FORMAT 1

Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).

See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ 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 [ ] New Course [X]

2. COURSE IDENTIFICATION: Dept **PHYS** Course # **451** 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 # [ ]

NOTE: Cross-listing requires approval of both departments and deans involved. Add lines at end of form for additional required signatures.

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

How will the two course levels differ from each other? How will each be taught at the appropriate level?:

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online – see URL at top of this page.

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 (AY2013-14 if approved by 3/1/2013; otherwise AY2014-15) **AY2014-15**

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)						

9. CONTACT HOURS PER WEEK: **2** LECTURE hours/weeks [ ] LAB hours /week [ ] 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-senate/curriculum/course-degree-procedures-/guidelines-for-computing-/ for more information on number of credits.

OTHER HOURS (specify type) [ ]

RECEIVED
SEP 12 2013
Dean's Office
College of Natural Science & Mathematics

Governance 9/24/13 TVP

10. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):

Example of a complete description:

FISH F487 W, O Fisheries Management
3 Credits Offered Spring
Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. *Prerequisites: COMM F131X or COMM F141X; ENGL F111X; ENGL F211X or ENGL F213X; ENGL F414; FISH F425; or permission of instructor.* Cross-listed with NRM F487. (3+0)

PHYS 451 "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. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core? **If YES, attach form.**	**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**		X = Baccalaureate Core	

11.A Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.

YES		NO	X

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 for credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**
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. Note: Changing the grading system for a course later on constitutes a Major Course Change – Format 2 form.

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.

15. SPECIAL RESTRICTIONS, CONDITIONS	

16. PROPOSED COURSE FEES	$
Has a memo been submitted through your dean to the Provost for fee approval? **Yes/No**	

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? **Yes/No**	**Yes**
If yes, give semester, year, course #, etc.:	Spring 2013 (and to be re-offered Spring 2014.)

18. ESTIMATED IMPACT

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

Physics Department has offered this course once already as a Trial Course, and will be offering it again this academic year. It is part of the program offerings, and 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.*

If this course is not offered, students will not complete the outcomes goals for the undergraduate program.

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.

This action will convert a successfully offered Trial Course to permanent status.

This course, and the companion course PHYS 351 "Thermal Physics", present topics in classical thermodynamics/thermal physics and in statistical mechanics in a sequence that provides better support for those topics. 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 351 "Thermal Physics". Absent these courses, students will not be able to achieve all of the outcomes goals for the BS Physics program.

APPROVALS: Add additional signature lines as needed.

	Date	12 SEP 2013
Signature, Chair, Program/Department of:		

	Date	9-23-13
Signature, Chair, College/School Curriculum Council for:	CNSM	

	Date	9-24-2013
Signature, Dean, College/School of:		

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

	Date	
Signature of Provost (if above level of approved programs)		

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

	Date	

Signature, Chair
Faculty Senate Review Committee: ___Curriculum Review ___GAAC

___Core Review ___SADAC

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:

ATTACH COMPLETE SYLLABUS (as part of this application). This list is online at:
http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:
☐ Title, ☐ number, ☐ credits, ☐ prerequisites, ☐ location, ☐ meeting time
(make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:
☐ Name, ☐ office location, ☐ office hours, ☐ telephone, ☐ email address.

3. Course readings/materials:
☐ Course textbook title, ☐ author, ☐ edition/publisher.
☐ Supplementary readings (indicate whether ☐ required or ☐ recommended) and
☐ any supplies required.

4. Course description:
☐ Content of the course and how it fits into the broader curriculum;
☐ Expected proficiencies required to undertake the course, if applicable.
☐ Inclusion of catalog description is *strongly* recommended, and
☐ Description in syllabus must be consistent with catalog course description.

5. ☐ Course Goals (general), and (see #6)

6. ☐ Student Learning Outcomes (more specific)

7. Instructional methods:
☐ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:
☐ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:
☐ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:
☐ Specify how students will be evaluated, ☐ what factors will be included, ☐ their relative value, and ☐ how they will be tabulated into grades (on a curve, absolute scores, etc.) ☐ Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":
http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf

11. Support Services:
☐ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services: Note that the phone# and location have been **updated.** http://www.uaf.edu/disability/ The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.
☐ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655)to provide reasonable accommodation to students with disabilities.

Statistical Physics

PHYSICS 451 – Spring 2015

Syllabus

Instructor: TBD (name, office, telephone, email address)

Office Hours: TBD

Class meets: TBD (times [equalling two hours per week], days of week, location)

Credits: 2 credits.

Prerequisites: PHYS F213X, PHYS F220, PHYS F301, PHYS F341, PHYS F342, PHYS F351, PHYS F421; 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 (from the catalog description.) This course covers the second half of the topics of statistical mechanics, and is required for the BS Physics program.

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. Make-up exams are considered only in the event of documented inability to take the examination with the rest of the class.

Recitation: This is primarily a lecture course, but one half hour of the second class meeting of each week 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.

Preparation for the course: completion of PHYS 351 (a prerequisite) should prepare the student to understand the details of thermodynamics; completion of PHYS 421 should prepare the student to understand the basis for quantum statistics.

Learning Outcomes: Students who complete PHYS 451 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.

Support Services: As this course is intended for upper division Physics majors, support services for the students in the course are provided during the instructor's office hours.

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. Review of Classical Thermodynamics
2. Review of Probability and Statistics
3. Introduction to Statistical Mechanics
4. The Canonical Ensemble, I (Stirling's approximation)
5. The Canonical Ensemble, II (partition function; free energy)
6. Application: Rotational/Vibrational Energies of Molecules
7. Phase space, density of states
8. Planck's distribution, photon gas
9. Fermions and Bosons: the impact of QM
10. Fermi statistics; the Fermi gas
11. Electrons in metals; degenerate Fermi gases in astrophysics
12. Bose statistics; the Boson gas
13. Phase transitions
14. Applied topics: superconductivity, superfluidity, Bose-Einstein condensates