

AC 2009-2493: A PROPOSED APPLIED ENGINEERING DEGREE AT EASTERN MICHIGAN UNIVERSITY

Moderick Greenfield, Eastern Michigan University

A Future Proposed Applied Engineering Degree at Eastern Michigan University

Abstract

Presently, many universities are offering the BS in Electronics Engineering Technology (EET) and the BS in Engineering Physics in separate departments. The BS in Electronics Engineering Technology (EET) focuses on applying practical engineering principles; however, the BS in Engineering Physics concentrates on applying traditional physics and engineering concepts. With regard to national standards, graduates of Engineering Physics are granted permission to take the FE Exam; it is assumed the program has obtained ABET Engineering Accreditation EAC/ABET. Although, some graduates of Electronics Engineering Technology acquire a strong math and science background, they are denied permission to take the FE Exam in many states because EET majors are presently denied ABET Engineering Accreditation. Nevertheless, many employers would benefit from applied hands-on knowledge coupled with engineering physics.

This paper describes a paradigm of interdisciplinary studies between Electronics Engineering Technology and Engineering Physics to be proposed in the near future. The proposed interdisciplinary degree would combine engineering principles and applications to meet the current industrial needs. As a result, many students could obtain employment related to applied product design, and they could also obtain the proper credentials to take the FE Exam.

The proposed program could coexist with current engineering technology and engineering physics programs. Thus, the degree is not an Engineering Technology Degree, but Interdisciplinary Degree offered between the two programs. The final degree would be granted through Engineering Physics with a title such as BS in Engineering Electronics and Physics. Requiring standard engineering textbooks, the education will be implemented through both departments. The program provides an equivalent Electro-Mechanical Engineering background.

Introduction

Currently, Austin College offers an interdepartmental BS in Biomedical engineering by the joint effort of the Chemical Engineering, Computer Science, Electrical and Mechanical Engineering Departments [1]. South Dakota State University offers a BS in Engineering Physics-Electrical Engineering Emphasis. In the freshman and sophomore years, the students are required to take the usual Engineering Mathematics, Sciences, and fundamental engineering courses such as Engineering Graphics, Circuit Analysis, and Computer Programming. During the junior and senior year, the student focuses on Electrical Engineering and Engineering Physics courses. During the senior year the student is allowed to senior design as Phys 464-465 or EE 464-465 [2]. Therefore, the proposed Engineering Electronics and Physics will be similar to this program.

The Proposed Bachelor of Science in Applied Engineering degree is interdisciplinary program that focuses on engineering fundamentals, engineering design, and practical engineering experience. The major courses will be offered in the Department of Physics and School of Engineering Technology.

Students earning the BS in Engineering Electronics and Physics will have a strong foundation in mathematics, physics, fundamental engineering, solid state electronics, and analog electronics. The current Engineering Physics curriculum at Eastern Michigan University provides a strong background in Engineering Mechanics [3].

Background

Using many currently developed courses is an added advantage of the proposed program; no additional faculty is needed. The courses will be taught by faculty with degrees in engineering and physics. The Physics Department offers sufficient laboratory space for training engineers.

Moreover, the program should attract local 2+2 transferees from several community colleges that are offering pre-engineering two-year degrees. These programs are expected to have completed two courses of calculus and calculus-based physics.

The future proposed program is expected to meet EAC/ABET accreditation. Students completing the program are expected to meet all requirements need to obtain jobs within the state and federal government agencies. Many engineering jobs in governmental agencies require ABET accreditation. Our military students at EMU currently majoring in EET are required to take calculus-based physics.

A disadvantage is that the program will be new to the public, and it will take several years to receive EAC/ABET accreditation; also, current established programs will hinder the development.

Objective

The future proposed BS in Engineering Electronics and Physics will provide its majors with a strong background in electronics design and engineering mechanics. Graduates will be qualified to work in the areas of electronics, instrumentation, and electro-mechanics. Students will be able to design circuits using the latest development software. All students will be required to complete a project beyond classroom level by senior year.

