APC CURRICULUM CHANGE PROPOSAL
CURRICULAR PROPOSAL FALL 2010
DEPARTMENT OF PHYSICS AND ENGINEERING/COLLEGE OF ARTS AND SCIENCES
CHANGES TO THE ENGINEERING PHYSICS PROGRAM

I. PROPOSAL LIST:

Proposal I: Add EGR 265 Mechanics of Materials, 3 units

Proposal II: Add EGR 225 Electronic Circuits Analysis, 3 units

Proposal III: Drop two courses from our curriculum, EGR 130/140 Engineering Drawing I/II, - 2 units

Proposal IV: Adjust degree requirements for the Engineering Physics program to accommodate the new courses, Mechanics of Materials and Electronic Circuits Analysis. This includes splitting the major into two emphases, Mechanics, and Electrodynamics.

Proposal V: Addition of a new course PHY 475 Senior Laboratory and Student Project, 2 units

II. RATIONALE FOR PROPOSALS:

Preliminary information for rationale:

Over the last couple of years the department of Physics and Engineering has completed curriculum studies of other programs, alumni surveys, and long discussions about our vision for the future of our engineering program. Also, to further support our slow progress in these areas, we have offered the two new courses in proposal I and II as experimental courses over the last two years and our students have shown strong interest even while not being required to complete these courses for our major. This has also allowed us to assess the value of these courses and this material for our student's professional interests. The department has attempted to complete a program review for the last three years and to further address these curriculum issues. This effort has been held up by the tumultuous, albeit understandable, time PLNU has experienced in our administrative units for the last few years. In the hopes of preventing any further delays in offering these advances in our engineering curriculum, for our students, we've decided to move forward with these proposals this year.

One further consideration in this proposal is the current study in the department of the possibility of acquiring ABET accreditation for our program in engineering physics, American Bureau of Engineering and Technology. This agency conducts accreditation of engineering and technology curriculum in institutions across the United States. After completing these changes our department will begin serious consideration of acquiring ABET accreditation for our program.

Finally I need to point out the interdependency of these changes to each other. The inclusion of the two new courses in our curriculum requires dropping the engineering drawing courses; otherwise we would acquire new staff load that would make these changes almost impossible. Also, the changes in the degree requirements are necessary to avoid increasing the requirements for the degree. The current proposed changes to the degree requirements actually reduce the requirements for the engineering program slightly closer to the requirements for the physics program, thus balancing out our program requirements across our department.

Proposal I: Add EGR 265 Mechanics of Materials (3)

We propose the addition of a new course in the Engineering Physics curriculum on the Mechanics of Materials. This will be a sophomore level course. We propose EGR 265 Mechanics of Materials, Units 3. This will serve as an entry level course for our students interested in careers in civil and mechanical

engineering. We will offer this course every other year opposite the new course in Proposal II.

This course represents basic entry level skills in engineering professions requiring applied mechanics to the design of structures, buildings, machines and vehicles. These are skills required for completing upper division courses in the mechanical and civil engineering fields. After graduation, many of our students move into careers in these areas and many complete graduate work in these areas. Our students need this course to allow them to easily move into these programs or start careers in these areas.

Proposal II: Add EGR 225 Electronic Circuits Analysis (3)

We propose the addition of a new course in the Engineering Physics curriculum on the Analysis of Electronic Circuits. This will be a sophomore level course but will often be taken at the junior level at PLNU. We propose EGR 225 Electronic Circuits Analysis, Units 3. This will serve as an entry level course for our students interested in careers in electrical and electronics Engineering, systems engineering and other areas. We will offer this course every other year opposite the new course in Proposal I.

This course represents basic entry level skills in engineering professions requiring electronic circuit analysis skill in the design of electronic devices, electrical equipment, engineering systems, and the integration of complex engineering systems as used in the aerospace engineering field. These are skills required for completing upper division courses in the electrical or computer engineering fields. After graduation, many of our students move into careers in these areas and many complete graduate work in these areas. Our students need this course to allow them to easily move into these programs or start careers in these areas.

