Trial course number should be 494.

FORMAT 1

Submit original with signatures + 1 copy + electronic copy to UAF Governance.
See http://www.uaf.edu/uafgov/faculty/cd for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Physics	**College/School**	CNSM
Prepared by	C. P. Price	**Phone**	x6106
Email Contact	cpprice@alaska.edu	**Faculty Contact**	C. P. Price

1. ACTION DESIRED (CHECK ONE): Trial Course [X] New Course [ ]

2. COURSE IDENTIFICATION: Dept [PHYS] Course # [F494 / 49X] No. of Credits [2]

Justify upper/lower division status & number of credits:	The prerequisites for this course include PHYS 421. This course will meet for twenty-eight hours.

3. PROPOSED COURSE TITLE: Statistical Physics

4. To be CROSS LISTED? YES/NO [No] If yes, Dept: [ ] Course # [ ]
(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. To be STACKED? YES/NO [No] If yes, Dept: [ ] Course # [ ]

6. FREQUENCY OF OFFERING: Spring
Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved) Spring 2013

8. COURSE FORMAT:
NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check all that apply)	[ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [X] 6 weeks to full semester
OTHER FORMAT (specify)	
Mode of delivery (specify lecture, field trips, labs, etc)	Lecture/discussion.

9. CONTACT HOURS PER WEEK: [2] LECTURE hours/weeks [0] LAB hours /week [0] PRACTICUM hours /week
Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty/cd/credits.html for more information on number of credits.

OTHER HOURS (specify type) [ ]

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College of Natural Science & Mathematics

Governance
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10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

PHYS 493 "Statistical Physics" (2 credits)
The canonical ensemble; maximizing entropy, the partition function and Helmholtz free energy, the harmonic oscillator, Einstein and Debye solids, classical systems and the ideal gas, diatomic molecules, equipartition theorem, the photon gas and the blackbody spectrum, the grand canonical ensemble, quantum statistics, Fermion and Boson systems.
Prerequisites: PHYS F213X, F220, F301, F341, F342, F393, F421; or permission of instructor. (2+0)

11. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core?	YES		NO	X

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6		W = Writing Intensive, Format 7		Natural Science, Format 8	

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	YES		NO	X

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	

How many times may the course be repeated for credit?		TIMES

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?		CREDITS

13. GRADING SYSTEM: Specify only one.

LETTER:	X	PASS/FAIL:	

RESTRICTIONS ON ENROLLMENT (If any)

14. PREREQUISITES PHYS 213; PHYS 220; PHYS 301; PHYS 341; PHYS 342; PHYS 393; PHYS 421; or permission of instructor.

These will be *required* before the student is allowed to enroll in the course.

RECOMMENDED

Classes, etc. that student is strongly encouraged to complete prior to this course.

15. SPECIAL RESTRICTIONS, CONDITIONS

16. PROPOSED COURSE FEES $

Has a memo been submitted through your dean to the Provost & VCAS for fee approval? Yes/No

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? **Yes/No** No

If yes, give semester, year, course #, etc.:

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

Physics Department is converting a 4-credit course PHYS 313 "Thermodynamics and Statistical Physics" to two 2-credit courses. There is thus no net impact on budget, facilities/space, faculty, etc.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No	X	Yes		**Library support is unchanged from previous (see above).**

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

No departmental or programmatic impacts.

21. POSITIVE AND NEGATIVE IMPACTS

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*

None.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

The material currently presented in the 4-credit course PHYS 313 "Thermodynamics and Statistical Physics" spans two increasingly distinct areas. Students need to be exposed to topics in classical thermodynamics/thermal physics before the last year of the curriculum, but are not ready to learn the topics in statistical mechanics until the last year of the curriculum. Separating the two parts of the present coursewill better prepare students towards the undergraduate degree in Physics. The curricular trend at peer and peer-aspirant institutions is to separate the two topics, as is proposed here and in the associated course proposal for PHYS 393 "Thermal Physics".