Students that interested in graduate studies will be prepared to study and do research in a broad range of disciplines such as Electrical Engineering, Mechanical Engineering, Nuclear Engineering, and Physics. Several local employers in a recent industrial advisory meeting expressed a need for computing. During the meeting, Mr. S. Manir Zaman of IAV, Inc. expressed an interest in offering co-ops to students with training in computing. As a result, students are also expected to obtain knowledge in computing such as C++ and MATLAB. To meet this goal, computing tools will be used in most courses.

Need

The Governor of Michigan has been working with international car makers to locate in Michigan. After relocating some of the car makers in Michigan, the industry will need employees with the background that is acquired in the proposed degree. The local universities are currently offering either Electrical or Mechanical Engineering without the interdisciplinary education of electro-mechanics. Michigan is currently involved with Green Technology and Renewable Energy. UN-SOLAR, a Michigan based-company has many jobs requiring the proposed degree [4].

The BS in Engineering Electronics and Physics is an interdisciplinary program that focuses on engineering fundamentals, engineering design, and practical engineering experience. To meet these objectives, all engineering students must complete 63 units of major field work, with courses in six different core areas.

Engineering Requirements

1. Students must earn at least a 2.5 GPA in all math, science, and engineering courses.
2. Engineering students are required to register, by petition if necessary, for the Fundamentals of Engineering Examination at the earliest date allowed by the State of Michigan prior to graduation.

Required Courses

REQUIRED PHYSICS COURSES		
PHY 223	Mechanics and Sound	5
PHY 224	Electricity and Light	5
PHY 350	Electricity and Magnetism I	3
PHY 360	Heat and Thermodynamics	4
PHY 406	Ethical Issues in Physics	1
*PHY 420	Capstone Project	3
Total		18-21

* OPTION: Students must select PHY 420 or ELEC 450.

REQUIRED ENGINEERING MECHANICS COURSES		
PHY 229	Strength and Elasticity of Materials	4
PHY 230	Engineering Dynamics	4
PHY 485	Fluid Dynamics	3
Total		11

The above courses were selected from Engineering Physics because they provide the basic foundation in Engineering. The student completing these courses will have a strong background in Engineering Mechanics. For instance, PHY 229, 230, 360, and 485 are all basic components administered on the FE Exam. Today, all engineers are required to understand Ethics as contained in PHY 406. Electricity and Magnetism (PHY 350) was selected to aid students in understanding the principle of electromechanical systems. It is also a fundamental course offered to Electrical Engineering students.

Required Courses

REQUIRED ELECTRONICS ENGINEERING COURSES		
ELEC 200	Circuit Analysis I	3
ELEC 210	Circuit Analysis II	3
ELEC 214	Digital Circuit Analysis I	3
ELEC 300	Analog Circuit Analysis I	3
ELEC 320	Microcomputer Circuits	3
ELEC 326	Transform Circuit Analysis	3
ELEC 310	Analog Circuit Analysis II	3
ELEC 479	Control Systems	3
*ELEC 450	Senior Design Project	3
Total		24-27

REQUIRED CO-OP		
ELEC 387	CO-OP	3
Total		3

REQUIRED MATHEMATICS COURSES		
MATH 120	Calculus I	4
MATH 121	Calculus II	4
MATH 122	Linear Algebra	3
MATH 223	Multivariable Calculus	4
MATH 325	Differential Equations	3
Total		18

REQUIRED CHEMISTRY COURSES		
CHEM 121/2	General Chemistry I with lab	4
CHEM 123/4	General Chemistry II with lab	4
Total		8

REQUIRED COMPUTER SCIENCE COURSE		
COSC 246	Programming in C++	3
Total		3

GENERAL EDUCATION	
Total	40

Grand Total	120
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Present State of Proposal

During a meeting the Physics Department was excited about the proposal. Due to the economy, the proposal is being delayed until later. A meeting will be scheduled to discuss the proposal with Physics Department. The University has suggested that all undergraduate programs have a total of 124 credit hours.

M. C. Greenfield, Eastern Michigan University

M. C. Greenfield is currently Assistant Professor of Electronics Engineering Technology at Eastern Michigan University at the School of Engineering Technology. He received his B.S. from Jackson State University, MSEE from the University of Missouri, and ABD at Southern Illinois University.

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