional compressible flow problems. Numerical techniques are presented and a numerical analysis project is completed on one-dimensional, unsteady flow.