Proposal III: Drop EGR 130/140 Engineering Drawing I/II (1) (1)

We propose dropping two courses currently in our curriculum EGR 130 Engineering Drawing I, Units 1, and EGR 140 Engineering Drawing II, Units 1. These courses have been historically offered every year in our department. The material covered in these courses is useful for engineering majors. In many engineering programs we've studied this material is integrating into other courses. The material consists mainly of competency in the operation of Cad Cam programs and in reading engineering drawings and we feel this material can be integrated into other courses. There are other courses that offer far more important skills sets for our students to acquire during their studies at PLNU. Two of the most important skill sets are represented in the two new courses we are proposing above. Students in our program will still be able to acquire skills in engineering drawings in our other courses as well. With limited capacity for courses, faculty in our department feels it's far more important we offer the two courses proposed above than courses in engineering drawing. Therefore we want to drop these courses to make room in our offerings for the new courses.

Proposal IV: Adjust degree requirements for the Engineering Physics program to accommodate the new courses, Mechanics of Materials and Electronic Circuits Analysis. This includes splitting the major into two emphases, Mechanics, and Electrodynamics.

We propose the following changes to our program in Engineering Physics (B.S.) and these changes to be described in the catalog.

- Drop EGR 130 Engineering Drawing I, 1 unit, and EGR 140 Engineering Drawing II, 1 unit, from requirements for this major.
- Require students take one of either PHY 311 Nuclear Physics, 3 units, or PHY 443 Solid State Physics, 3 units, but not both
- For the emphasis in Mechanics require students to complete the following courses
    1. EGR 215 Engineering Mechanics, 3 units
    2. EGR 225 Electronic Circuits Analysis, 3 units

3. EGR 265 Mechanics of Materials, 4 units

- For the emphasis in Electromagnetics require students to complete the following courses
    1. EGR 352 Analog Electronics, 2 units
    2. EGR 422 Digital Electronics, 2 units
    3. EGR 432 Computer Interfacing, 2 units
    4. EGR 442 Mobile Robotics, 2 units
    5. PHY 362 Electricity and Magnetism II, 3 units
    6. EGR225 Electronic Circuits Analysis
- Drop the statement in the catalog under the Core Curriculum stating **Engineering Physics students may substitute Engineering 215 for Physics 341*. All students will be required to complete EGR 341 Analytical Mechanics.

Proposal V: Add PHY475 Senior Laboratory and Student Project (2)

We propose to include a new course in our curriculum that will be required of all our students to complete any of our majors. This course will accomplish two goals, first it will give our students a greater laboratory experience on the advanced level, and second it will function as a capstone course for our majors where students will gain knowledge and experience about how professionals in physics and engineering work and accomplish tasks and how to start careers in these fields.

Rationale: A significant number of respondents from a recent alumni study indicated that their ability to write effectively and orally communicate in the discipline was not enhanced through the current departmental courses. We believe this course would make significant strides in improving this. Additionally, because our current upper division courses are offered every other year, we do not have any courses which can provide a capstone experience. Drawing on, combining, and synthesizing from courses throughout the curriculum will provide a much richer learning environment for the student.

III. SYLLABI FOR NEW COURSES:

Syllabus
EGR 225 – ELECTRONIC CIRCUITS ANALYSIS
Fall 2010

INSTRUCTOR: Kendall Mallory OFFICE: Rohr Science 209

EMAIL: kmallory@pointloma.edu PHONE: (619) 849-2356

OFFICE HOURS: Mon. and Wed. 3:20 to 4:20
Tues. and Thurs. 1:30 to 2:30

SOFTWARE REQUIRED: (First computer program is required and then either one of the second or third computer programs.)

