

# **NEW COURSE PROPOSAL: Eng Thermodynamics Heat Transfer (ENSC 388-3)**

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Course Number

ENSC 388-3

Course Title (long)

Engineering Thermodynamics and Heat Transfer

Course Title (short)

Eng Thermodynamics Heat Transfer

Weekly Hours

Lect 3; Sem 0; Tut 1; Lab 1

Course Outline

Macroscopic approach to energy analysis. Energy transfer as work and heat, the First Law of thermodynamics. Properties and states of simple substances. Control-mass and control-volume analyses. Entropy and the Second Law of thermodynamics. The Carnot cycle and its implications for practical cyclic devices. Energy conversion systems; internal combustion engines, power plants and refrigeration cycles. Introduction to heat transfer by conduction, convection, and radiation. Formulation and solution of steady and transient problems. Issues relevant to the cooling of microelectronics: applications of natural and forced convection in thermal solutions.

Prerequisite

MATH 150 or MATH 151

Corequisite

None

Special Instructions

Students who have taken PHYS 344 cannot take this course.

Course(s) to be dropped if this course is approved:

### Rationale for Introduction of this Course

This course will replace PHYS 344 in the MSE curriculum. Please see the attached Justification Page for more information.

### Scheduling and Registration Information

This course will first be offered in Fall 2009, and annually thereafter.

Will this be a required or elective course in the curriculum?

Required

What is the probable enrollment when offered?

50

Which of your present CFL faculty have the expertise to offer this course?

M. Bahrami and John Jones

Are there any proposed student fees associated with this course other than tuition fees?

No

Campus where course will be taught

Surrey

Library report status

Pending

Provide details on how existing instructional resources will be redistributed to accommodate this new course.

New resources will be provided to accommodate this course.

### **Proposed Course Outline**

#### TOPICS:

- Basic concepts of thermodynamics-thermodynamic systems and properties
- Properties of pure substances- equations of state
- First law of thermodynamics- control mass (closed systems)
- First law of thermodynamics- control volume (open systems)
- Second law of thermodynamics
- Entropy- control mass and control volume
- Conduction heat transfer- steady state

- Conduction heat transfer- transient
- Convection heat transfer- forced convection
- Convection heat transfer- natural convection
- Radiation heat transfer- properties
- Radiation heat transfer- exchanged between surfaces
- Cooling of electronic equipment- introduction, applications and examples

**CONTACT HOURS:**

3 lecture hours per week, 1 tutorial hours per week.

**RECOMMENDED TEXTBOOK:**

*Introduction to Thermodynamics and Heat Transfer*, by Yunus A. Cengel, McGraw Hill, 2<sup>nd</sup> edition, 2007

**EVALUATION:**

<b>Evaluation Component</b>	<b>Percentage of overall mark (out of 100)</b>
Projects and Laboratories	20%
Midterm	40%
Final	40%

The midterm and final are closed book examinations of the course material. However, students are permitted to use a photocopy of the property tables and unit conversion tables from textbook plus a crib sheet consisting of one 8 1/2× 11 paper (double-sided). Each week an assignment of 1 or 2 problems will be given (and posted online).

The projects sections are designed to improve the students' engineering design and their analytical problem solving skills. Each project includes model development, parametric studies, and optimization.

There will be 5 experiments in lab sections. Students are required to write laboratory reports individually.