TO: The Faculty of the College of Engineering

FROM: The School of Aeronautics and Astronautics

RE: New Undergraduate Course, AAE 33800 Thermal Sciences

The faculty of the School of Aeronautics and Astronautics have approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

AAE 33800 Thermal Sciences
Sem. 1 and 2, Class 3, cr. 3
Prerequisites: ME 20000 Minimum Grade of D-, AAE 20000 Minimum Grade of S
Co-requisite: AAE 33400

Description:
A fundamental course covering a range of topics selected from the disciplines of engineering thermodynamics, fluid mechanics, heat transfer and combustion, with an emphasis on their application to propulsion. This is an entry level course to prepare students for advanced analysis of propulsion and energy systems. Upon completion of this course, students are expected to be able to apply fundamental principles to perform thermodynamic analysis for thermophysical problems involving fluid flow, heat transfer and combustion.

Reason:
This course provides fundamental background for students interested in majoring or minoring in Propulsion within the AAE curriculum. Students interested in Aerodynamics may also have interest. The introduction of the course permits a more in-depth treatment of aerospace propulsion in higher level undergraduate courses (currently numbered AAE 37200 and AAE 43900) providing a solid basis for graduates of the program with expertise in the propulsion area. While the topics covered appear across a variety of undergraduate courses within COE, AAE student access to these courses is limited and would require students to take more credits than can be dedicated within the existing curriculum.

Tom I-P. Shih, Professor and Head
School of Aeronautics and Astronautics

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes 4/29/14

Date 4/29/14

Chairman ECC

AAE 33800 THERMAL SCIENCES

PROFESSOR HAIFENG WANG
Office: Armstrong Hall, Room 3214
Email: haifeng@purdue.edu
Web: http://engineering.purdue.edu/cepl
Office hours: ARMS 3214 unless instructed differently
11:00am-12:00pm Wednesday
11:00am-12:00pm Friday

COURSE DESCRIPTION:

A fundamental course covering a range of topics selected from the disciplines of engineering thermodynamics, fluid mechanics, heat transfer and combustion, with an emphasis on their application to propulsion. This is an entry level course to prepare students for advanced analysis of propulsion and energy systems. Upon completion of this course, students are expected to be able to apply fundamental principles to perform thermodynamic analysis for thermophysical problems involving fluid flow, heat transfer and combustion.

Prerequisites: ME 20000 Minimum Grade of D-, AAE 20000 Minimum Grade of S
Co-requisite: AAE 33400

COURSE GOALS:

Upon completion of this course, students are expected to be able to apply fundamental principles to perform thermodynamic analysis for thermophysical problems involving fluid flow, heat transfer and combustion.

LEARNING OBJECTIVES:

- Identify types of problems from thermo-fluid systems
- Perform heat conduction analysis for steady and unsteady problems;
- Perform analysis for radiation heat transfer;
- Develop deeper understanding of the laws of thermodynamics and their applications to various problems
- Apply fundamentals of fluid mechanics to various fluid flow problems
- Analyze convection heat transfer problems
- Conduct analysis of simple combustion systems such as adiabatic or chemical equilibrium.
- Analyze simple thermo-fluid systems using fundamentals we learn from the class

REQUIRED TEXTBOOK

Yunus A. Cengel, Robert H. Turner, John M. Cimbala. Fundamentals of Thermal-Fluid Sciences, 4th Edition, 2012, McGraw-Hill

COURSE REQUIREMENTS:

Students are required to attend all lectures, to engage in all class activities, to finish homework assignments, to take all exams. The final grade is an overall evaluation of the students' achievements with respect to the course objectives, largely based on quantitative measures such as homework grades and exam grades. Other activities such as class attendance, engagement in class activities, constructive feedback account for a small percentage of the final grade.

OUTLINE

Weeks	Subjects
1–3	Introduction and Overview Heat Conduction
4	Radiation Heat Transfer
	Exam One
5–9	Laws of thermodynamics Fluid mechanics Convection heat transfer
	Exam Two
10–14	Combustion
	Final exam

AAE 33800

Office of the Registrar
FORM 40 REV. 5/11

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

Print Form

EFD 26-14

DEPARTMENT School of Aeronautics and Astronautics EFFECTIVE SESSION Fall 2015 201510

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [X] 1. New course with supporting documents
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes (department head signature only)
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	AAE	Subject Abbreviation	
Course Number	33800	Course Number	
Long Title	Thermal Sciences		
Short Title	Thermal Sciences		

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
[X] Fall [X] Spring [ ] Summer

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [X] W. Lafayette
[ ] Indianapolis

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range:
Minimum Cr. Hrs
(Check One) To [ ] Or [ ]
Maximum Cr. Hrs.
3. Equivalent Credit: Yes [ ] No [ ]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees: [ ] Coop [ ] Lab [ ] Rate Request
Include comment to explain fee
6. Registration Approval Type
Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

ScheduleType	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	50	3	16	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses
RECEIVED
APR 29 2014
OFFICE OF THE REGISTRAR

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):
Prerequisites: ME 20000 Minimum Grade of D-, AAE 20000 Minimum Grade of S, Co-requisite: AAE 33400. A fundamental course covering a range of topics selected from the disciplines of engineering thermodynamics, fluid mechanics, heat transfer and combustion, with an emphasis on their application to propulsion. This is an entry level course to prepare students for advanced analysis of propulsion and energy systems. Upon completion of this course, students are expected to be able to apply fundamental principles to perform thermodynamic analysis for thermophysical problems involving fluid flow, heat transfer and combustion.

*COURSE LEARNING OUTCOMES:
An ability to identify types of problems from thermo-fluid systems. A deeper understanding of the laws of thermodynamics as applied to propulsion applications. An ability to apply the fundamentals of fluid mechanics to fluid flow problems encountered in propulsion applications. An ability to perform analysis for conduction. convection and radiation heat transfer problems. An ability to conduct analysis of simple combustion systems such as adiabatic or chemical equilibrium.

Calumet Department Head	Date	Calumet School Dean	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date
North Central Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date
West Lafayette Department Head	3/28/14 Date	West Lafayette College/School Dean	4/29/14 Date
		West Lafayette Registrar	5/15/14 Date

OFFICE OF THE REGISTRAR

LAM 5/1/14