



Course Approval Form

For instructions see:
<http://registrar.gmu.edu/facultystaff/catalog-revisions/course/>

Action Requested:

Create new course Inactivate existing course

Modify existing course (check all that apply)

Title Credits Repeat Status Grade Type

Prereq/coreq Schedule Type Restrictions

Other: _____

Course Level:

Undergraduate

Graduate

College/School: **Department:**

Submitted by: **Ext:** **Email:**

Subject Code: **Number:** **Effective Term:** Fall Spring Summer **Year:**

(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Title: Current **Fulfills Mason Core Req?** (undergrad only)

Banner (30 characters max w/ spaces)

New Currently fulfills requirement

Submission in progress

Credits: (check one) Fixed

Repeat Status: (check one) Not Repeatable (NR) Repeatable within degree (RD) Repeatable within term (RT) **Maximum credits allowed:**

Grade Mode: (check one) Regular (A, B, C, etc.) Satisfactory/No Credit Special (A, B, C, etc. +IP)

Schedule Type: (check one) Lecture (LEC) Lab (LAB) Recitation (RCT) Internship (INT)

Independent Study (IND) Seminar (SEM) Studio (STU)

Prerequisite(s): **Corequisite(s):**

Instructional Mode: 100% face-to-face Hybrid: ≤ 50% electronically delivered 100% electronically delivered

Restrictions Enforced by System: Major, College, Degree, Program, etc. (include code)

Equivalencies: (check only as applicable) YES, course is 100% equivalent to: _____

YES, course is being renumbered to/will replace the following: _____

Catalog Copy for NEW Courses Only (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	Notes (List additional information for the course)
Introduction to the basic concepts used in engineering when dealing with thermodynamic problems. Topics include equations of state, phase changes, latent heat, internal energy, enthalpy, entropy, and analysis of basic thermodynamic cycles such as Carnot cycles, power generation, internal combustion engines and refrigeration processes.	
Indicate number of contact hours: Hours of Lecture or Seminar per week: <input type="text" value="3"/> Hours of Lab or Studio: <input type="text"/>	
When Offered: (check all that apply) <input checked="" type="checkbox"/> Fall <input type="checkbox"/> Summer <input checked="" type="checkbox"/> Spring	

Approval Signatures

Department Approval _____ Date _____ College/School Approval _____ Date _____

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

For Graduate Courses Only

Graduate Council Member _____ Provost Office _____ Graduate Council Approval Date _____

For Registrar Office's Use Only: Banner _____ Catalog _____

Course Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference.
Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

Course Number and Title:

PHYS 690, Engineering Thermodynamics

Date of Departmental Approval:

March 4, 2016

Course Prerequisites:

PHYS 620 (Continuum Mechanics) or PHYS 705 (Classical Mechanics) or permission of instructor

Catalog Description:

Introduction to the basic concepts used in engineering when dealing with thermodynamic problems. Topics include equations of state, phase changes, latent heat, internal energy, enthalpy, entropy, and analysis of basic thermodynamic cycles such as Carnot cycles, power generation, internal combustion engines and refrigeration processes.

Reason for the New Course:

This new course will be one of the core requirements in the expanded scope for the existing engineering physics emphasis in our MS Program in Applied & Engineering Physics. A corresponding Program Modification Proposal in expanding the scope of the Engineering Physics Emphasis in our MS Program in Applied & Engineering Physics is submitted together with this Course Approval Form. The main aim of this new course is to offer students interested in engineering physics fundamental knowledge in basic thermodynamics concepts and relationships essential for physicists and engineers working in this field.

Prerequisite(s): PHYS 620 or PHYS 705 or permission of instructor

Hours of Lecture or Seminar per week: 3

Relationship to Existing Programs:

A proposal for modifying the curriculum requirement of the Engineering Physics emphasis of the M.S. Program in Applied and Engineering Physics is submitted together with this course proposal. The proposed Engineering Thermodynamics course (PHYS 690) will be one of the required core courses for the modified Engineering Physics emphasis of the M.S. Program in Applied and Engineering Physics. PHYS 690 can also serve as an elective course for the graduate students in Bioengineering, Civil, Environmental, and Infrastructure Engineering, as well as Mechanical Engineering.

Relationship to Existing Courses:

There is no existing course in Engineering Thermodynamics. A special physics topic course on Engineering Thermodynamics is being offered this semester to suit the needs of the program.

