FAIRMONT STATE UNIVERSITY™

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Approved by Curriculum Committee January 25, 2022

MEMORANDUM

TO: Faculty Senate

FROM: Susan Ross

DATE: 3/18/2022

SUBJECT: Curriculum Proposal # 21-22-26

The Physics Program proposes to add a second new 4-credit general physics course, PHYS 1002 General Physics II. This course will be the second of the new two-course General Physics I/II series for any program which accepts high school physics or basic algebra-based physics course as a program prerequisite. A one-credit lab with experiments involving data collection, analysis and report-writing will supplement the three hours of classroom lecture. Physics 1001 will be the prerequisite course for Physics 1002. Course content will follow the same content outline as PHYS 1102, but at a less rigorous level and with lower math requirements. Specifically, there is no Trigonometry prerequisite.

cc: Dianna Phillips
Lori Schoonmaker
Stephanie Gabor
Laura Ransom
Galen Hansen

CURRICULUM PROPOSAL (Submit one hard copy and an electronic copy to the Associate Provost by the second Tuesday of the month.)

Proposal Number:	#21-22-26
School/Department/Program:	College of Science and Technology/Natural Sciences Department/Physics Program
Preparer/Contact Person:	Galen Hansen
Telephone Extension:	X4716
Date Originally Submitted:	November 1, 2020
Revision (Indicate date and label it Revision #1, #2, etc.):	
Implementation Date Requested:	Spring 2022

I. **PROPOSAL**. Write a brief abstract, not exceeding 100 words, which describes the overall content of the proposal.

The Physics Program proposes to add a second new 4-credit general physics course, PHYS 1002 General Physics II. This course will be the second of the new two-course General Physics I/II series for any program which accepts high school physics or basic algebra-based physics course as a program prerequisite. A one-credit lab with experiments involving data collection, analysis and report-writing will supplement the three hours of classroom lecture. Physics 1001 will be the prerequisite course for Physics 1002. Course content will follow the same content outline as PHYS 1102, but at a less rigorous level and with lower math requirements. Specifically, there is no Trigonometry prerequisite.

A. Provision for interchangeable use of course(s) with program(s)

Engineering Technology, Health Science, Education and other programs requiring a physics prerequisite may consider substituting this course for Physics 1102.

B. Revision of course content. Include, as an appendix, a revised course description, written in complete sentences, suitable for use in the university catalog.

N/A

C. Other changes to existing courses such as changes to title, course number, and elective or required status.

N/A

D. Creation of new course(s). For each new course

1. Designate the course number, title, units of credit, prerequisites (if any), ownership (FSU or shared) and specify its status as an elective or required course. If you are creating a shared course, attach a memo from the Deans of the affected Schools explaining the rationale for the course being shared.

Course Number	Title	Credit	Prerequisites	Ownership	Status
PHYS 1002	General Physics 2	4	Physics 1001	FSU	Elective

2. Include, as an appendix, a course description, written in complete sentences, suitable for use in the college catalog.

   Please see Appendix A

3. Include, as an appendix, a detailed course outline consisting of at least two levels.

   Please see Appendix B

4. In order to meet the requirements as outlined in Goal One of the Strategic Plan, please include Outcome Competencies and Methods of Assessment as an appendix. Examples are available upon request from the Chair of the Curriculum Committee.

   Please see Appendix C

E. Attach an itemized summary of the present program(s) affected, if any, and of the proposed change(s).

Presently no programs are affected. However, in the future some programs may choose to use this course to meet prerequisite requirements rather than Physics 1102.

Describe how this proposal affects the hours needed to complete this program. Specifically, what is the net gain or loss in hours? Use the format for Current and Proposed Programs in Appendix A.

N/A

II. **RATIONALE FOR THE PROPOSAL**.

A. **Quantitative Assessment**: PHYS 1002 General Physics II is the second semester follow-up course to PHYS 1001 General Physics I which was approved in April, 2021.

There have been many requests over the years for a set of physics courses with algebra and trigonometry requirements and physics outcomes which are lower than Physics 1101 and 1102, for programs that require physics as a prerequisite but without the specifications of the higher trig-based math level required for Physics 1101-2. The need for this course is also evidenced by the number of students (over 40 per year for the past several years) taking general physics courses (non-trig core-curriculum level) designed for the curriculum of programs such as 7-9 grade education and various health services and life-science programs, which are being transferred into FSU programs erroneously as trig-based prerequisite physics courses Physics 1101-2. This error has been enabled because Physics 1101 has also been approved as meeting core-curriculum credit requirements and has been listed on the WV State Core-Curriculum transfer agreement. Physics 1001 and 1002 will now accept the transferred credit for these lower algebra-based courses. Programs wishing to accept lower level algebra-based physics courses to meet their perquisite physics requirements can do so by officially approving PHYS 1001 and PHYS 1002 and such transferred courses in place of Physics 1101-1102.