- **OrCad 16.3 Demo Version**, from **Cadence** - This software is free in the Demo Version. It's a well developed GUI (graphical user interface) that rides on top of a long standing standard scripting language for use by electrical engineers to simulate and analyze circuits and systems called **PSpice**. The GUI automates the process of schematic capture (creating the model of your circuit) and then invoking solving engines to analyze circuit performance

- **MATLAB student version**, from the **MathSoft** Company. This cost somewhere around $100 but the license lasts for four years. This software is a highly developed standard for automating mathematical analysis of all kinds and is especially good at numerical methods. It runs by writing MATLAB scripts called M files but with a modern user interface and has broad capabilities.

- **FreeMat**, an open source version of MATLAB. I know little about this program as I just discovered it. I understand it's a good and, principally, it's ***free***.

OBJECTIVES OF THIS COURSE:

This course will develop the electrical and electronics circuits analysis skills required for a student to develop a career in electrical engineering. The student will also develop the analytical skills necessary for further studies in electronics, electrical equipment, electrical automaton and controls, communications, instrumentation and many other fields of engineering. This will include the following subjects.

- Function and theory of basic electrical components and their interactions
- Electrical currents and measurements
- Nodal and mesh analysis and other circuit analysis techniques
- DC and AD circuits
- Spectral response in RL, RC, and RLC circuits
- Sinusoidal steady state analysis
- Power and energy in AC and polyphase circuits
- Transformers and magnetic coupling
- Laplace Transform techniques and complex frequency
- Frequency response and transient response of circuits
- Two port networks
- Fourier transform techniques
- State Space Analysis techniques

EXPECTATIONS OF STUDENTS:

- Attendance in class is mandatory, (resistance in futile). Keeping up in this class will be difficult if you don't attend regularly.
- Homework must all be completed. This course is skills based and a student needs to gain the ability to accurately analyze electrical circuits. Just memorizing information will not develop problem solving skills in the student. These skills can only be developed through practice.
- Students will demonstrate creativity and advance capability in problem solving skills.
- Students will master all the standard techniques of circuits analysis used by engineers.
- Students will acquired understands of the function and behavior of electrical currents, circuits and Devices.
- All exams and quizzes must be completed. Any missed exams will receive zero credit. If there are unforeseen circumstances leading to a student missing an exam, quiz, or being late on a homework assignment you must discuss your options with the instructor. (Remember resistance is futile.)

LEARNING OUTCOMES FOR THIS COURSE:

- Students will demonstrate their knowledge of the theory governing basic electronic circuit elements, the use of differential equations to model these elements, and the theory behind basic circuit analysis techniques including Kirchoff's laws and loop/nodal analysis, by their performance on course exams.
- Students will demonstrate strong problems solving skills in electronic circuit analysis through their performance on exams and completion of homework assignments.
- Students will demonstrate their use of more advanced techniques of circuit analysis including transient and steady states analysis, complex impedance techniques, and complex frequency techniques including Laplace transforms, by their performance on exams and completion of homework assignments.

ASSIGNMENTS:

A class calendar will also be distributed with this syllabus. The calendar has all assignments and due dates listed.

The homework assignments are given with the on-line homework system, Aris System, which can be found at:

www.mhhe.com/hayt7e

You will need the following student code to log into this system for our class:

4FD-AC-AC3

GRADING:

Grading will be based on scores from homework, quizzes, and exams. Quizzes will be given on a regular basis so the instructor can track student's progress. Exams will be given after every two or three chapters as shown in the course calendar.

The distribution of credit between homework, quizzes and exams will be as follows:

- 20 % quizzes
- 20 % homework

- 30 % exams, other than midterm and final
- 15 % midterm exam and final exam

Grade assignment on all exams and quizzes will be by the following scale

- > 90 % A
- > 80 % < 90 % B
- > 70 % < 80 % C
- > 60 % < 70 % D
- < 60 % F

ACADEMIC ACCOMMODATIONS (Undergraduate Level):

While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic accommodations. At Point Loma Nazarene University, these students are requested to file documentation during the first two weeks of the semester with the Academic Support Center (ASC), located in the Bond Academic Center. This policy assists the University in its commitment to full compliance with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. Once the student files documentation, the ASC will contact the student's instructors and provide written recommendations for reasonable and appropriate accommodations to meet the individual learning needs of the student.