APPROVALS:

Asim Q. Chowdhury	Date	5/9/2012
Signature, Chair, Physics Department:		
	Date	5/20/2012
Signature, Chair, CNSM Curriculum Council		
	Date	5/23/12
Signature, Dean, College of Natural Sciences and Mathematics		
	Date	

Signature of Provost (if applicable)

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

Signature, Chair, UAF Faculty Senate Curriculum Review Committee

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

		Date	
Signature, Chair, Program/Department of:			
		Date	
Signature, Chair, College/School Curriculum Council for:			
		Date	
Signature, Dean, College/School of:			

Statistical Physics

PHYSICS 493 – Spring 2013

Syllabus

Instructor: TBD

Office Hours: TBD

Class meets: 9:15 - 10:15am, Wednesday and Friday

Credits: 2 credits.

Prerequisites: PHYS F213X, PHYS F220, PHYS F301, PHYS F341, PHYS 342, PHYS 393, PHYS 421; or permission of instructor.

Text: Intro. to Statistical Mechanics, by Bowley and Sanchez, Oxford, 2nd ed; ISBN 978-0198517948

Topics: The canonical ensemble; maximizing entropy, the partition function and Helmholtz free energy, the harmonic oscillator, Einstein and Debye solids, classical systems and the ideal gas, diatomic molecules, equipartition theorem, the photon gas and the blackbody spectrum, the grand canonical ensemble, quantum statistics, Fermion and Boson systems.

Grading: The course grade will be based upon the following weighting:

Participation in Recitation	10%
Homework	20%
Mid-Term Exam	30%
Final Exam	40%

Homework: There will be a homework assignment each week. The assignments are due one week after they are assigned. Thus, a homework assigned on a Wednesday is due the following Wednesday. The homework assignments will be posted on this web site as well as in the glass hallway case assigned to this class. You are encouraged to work with others on the homework but the work you turn in should be your own. Verbatim copies are easily detected and will result in both papers receiving a zero. (See the section on plagiarism below)

Quizzes: Several short quizzes will be given during classtime throughout the semester. They will be closed book and no calculators will be allowed (or needed!).

Exams: There will be one mid-term exam (Friday, 8 March 2013) and one final exam. The mid-term exam will be a one-hour, closed book exam given during regular class time. The final exam will be held according the the published UAF schedule.

Recitation: One half hour of the Friday class meeting will be used for recitation. The purpose of the recitation is to provide the students with an opportunity to explore the lectures and homeworks further. It is intended that the recitation will be in the form of a group discussion of topics introduced by the students.

Learning Outcomes: Students who complete PHYS 493 will understand the concept of the ensemble in the construction of the statistical mechanics, will appreciate the connection between the equilibrium distribution, the condition of maximum entropy, and the canonical ensemble, will understand the construction and use of the partition function, will be able to calculate the classical thermodynamics of the ideal gas from the free particle partitition function, will have been exposed to advanced topics such as the equipartition theorem, the quantum statisics, and the grand partition function, and will have seen application to the photon gas and the degenerate electron gas.

Special Needs: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accomodation to students with disabilities.

Plagiarism: Plagiarism and cheating are serious matters for students and academic institutions. The UAF Honor Code (or Student Conduct Code) defines the academic standards expected at the University of Alaska and which will be followed in this class. The Code reads, in part:

> "Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations. Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports. Not work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion."

Calendar:

Week / Lecture topics

1. The Canonical Ensemble: The partition function and internal energy
2. The Canonical Ensemble cont'd: Entropy, 1st and 2nd Laws, the Helmholtz free energy: $F = -kT\ln Z$
3. Simple Harmonic Oscillator: Partition function for oscillators, factoring the partition function
4. SHO cont'd: Einstein solid, Debye solution and phonons
5. Classical systems: Phase space and the partition function, single particle partition function
6. Classical systems cont'd: Thermodynamics of a classical (ideal) gas
7. Diatomic gases: rotational states, vibrational states, contribution of each to Cv
8. Diatomic gases cont'd: Equipartition theorem
9. Photons: Photon states and the density of states, the blackbody spectrum
10. Photon gas: thermodynamics of a photon gas
11. Grand canonical ensemble: Definitions and connection the thermodynamics, quantum statistics
12. Grand canonical ensemble cont'd: fermions; bosons; occupation numbers
13. Fermions and Bosons: Partition function, occupation number, energy distribution
14. Electron gas: High temperature, low temperature; effects of degenerate electron gases