May 15, 2009

MEMORANDUM

TO: Darryll Pines  
   Dean, A. James Clark School of Engineering

FROM: Phyllis Peres  
   Associate Provost for Academic Planning and Programs

SUBJECT: Proposals to modify the Post-Baccalaureate Certificate in Engineering (PCC log nos. 08062, 08063, and 08067)

At its meeting on today, the Senate Committee on Programs, Curricula and Courses approved your proposals to modify the Post-Baccalaureate Certificate in Engineering by adding specializations in Technology Ventures and Innovation, Systems Engineering, and Energetic Concepts, and to offer these specializations online. Copies of the approved proposals are attached.

The changes are effective Fall 2009. The College should ensure that the changes are fully described in the Graduate Catalog and all relevant descriptive materials, and that all advisors are informed.

CWR/

Enclosure

cc: Carmen Balthrop, Chair, Senate PCC Committee  
    Sarah Bauder, Office of Student Financial Aid  
    Reka Montfort, University Senate  
    Barbara Hope, Data Administration  
    Denise Nadasen, Institutional Research & Planning  
    Anne Turkos, Archives  
    Linda Yokoi, Office of the Registrar  
    Thomas Castonguay, Graduate School  
    Gary Pertmer, A. James Clark School of Engineering  
    George Syzmos, A. James Clark School of Engineering  
    Paul Easterling, A. James Clark School of Engineering  
    James Green, A. James Clark School of Engineering
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.
- Early consultation with the Office of the Associate Provost for Academic Planning & Programs is strongly recommended if there are questions or concerns, particularly with new programs.
- Please submit the signed form to Claudia Rector, Office of the Associate Provost for Academic Planning and Programs, 119 Main Administration Building, Campus.
- Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.

DATE SUBMITTED 04/21/09 PCC LOG NO. 08067

COLLEGE/SCHOOL ENGR

DEPARTMENT/PROGRAM OAEE

PROPOSED ACTION (A separate form for each) ADD X DELETE CHANGE

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.)

Establish a new specialization in Energetic Concepts within the existing Post-Baccalaureate Certificate in Engineering.

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.)

See attached.

APPROVAL SIGNATURES - Please print name, sign, and date

1. Department Committee Chair
   GEORGE SYMOS
   4/21/09

2. Department Chair
   GEORGE SYMOS
   4/21/09

3. College/School PCC Chair
   4/21/09

4. Dean
   2/4/09

5. Dean of the Graduate School (if required)
   5/18/09

6. Chair, Senate PCC
   5/11/09

7. Chair of Senate
   5/11/09

8. Vice President for Academic Affairs & Provost
   6/15/09

VPAAP 8-05
Add a Specialization in Energetic Concepts to the Post-Baccalaureate Certificate in Engineering

The A. James Clark School of Engineering proposes to establish an online specialization in Energetic Concepts within the existing Post-Baccalaureate Certificate in Engineering.

Energetics is a branch of the physical science of mechanics, which deals primarily with energy and its transformations. Energetics research is the underpinning of the development of explosives and propellants. Energetics has clear applicability to military R&D, including the development of explosives technology, undersea weapons, and pilot ejection devices. Other applications are in space exploration, fire suppression, anti-terrorism, and cartridge-actuated devices such as door openers and automobile airbags.

The Professional Master of Engineering specialization in Energetic Concepts was developed originally for researchers at the Naval Surface Warfare Center (NSWC) in Indian Head, MD. The first cohort of students has finished the program and we are currently offering the courses on a continuing basis. There has been a request from the staff at NSWC to allow their researchers the flexibility to study Energetic Concepts in either a four-course certificate or the existing full Master’s degree.

The certificate specialization will consist of four of the six core courses required for the ENPM academic specialization in Energetic Concepts. The new specialization will comply with all UMCP policies and requirements for graduate education.

**ENPM 681 Shockwave Physics I** (3) Covers the early history of the field becoming a scientific discipline, conservation equations for one-dimensional plane steady shocks, impedance matching, contact discontinuities, experimental techniques, thermodynamics of steady shocks, equations of state, one dimensional detonation theories, thermal explosions, techniques to measure steady detonation wave properties, sensitivity tests, and error analysis.

**ENPM 682 Shockwave Physics II** (3) Porous solids, elastic-plastic solids, Spall of solids, differential equations for conservation of mass, momentum and energy, Lagrange coordinates, time-dependent material properties, selected two dimensional flow issues, curved front detonation theories, and future areas of research in shock wave science.
**ENPM 683 Chemistry of Energetic Materials** (3) Overview of Functional groups of energetic molecules, Important properties in energetic molecules, Propellants, Explosives, Pyrotechnics – how do they differ chemically, Estimation of properties of EMs, Relationship between performance of explosives and energetic ingredients, Assessment of sensitivity of EMs, Thermal stability of energetic materials, Nitrocellulose and stabilizers, Chemistry of Nonideal explosives, Reactive materials, Polymorphism in energetics, Acidity and basicity of energetic materials, Crystal properties and sensitivity, Destruction of energetic materials – alkaline hydrolysis

**ENPM 684 Rocket Propulsion** (3) Review of basic rocket propulsion principles including performance, design, analysis, nozzle theory, and thermodynamic relationships. Students will conduct performance analyses of solid, liquid, and hybrid rocket motors. Design projects will be focused to allow students to develop a basic understanding for the challenges associated with the design of chemical rocket engines/motors. We will examine the classification of solid and liquid propellants/fuels/oxidizers and their combustion characteristics.

**ENME 808B Materials by Design** (3) Focuses on a new Materials by Design approach to creating energetic materials using Functionally Graded Materials (FGMs) concepts. Application of a new process, known as Twin Screw Extrusion (TSE), for continuously manufacturing energetic polymer composites which takes advantage of the continuous nature and superior mixing characteristics of the TSE process to manufacture a new concept for propellants and explosives: Functionally Graded Energetic Materials (FGEMs).

**ENME 707 Combustion & Reacting Flows** (3) Review of basic chemical thermodynamics principles (1'st, 2'nd law). Students will be introduced to the concepts of mass transfer so that they can eventually solve reaction-diffusion problems later in the term. We will spend considerable time developing the foundations of chemical kinetics and combustion chemistry. Examples of the chemistry of polluting emission will be discussed as well as unusual non-tradition combustion chemistries. We then introduce the concepts of prototype reactors (batch, plug-flow and perfectly stirred reactors) and then develop the theory of laminar premixed and diffusion flames. We will discuss two-phase combustion processes. E.g. Droplet burning and burning of solids. Other special topics will include statistical mechanical description of reaction rate theory.