Syllabus
EGR 265 – MECHANICS OF MATERIALS
Spring 2010

INSTRUCTOR: Kendall Mallory OFFICE: Rohr Science 209

EMAIL: kmallory@pointloma.edu PHONE: (619) 849-2356

OFFICE HOURS: Tues. and Thurs. 10:00 to 12:00

TEXTBOOK: Ferdinand Beer, Russell Johnson, John DeWolf, David Mazurek, *Mechanics of Materials, McGraw Hill, 5th Ed.*

OBJECTIVES OF THIS COURSE:

This course will develop knowledge of the mechanics of materials as used by engineers in the design and development of structures, machines and vehicles. This will emphasize the theory of stress and strain and the behavior of materials under axial and shear stress, bending moments, and torsion. This includes elastic and plastic deformations and structural failure modes. Also, skills at the use of mechanics and mathematics in problem solving will be heavily emphasized in this course. This will include the following subjects.

- Basic concept and methods used in the analysis of stress, strain and failure of materials
- Elastic and plastic deformation yield point and failure
- Axial loading
- Torsion
- Pure bending
- Real beams and bending with complex loading
- Shearing stresses
- Transformations of stress and strain
- Principle stresses and strain
- Deflection of beams and other loaded members
- Columns

EXPECTATIONS OF STUDENTS:

- Attendance in class is mandatory, (resistance in futile). Keeping up in this class will be difficult if you don't attend regularly.
- Homework must all be completed. This course is skills based and a student needs to gain the ability to accurately analyze electrical circuits. Just memorizing information will not develop problem solving skills in the student. These skills can only be developed through practice.
- Students will demonstrate creativity and advance capability in problem solving skills.
- Students will master all the standard techniques of circuits analysis used by engineers.
- Students will acquired understands of the function and behavior of electrical currents, circuits and Devices.
- All exams and quizzes must be completed. Any missed exams will receive zero credit. If there are unforeseen circumstances leading to a student missing an exam, quiz, or being late on a homework assignment you must discuss your options with the instructor. (Remember resistance is futile.)

LEARNING OUTCOMES FOR THIS COURSE:

- Students will demonstrate their knowledge of theory behind the mechanical properties of materials including Stress and Strain, Elastic and Plastic Deformation, Axial Stress and Strain, Torsion, Bending Moments, Shear Stress and Strain, and Transformation of Stress and Strain through their performance on Exams.
- Students will demonstrate strong problem solving skills as applied to Shafts, Beams, Posts, Plates and other structural elements through their performance on Exams and Homework assignments.

GRADING:

There will be an exam at the end of each chapter, homework assignments from each chapter, quizzes at random times, and a cumulative final exam that will count for 20% of your grade.

Quizzes	10%
Homework	25%
Exams	40%
Final	25%

Phy475: Senior Laboratory and Student Project (Physics Capstone)
Fall 2010

Course Description: Physics Capstone provides students the opportunity for preparation of a technical paper on research and to orally present results of this research. First, topics investigated will draw on learning from the core curriculum classes, including topics in an advanced laboratory setting in mechanics, quantum mechanics, statistical mechanics, and electricity and magnetism. Students will then develop and explore a project of their choosing.

Advanced Lab Rotation: The first 8 weeks will consist of 4 investigations and writing a technical paper structure and style should follow the guidelines established for submission to the Journal of Undergraduate Research in Physics. The APS style guide may be a useful additional resource. These four written reports will be worth 40% of your course grade.

