MEMORANDUM

TO: Dr. Stephen Halperin  
   Dean, College of Computer, Mathematical and Physical Sciences

FROM: Victor Korenman  
   Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Convert the Existing Citation in Physics to a Minor in Physics  
   (PCC Log No. 04026)

   At its meeting on November 12, 2004, the Senate Committee on Programs, Curricula, and Courses approved your proposal to convert the existing Citation in Physics to a Minor in Physics. A copy of the approved proposal is enclosed.

   This approval is effective immediately. No student may be allowed to begin the discontinued Citation program after this time, but students who have already taken or who are taking a course towards the Citation must be permitted to complete it if they so choose. All advisers should be notified and the College should ensure that the approved guidelines are followed.

VK: sfm  
Enclosure  

Cc: Dr. Sylvester J. Gates, Chair, Senate PCC  
    Dr. Mary Giles, University Senate  
    Ms. Barbara Hope, Data Administration  
    Dr. Phyllis Peres, Undergraduate Studies  
    Ms. Anne Turkos, Archives  
    Dr. Scott Wolpert, College of Computer, Mathematical and Physical Sciences  
    Dr. Linda Yokoi, Records & Registrations
THE UNIVERSITY OF MARYLAND, COLLEGE PARK  
PROGRAM/CURRICULUM PROPOSAL

DIRECTIONS: Provide one form with original approval signatures in lines 1 - 4 for each proposed action. Keep this form to one-page in length. Forms and appropriate attachments should be submitted to the Office of Academic Affairs, who will assign a Log Number to each proposal. Also submit an electronic version of as much of the proposal as is possible.

DATE SUBMITTED_ April 21, 2004  
PCC LOG NO. 04026

COLLEGE/SCHOOL_ CMPS_ 
DEPARTMENT/PROGRAM_ Physics

PROPOSED ACTION (A separate form for each) ADD_____ DELETE_____ CHANGE_____ X____

DESCRIPTION (Provide a succinct account of the proposed action. Details should be provided in an attachment. Provide old and new sample programs for curriculum changes.)
We are proposing to convert the existing Physics Citation to a Physics Minor.

JUSTIFICATION/REASONS/RESOURCES (Briefly explain the reason for the proposed action. Identify the source of new resources that may be required. Details should be provided in an attachment.) No additional resources are required. The change is being requested because Citations are being eliminated by the campus in the next year, and they are being replaced by Minor's. The conversion process is relatively straightforward, and hence we have only had to make minor changes to the Citation to create the Minor. The existing Citation would be eliminated.

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APPROVAL SIGNATURES

1. Department Committee Chair ____________________________ ____________________________ 21 April 2004
2. Department Chair ____________________________ ____________________________ 4/21/2004
3. College/School PCC Chair ____________________________ ____________________________ 11/5/2004
4. Dean ____________________________ ____________________________ 11.5.04
5. Dean of the Graduate School (if required) ____________________________ ____________________________ 
6. Chair, Senate PCC ____________________________ ____________________________ 11/12/2004
7. Chair of Senate ____________________________ ____________________________ 
8. Vice President for Academic Affairs & Provost ____________________________ ____________________________ 11/12/2004

VPAAP Rev. 3/1/04
(1) Proposal for a Minor in Physics

1. This is a proposal to convert the existing Citation in Physics into a Minor in Physics. The transcript will designate the minor as “Physics”.

2. Catalog Description

This minor provides a rigorous foundation in physics for students who choose not to complete the entire physics major. The minor begins with a set of two introductory courses (6 credits) in electromagnetic fields (PHYS 262 or PHYS 272) and waves (PHYS 263 or PHYS 273). As part of this introduction to Physics, the minor also requires a one-credit introductory physics laboratory (PHYS 174, PHYS 261, or PHYS 271) involving techniques of data gathering and analysis. To obtain a deeper understanding of physics, the minor requires three additional upper-level courses (3-4 credits each), which students can select from: intermediate theoretical methods (PHYS 374), optics lab (PHYS 375), quantum physics (PHYS 401, 402), statistical mechanics (PHYS 404), classical mechanics (PHYS 410), electricity and magnetism (PHYS 411), modern optics (PHYS 465), and computational physics (PHYS 474). Other upper level Physics courses can be substituted only with approval from the Department's undergraduate director and the Faculty Minor Advisor. All courses must be completed with a grade of C or better to be counted towards the minor. No more than 7 credits in this minor can count toward major requirements. Students with more than 7 credits of overlap must substitute non-overlapping 300 or 400 level courses from the above list to reduce the overlap to no more than 7 credits. Students interested in taking this minor program should contact the undergraduate office in the Department of Physics for advising. Physics majors and students majoring in Astronomy are not eligible to complete the Physics Minor due to the large number of overlapping course requirements.