B. **Qualitative Assessment**: To attract students, the course content coverage will be about the same as Physics 1102, but with student learning outcomes set at a skill level about 50% of the quantitative capabilities and qualitative understanding of the present Physics 1102. Content assessment will involve about 30% multiple-choice qualitative questions that involve primarily memorization, about 20% multiple-choice questions that require some quantitative calculation, about 20% short-answer explanations, and about 30 % simple 1-variable mathematical problem solving. Physics labs will be similar to Physics 1102, with comparable levels of hand-on data acquisition and computer analysis, but with lower expectations in

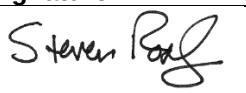
mathematical analysis skill and content understanding. Homework will also be set with a lower level of mathematics and critical thinking skills required.

This course, along with Physics 1001 provide a home for core-curriculum and algebra-based physics credit transferred from other institutions within and outside of West Virginia, such as on-line physics courses, that do not meet higher program prerequisite requirements.

C. New materials needed to teach the lab are estimated to be about $200 per semester, which fits within the annual physics program budget. The same texted used for Physics 1101 will be used, but with a lower level of competency expected. A copy of the course textbook already exists in the library.

III. Should this proposal affect any course or program in another school, a memo must be sent to the Dean of each school impacted and a copy of the memo(s) must be included with this proposal. In addition, the Deans of the affected schools must sign below to indicate their notification of this proposal.

By signing here, you are indicating your college's/school's notification of this proposal.

College/School	Dean	Signature
Science and Technology	**Steven Roof**	

IV. Should this proposal affect any course to be added or deleted from the general studies requirements, a memo from the chair of the General Studies Committee indicating approval of the change must be included with this proposal.

V. ADDITIONAL COMMENTS.

The General Studies Committee has approved this course.

APPENDIX A – PHYS 1002 General Physics II
Course Description

This course introduces students with a minimal algebra and trigonometry-based math and science background to general principles of electricity and magnetism, light and aspects of modern physics. A three-hour laboratory period each week supplements the three lecture-recitation hours. Prerequisites: PHYS 1001

APPENDIX B

PHYS 1002 Course Outline

1. Static Electricity a. Electric charge and force b. Electric fields c. Electric energy d. Capacitance 2. Electric Current a. Current and resistance b. Direct current circuits c. Kirchhoff's Rules 3. Magnetism a. Magnetic fields b. Magnetic force c. Sources of magnetic fields 4. Magnetic Induction a. Faraday's law b. Lenz's law c. Generation of electrical current d. Alternating currents 5. Nature of light a. Electromagnetic waves and spectrum b. Intensity c. Interactions with matter	6. Geometric Optics a. Reflection b. Refraction c. Lenses 7. Interference and Diffraction a. Double-slit interference b. Single-slit diffraction c. Diffraction gratings 8. Atomic Physics a. The atom b. Electron energy levels c. Light emission d. Molecules and solids 9. Nuclear Physics a. Atomic nucleus b. Binding Energy c. Radioactivity 10. Particle Physics a. Fundamental forces b. Particles and antiparticles c. Conservation laws d. Fundamental particles

APPENDIX C
PHYS 1002 General Physics II Course Competencies and Assessments

Physics Outcome 1. Students will develop and demonstrate a qualitative understanding of electric forces and fields and magnetic forces and fields form both Newton's Laws and Energy perspectives, the nature of light and its various interactions with matter, and the properties of fundamental atomic particles.

Physics Outcome 2. Students will develop and demonstrate increased analytical reasoning and quantitative problem solving skills that allow conceptual and mathematical analysis of electrical and atomic systems, including aspects of electrical currents, magnetism and light, using vector notation, one-variable and two-variable algebra and geometry. Students should be able to analyze systems experiencing interactions in one and two dimensions. This includes carefully reading the problem, converting the problem statement to an appropriate representation including pictures/graphs and the appropriate mathematical variables and relationships, and answering specified questions using proper logical and mathematical procedures.

Physics Outcome 3. Students will develop and demonstrate increased proficiency in collecting and recording observations, both verbally and as numerical data using laboratory equipment, and in quantitatively analyzing data to demonstrate physical principles, extract physical parameters, test and refine models (theories) using hypotheses, and answer pertinent questions. The students should also develop and demonstrate an increase in understanding and proficiency in assessing the role of error and uncertainty in experimentation and scientific reasoning and problem-solving.

Assessments: Content, scientific modeling and utilization capabilities - written exams and quizzes.
Observation, data collection and analysis, and scientific modelling – laboratory activities and reports