Individual Project: Through the semester you will be developing an individual project which utilizes your skills learned through the advanced lab rotation and drawing on knowledge from other physics and engineering courses. You will submit an initial proposal (by week 5), a detailed proposal (by week 8). Your initial manuscript will be peer reviewed, and you will give a practice talk in weeks 14-15. You will give your final talk and submit your final manuscript. These activities comprise 60% of your course grade.

Learning Outcomes: By the end of this course students will demonstrate the following skills through completion of Lab reports, a practice journal article, and a final presentation:

- Use data analysis and error analysis techniques within lab experiments.
- Employ proper techniques to minimize uncertainty and eliminate systematic errors in experiments
- Use knowledge from operational manuals to correctly use advanced equipment.
- Presentation of data effectively in written and oral formats.
- Create near-publication-quality manuscripts in LaTeX.
- Design and carry-out an experimental investigation.
- Appraise manuscripts of peer investigations.
- Make an effective presentation at a level appropriate to a technical meeting.
- Respond effectively to technical questions about their investigation.

Final Grades - The grade you earn in this course is based on the following scale: 100%-90% A, 90%-80% B, 80%-70% C, 70%-60% D. The points you receive during the course are weighted accordingly: 40% advanced lab rotation write-ups, 5% proposal, 5% peer review, 10% practice talk, 20% final talk, 20% final manuscript.

Attendance - Attendance is required at all meetings. Let me know in advance if you must miss class for an unavoidable reason. If absences become excessive, you will be required to meet with me and the situation will be dealt with on a case-by-case basis.

Academic Integrity - The fundamental principle is to fairly represent the source of intellectual content. As you use resources make sure to site them. As you collect data, if it is in a group, make sure that you are all actively participating in this process. All students are expected to uphold the highest standards of honesty and integrity in their academic work. Cheating or plagiarism may result at a minimum in failure on the assignment and may result in an automatic failure in this course.

Academic Accommodations - While all students are expected to meet the minimum academic standards for completion of this course as established by the instructor, students with disabilities may require academic accommodations. At Point Loma Nazarene University, students requesting academic accommodations must file documentation with the Disability Resource Center (DRC), located in the Bond Academic Center. Once the student files documentation, the Disability Resource Center will contact the student's instructors and provide written recommendations for reasonable and appropriate accommodations to meet the individual needs of the student. This policy assists the university in its commitment to full compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities (ADA) Act of 1990, and ADA Amendments Act of 2008, all of which prohibit discrimination against students with disabilities and guarantees all qualified students equal access to and benefits of PLNU programs and activities.

IV. CATALOG COPY:

The following are catalog copy for the new course descriptions.

EGR 225 (3) Electronics Circuits Analysis

Theory and analysis of electrical and electronics circuits. Topics include basic circuit elements, laws of circuit analysis, Kirchoff's laws, loop and nodal analysis, differential equations for modeling electronic circuits, AC and DC analysis, transient analysis, complex impedance and steady state analysis, Laplace Transforms and frequency domain analysis.
Prerequisite: PHY 242 University Physics II

EGR 265 (3) Mechanics of Materials

Theory and analysis of forces, stress, and strain within engineering structural elements and members. Topics include the theory of stress and strain, elastic and plastic deformation, modes of structural failure, compression and tension, torsion, shear, shafts, beams, posts, transformations of stress and strain.
Prerequisite: PHY 241 University Physics I

PHY 475 (2) Senior Laboratory and Student Project

This course provides students the opportunity to prepare a technical paper on scientific or engineering research and to make an oral presentation of their results of this research. Initially topics investigated will draw on learning from the core curriculum, including topics in an advanced laboratory setting in mechanics, quantum mechanics, statistical mechanics, and electricity and magnetism. Students will then develop and explore a project of their choosing. This course will normally be completed in a student's senior year.

The following are rewrites to specified sections of our catalog copy to account for the changes to our program requirements.