Courses required for the minor are: (7 Credits):
- PHYS 174: "Physics Laboratory Introduction (1)", or PHYS 261: "General Physics: Vibrations, Waves, Heat, Electricity and Magnetism: Laboratory (1)" , or PHYS 271: "General Physics: Electrodynamics, Light, Relativity and Modern Physics: Laboratory (1)"
- PHYS 272: "Introductory Physics: Fields (3)", or PHYS 260: "General Physics: Vibrations, Waves, Heat, Electricity and Magnetism (3)"
- PHYS 273: "Introductory Physics: Waves (3)" or PHYS 270: "General Physics: Electrodynamics, Light, Relativity and Modern Physics (3)".

In addition, the student must choose three from the following: (9-12 Credits)
- PHYS 374: Intermediate Theoretical Methods (4)
- PHYS 375: Experimental Physics III: Electromagnetic Waves, Optics and Modern Physics (3)
- PHYS 401: Quantum Physics I (4)
- PHYS 402: Quantum Physics II (4)
- PHYS 404: Introductory Statistical Thermodynamics (3)
- PHYS 410: Classical Mechanics (4)
- PHYS 411: Intermediate Electricity and Magnetism (4)
- PHYS 465: Modern Optics (3)
- PHYS 474: Computational Physics (3)
3. Oversight and Record Keeping

The Faculty Advisor for the Minor is Professor Theodore Jacobson. Oversight of the minor program will be through the normal academic processes of the Department of Physics. The Department’s Undergraduate Director will be responsible for ensuring that students are properly advised and that records are appropriately kept.

4. Prerequisites

MATH 140 (4 credits), MATH 141 (4 credits), MATH 241 (4 credits), MATH 240 (4 credits), MATH 246 (3 credits), and Physics 161 (or Physics 171) (3 credits) are prerequisites for some of the courses in this program. However, none of these courses has been included in the requirements for the minor because they are very likely already included in the major requirements for students who will be interested in this minor (mainly students from the College of Engineering). The inclusion of these courses into the minor would create a large number of overlapping credits, as well as confusion, because our target students would not be able to apply them to the minor because of overlap restrictions.

5. Additional Comments

Note 1: Students majoring in Astronomy are not eligible to complete the Physics Minor due to the large number of overlapping course requirements.

Note 2: We are requesting that students pursuing the minor in Physics be allowed a maximum of 7 credits of overlap with their major requirements. This is one more credit than the 6 permitted in the guidelines for the creation of a minor. There are two reasons for requesting this exception. First, it is the same overlap that is now in place in the Physics Citation. Second, we expect the extra credit would be used by students to get credit for Physics 261 or for Physics 271. These are both 1-credit labs that are required co-requisites for Physics 260 or 270. Thus our target students will end up taking these courses whether or not we require them for the minor. An alternative (to allowing 7 credits of overlap) would be to not include them at all in the requirements (thus leaving us with 6 credits of overlap and a total of 15-18 credits total which is still within guidelines). However, this would create hidden co-requisites to add to the above list of hidden prerequisites. This also would leave the minor with no required experimental component and could lead to the impression that understanding experiment is less important than the theory covered in lecture. We feel that 1-credit exception to the 6-credit overlap rule is justified given that this is the minimum exception, that there are a substantial number of hidden prerequisites (about 22 credits total), that we are above the minimum number of required credits and that we want to retain a required experimental component to the minor.

Note 3: The main students that this Minor is targeted at are in Engineering. In addition, based on the popularity of the Math-Physics double major, we expect to get a significant number of Math majors in the Physics minor.
(2) The Existing Citation in Physics

(a) Existing Description of Citation in Physics
The Physics Citation provides a rigorous foundation in physics for students who choose not to complete the entire physics major. The citation begins with a set of three introductory courses (9 credits) in mechanics and relativity (PHYS 161 or PHYS 171), electromagnetic fields (PHYS 262 or PHYS 272), and waves (PHYS 263 or PHYS 273). As part of this introduction to physics, the citation also requires an introductory laboratory (PHYS 174, PHYS 261, or PHYS 271) involving techniques of data gathering and analysis. To obtain a deeper understanding of physics, the citation requires two additional upper-level courses (3-4 credits each), which students can select from: intermediate theoretical methods (PHYS 374), optics lab (PHYS 375), quantum physics (PHYS 401, 402), statistical mechanics (PHYS 404), classical mechanics (PHYS 410), electricity and magnetism (PHYS 411), modern optics (PHYS 465), computational physics (PHYS 474), or other upper level Physics courses with approval from the Department's undergraduate director and faculty Citation advisor.

