PROPOSAL NUMBER: 99- 428

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: Energy Conversion Systems

SPONSOR/S: H. Clay Gabler, Associate Professor

DEPARTMENT: Mechanical Engineering C910.514

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 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*

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

DEPARTMENT
(SIGNATURE INDICATES APPROVAL)

_____ 10/22/98 _____ 10/22/98
DEPT. CURRICULUM CHAIR / DATE — DEPT. CHAIRPERSON / DATE

COLLEGE CURRICULUM COMMITTEE
DATE OF OPEN HEARING (if necessary)_____
X APPROVED
— NOT APPROVED
COMMENTS:

_____ 3/22/99
SIGNATURE — DATE

ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)
— APPROVED
— NOT APPROVED
COMMENTS:

_____ 10/23/98
SIGNATURE (Academic Dean) — DATE

_____ _____
SIGNATURE (Graduate Dean) — DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 3/10/99 (College Level only)

✓ APPROVED

— NOT APPROVED

COMMENTS:

Lauretta Reeves 4/1/99

SIGNATURE **DATE**

SENATE

Date announced at Senate 2/23/99

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 0910.514

DATE/SIGNATURE OF REGISTRAR Robert A. Kelat 4/14/99

NOTIFICATION FORWARD:

✓ **SENATE CURRICULUM COMMITTEE CHAIRPERSON**

✓ **DEPARTMENT CHAIRPERSONS**

✓ **ACADEMIC DEAN(S)** TM 4/20/99

✓ **REGISTRAR**

SPONSOR(S)

Course Proposal

1. Details:

a) Course Title:	Energy Conversion Systems (0910.514)
b) Sponsor:	Dr. H. Clay Gabler, Department of Mechanical Engineering, College of Engineering
c) Credit Hours:	3 credit hours
d) Course Level:	Graduate
e) Curricular Effect:	A graduate elective for Masters of Science in Engineering majors. May also be taken by Chemical, Civil or Electrical Engineering majors, if they meet prerequisites.
f) Prerequisites:	Engineering Thermodynamics II (910.312) and Fluids I (901.341), 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 1130 square foot thermodynamics and engine laboratory, is in place 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.

Energy Conversion Systems introduces graduate-engineering students to the important area of power generation systems. Knowledge of power generation systems is vital for many career paths in the energy services industry. The deregulation of the electric power industry and increasingly strict environmental regulations on power producers require that students of this subject have a fundamental understanding of the strengths and weaknesses of both existing and emerging power generation technologies.

3. Essence of the Course:

a) Objectives:

Engineering Thermodynamics II briefly introduces Mechanical Engineering Students to the concept of thermal power generation cycles. The primary objective of the course Energy Conversion Systems, is to provide students with insight into state-of-the-art technologies for

electrical power generation and the environmental consequences of these technologies. This course differs from the undergraduate course "Introduction to Energy Conversion systems" in that the graduate course will require completion of an in-depth semester long design project, and additional independent reading from the literature.

The following are the specific objectives of this course:

1. Compute Heating Value of Gas-Phase Fuels
2. Equilibrium Concentrations of Fuel Oxidation Products
3. Compute Adiabatic Flame Temperature
4. Derive Overall Rate Expressions for Gas Phase Pollutant Formation
5. Compute mass rate of vaporization for liquid fuel droplets
6. Compute Coal Char Combustion Rates
7. Compute Nuclear Fuel Number Densities and Macroscopic Fission Cross-sections
8. Compute the thermal heat generation rate in a nuclear reactor fuel pin.

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 Power Cycles and Cycle Analysis
   - 1.1. High Efficiency Steam Power Cycles
   - 1.2. High Efficiency Gas Turbine Cycles
   - 1.3. Advanced Gas Turbine Cycles
   - 1.4. Combined Cycle Technology and Systems
2. Gaseous Fuels
   - 2.1. Production
   - 2.2. Composition
   - 2.3. Thermodynamics
   - 2.4. Kinetics
   - 2.5. Gas-phase Pollutants
3. Liquid Fuels
   - 3.1. Production
   - 3.2. Composition

- 3.3. Fuel Properties
- 3.4. Atomization
- 3.5. Droplet Combustion
- 3.6. Coking
- 3.7. Slagging and Ash
- 3.8. Alternative Liquid Fuels

4. Solid Fuels
   - 4.1. Production
   - 4.2. Coal Structure and Composition
   - 4.3. Devolatilization
   - 4.4. Char Combustion
5. Nuclear Energy
   - 5.1. Nuclear Fission
   - 5.2. Nuclear Core Design
   - 5.3. Reactor Steam Supply Systems
6. Direct Energy Conversion and Fuel Cells
7. Environmental Control
   - 7.1. Pollutant Generation Mechanisms
   - 7.2. NOx
   - 7.3. SOx
   - 7.4. Organic Emissions
   - 7.5. Inorganic Particulates
8. Alternative Energy Sources

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:

Energy Conversion Systems (0910.514)

Prerequisites: Engineering Thermodynamics II (910.312) and Fluids I (901.341), or equivalent courses.

This course will introduce energy conversion technologies for the generation of electrical power. Topics will include a review of power cycles, steam and gas cycles, generation of thermal power, combustion and fuels, steam power plant design considerations, gas turbine power plant operation and design considerations, combined cycles, co-generation, nuclear power, alternative energy sources, fuel cells, and environmental considerations in power generation. A course project will be required on an advanced topic of mutual interest between the student and instructor.