CORE CURRICULUM
The following courses are required of all Physics and Engineering Physics majors:

Course #	Title	Units
EGR 110	Computational Methods for Scientists and Engineers I	1
EGR 120	Computational Methods for Scientists and Engineers II	1
PHY 241	University Physics I	4
PHY 242	University Physics II	4
PHY 304	Modern Physics	4
PHY 341	Analytical Mechanics	4
PHY 361	Electricity and Magnetism	3
PHY 401	Thermodynamics	3
PHY 431	Quantum Mechanics	3
PHY 495	Seminar in Physics	1
PHY 475	Senior Laboratory and Student Project	2
MTH 164	Calculus I	4
MTH 174	Calculus II	4
MTH 274	Calculus III	4
MTH 334	Applied Mathematics	4
(MTH333	Differential Equations	3)
CHE 152	General Chemistry I	4
	TOTAL	50 (49)

*Highlighting assumes MICS course approval. MTH334 will be dropped.

RECOMMENDATION

Course #	Title	Units
CSC 142	Introduction to Computer Science	2
CSC 154	Fundamentals of Computer Science	4
(CSC143	Introduction to Computer Programming	3)
(CSC152	Fundamentals of Computer Science	3)

*Highlighting indicates courses that will be added assuming MICS proposal passes.
142 and 154 will be dropped as recommended courses

ENGINEERING PHYSICS (B.S.) *MAJOR*

The courses listed below are required in addition to the core curriculum to obtain a B.S. in Engineering Physics. There are two possible options in the Engineering Physics Major, one is a specialization in Mechanics and the other is a specialization in Electromagnetics.

Specialization in Mechanics

Course #	Title	Units
EGR 215	Engineering Mechanics	3
EGR 265	Mechanics of Materials	3
EGR 225	Electronic Circuits Analysis	3
Complete one of the following two courses PHY 311 or PHY 443		
PHY 311	Nuclear Physics	3
PHY 443	Solid State Physics	3
	TOTAL	12

Specialization in Electromagnetics

Course #	Title	Units
EGR 225	Electronic Circuits Analysis	3
EGR 352	Analogue Electronics	2
EGR 422	Digital Electronics	2
EGR 432	Computer Interfacing	2
EGR 442	Mobile Robotics	2
PHY 362	Electricity, Magnetism, and Waves II	3
Complete one of the following two courses PHY 311 or PHY 443		
PHY 311	Nuclear Physics	3
PHY 443	Solid State Physics	3
	TOTAL	17

A few additional notes: (these are not changes to the catalog)

In adding up the required units beyond the G.E. requirements the following courses required in our major also serve as G.E. requirements.

PHY 241 (4) University Physics I (Also CHE 152 (4) General Chemistry I fulfills this same requirement)
MTH 164 (4) Calculus I

V. RECORDED DEPARTMENT/SCHOOL VOTE:

The department unanimously supports these changes.

VI. LIBRARY IMPACT:

There is no impact on the library. The library already tries to support these courses with materials in support of our department's curriculum.

VII. TECHNOLOGICAL IMPACT:

All new software requirements for the new courses have minimal impact on PLNU. The biggest requirement for software includes circuit simulation software, but the OrCAD software suite by Cadence Software is offered in a free student version, and this is currently the most widely used version of circuit simulation software in the profession at this time.

There are no new lab requirements for these courses since these are not lab based courses.

VIII. FINAL SUMMARY: REVIEW OF COURSE STAFFING AND IMPACT

Total course additions: 3

Total course deletions: 2

Total unit additions: 5 staffing units per year for the engineering courses (one per year) and the advanced lab.

Total unit deletions: 4 units of teaching load per year from Engineering drawing courses. (In recent years we have been offering EGR 490 courses in place of the Engineering drawing courses.)

Summary Staffing units: -4 per year, +5 per year

Total Impact: +1 staffing load per year