(b) Required Courses for Existing Citation in Physics

The following: (10 Credits)

- PHYS 171: "Introductory Physics: Mechanics and Relativity (3)", or PHYS 161: "General Physics: Mechanics and Particle Dynamics (3)"
- PHYS 174: "Physics Laboratory Introduction (1)", or PHYS 261: "General Physics: Vibrations, Waves, Heat, Electricity and Magnetism: Laboratory (1)", or PHYS 271: "General Physics: Electrodynamics, Light, Relativity and Modern Physics: Laboratory (1)"
- PHYS 272: "Introductory Physics: Fields (3)", or PHYS 260: "General Physics: Vibrations, Waves, Heat, Electricity and Magnetism (3)"
- PHYS 273: "Introductory Physics: Waves (3)" or PHYS 270: "General Physics: Electrodynamics., Light, Relativity and Modern Physics (3)"

Two of the following: (6-8 Credits)

- PHYS 374: Intermediate Theoretical Methods (4)
- PHYS 375: Experimental Physics III: Electromagnetic Waves, Optics and Modern Physics (3)
- PHYS 401: Quantum Physics I (4)
- PHYS 402: Quantum Physics II (4)
- PHYS 404: Introductory Statistical Thermodynamics (3)
- PHYS 410: Classical Mechanics (4)
- PHYS 411: Intermediate Electricity and Magnetism (4)
- PHYS 465: Modern Optics (3)
- PHYS 474: Computational Physics (3)

Students may use other 300 and 400 level Physics courses with approval from the citation’s faculty advisor and the Department's undergraduate director. All courses must be completed with a grade of C or better. Note that no more than 7 credits in this Citation can count toward major requirements. With approval from the Citation Faculty Advisor, students with more than 7 credits of overlap must substitute a non-overlapping 300 or 400 level course from the above list to reduce the overlap to no more than 7 credits.
(c) Faculty Advisor on Existing Citation in Physics: Professor Theodore Jacobson

(d) Added Program Notes on Existing Citation in Physics:

NOTE 1: This Citation is open to all majors, with the exception of Physics majors and Astronomy majors. Physics majors are not eligible for the Citation since College guidelines forbid students from obtaining a Citation in a program they are majoring in. Astronomy majors will not be eligible for this Citation since the Citation requirements will overlap significantly with Astronomy major requirements. Astronomy majors desiring to complete more physics courses than required by their department are encouraged to consider a double major in Astronomy and Physics.

NOTE 2: We note that Math majors have the option of completing the three-semester sequence PHYS 171-272-273 to complete a supporting area for that major. This potential overlap between the Math major requirements and the Physics Citation requirements should not exclude Math majors from obtaining this Citation for the following reasons:

1) We would like to encourage Math majors to take more physics,
2) We note that this Physics Citation requires substantially more than the minimum of 12 credits required by the University in its guidelines for a citation.
3) The potential overlap occurs only with a possible supporting sequence rather than a central part of the Math major.
4) Finally, to meet the restriction that no more than 7 credits can overlap with major requirements, Math majors would need to choose an additional upper level Physics course approved by the Citation Faculty Advisor. Math majors who choose to use the PHYS 171-272-273 sequence to complete a supporting sequence for their major could only use two of the courses for the Citation (all three would be 9 credits, which is two credits too many of overlap). With two courses in overlap, this would give them 6 credits of overlap and they would need to choose an additional upper level course to fulfill the Citation. Including this additional upper level course, and the remaining Citation requirements, they would still need to complete 10 to 12 credits to earn the Physics citation.

An entirely similar situation will occur with some engineering majors, who complete the three-semester sequence PHYS 171-272-273 or PHYS 161-262-263 as part of their major.

NOTE 3: This version of the Citation allows students to choose to take the sequence PHYS 161, 262, 263 or the sequence PHYS 171, 272, 273. This change was made based on comments received from faculty at the faculty retreat, with the aim being to encourage engineers (who are exposed to the 161 sequence) to pursue the Citation.

NOTE 4: CMPS guidelines set a maximum number of credits (18) that can be required in a Citation and the maximum number of credits that can overlap. We are requesting 7 credits of potential overlap, which is one more than the guidelines. We request this because this would let engineers get credit for 161, 262, and 262a, for example. Note though that engineers taking the 161, 262, 263 sequence as part of their major would not be able to use all three courses for the Citation (too much overlap) and so would need to substitute one upper level physics course.
NOTE 5: Finally, the role of the lab course PHYS 174 (or PHYS 262a/263a) has come up in a number of different contexts. The main justification for including a lab was that students should be encouraged to try the lab sequence, since they would need the labs if they switched their major to Physics.