Semester of Initial Offering:

Spring 2017.

Proposed Instructors:

Rainald Lohner, Fernando Camelli, Chi Yang

Tentative Syllabus for PHYS 690

Engineering Thermodynamics

Contact Information

- Day(s) and Time:
- Location:
- Instructor:
- Email:
- Phone:
- Office Hour:
- Office:

Course Description

Introduction to the basic concepts used in engineering when dealing with thermodynamic problems. Topics include equations of state, phase changes, latent heat, internal energy, enthalpy, entropy, and analysis of basic thermodynamic cycles such as Carnot cycles, power generation, internal combustion engines and refrigeration processes.

Course Prerequisites

PHYS 620 (Continuum Mechanics) or PHYS 705 (Classical Mechanics) or permission of instructor

Course Objectives

- To familiarize students with the basic concepts used in engineering when dealing with thermodynamic problems;
- To know and be able to think in terms of such concepts as equations of state, phase changes, latent heat, internal energy, enthalpy and entropy;
- To understand and compute basic thermodynamic cycles such as Carnot cycles, power generation, internal combustion engines and refrigeration processes.

Course Schedule

- Week 1: Introduction, and Fundamental Concepts
- Week 2: Equations of State
- Week 3: First Law of Thermodynamics and Consequences of First Law
- Week 4: Carnot Cycle, and Enthalpy
- Week 5: Second Law of Thermodynamics, Entropy, and Combined First and Second Laws
- Week 6: Fluid Flow
- Week 7: Heat Transfer
- Week 8: Mid-Term Exam
- Week 9: Mixtures of Gases and Vapors
- Week 10: Vapor Power Cycles
- Week 11: Thermodynamics of Internal Combustion Engines
- Week 12: Refrigeration Processes
- Week 13: Thermodynamics of Reactive Systems
- Week 14: Review and Discussion

- Week 15: Final Exam

Sample Assignments

- Compute Diverse States for Gases and Liquids
- Compute Work/Heat Transfer etc for Various Machines
- Evaluate Compression Ratios for Internal Combustion Engines
- Compute Power Requirement of a Compressor
- Compute Entropy Changes of Water Between Two Temperatures
- Compute Changes of Entropy for Various Processes
- Compute Various 1-D Nozzle Flows
- Compute Flows in Pipelines
- Compute Insulation Layers for Pipes
- Compute Radiative Heat Losses for Various Configurations
- Compute Evaporative Cooling Cases
- Compute Various Dehumidifiers
- Compute a Complete Fossil Fuel Power Plant
- Design/Compute a Gasoline and a Diesel Engine
- Compute Various Refrigerators

Textbooks

- E.P. Gyftopoulos and G.P. Beretta “Thermodynamics: Foundations and Applications,” Dover Publications, 2010.

References

- F.W. Sears and J.E. Lee “Thermodynamics - An Introductory Text for Engineering Students,” Second Edition, Addison Wesley, 1962.
- M.J. Moran, H.N. Shapiro, D.D. Boettner and M.B. Bailey “Fundamentals of Engineering Thermodynamics” Seventh Edition, Wiley, 2010.

Grading

- Exams: 80% - One midterm (30%) and one final (50%). You will be give review problems to prepare for the exams.
- Homework: 20% - Usually one assignment per week.
- Course grade will be a letter grade. The following graduate grading is available at university catalog.

<u>Grade</u>	<u>Quality Points</u>	<u>Graduate Courses</u>
A+	4.00	Satisfactory/Passing
A	4.00	Satisfactory/Passing
A-	3.67	Satisfactory/Passing
B+	3.33	Satisfactory/Passing
B	3.00	Satisfactory/Passing
B-	2.67	Satisfactory/Passing
C	2.00	Unsatisfactory/Passing
F	0.00	Unsatisfactory/Failing

Academic Integrity

All students will be expected to abide by the Honor Code: Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work. GMU honor code is available at <http://oai.gmu.edu/the-mason-honor-code-2/>.

University Policy

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>.

Disability Accommodations

If you have a learning disability or other condition that may affect academic performance, please:

- a) Make sure documentation is on file with Office of Disability Services (SUB I, Rm. 4205; 993-2474; <http://ods.gmu.edu>) to determine the accommodations you need; and
- b) Talk with the instructor to discuss your accommodation needs.