Brothers, Sheila C

From: Hippisley, Andrew R
Sent: Friday, February 15, 2013 3:17 PM
To: Brothers, Sheila C
Subject: FW: Undergraduate certificate Power and Energy

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From: Andrew Hippisley <arhipp2@email.uky.edu>
Date: Fri, 15 Feb 2013 11:42:29 -0500
To: "Brothers, Sheila C" <sbrothers@uky.edu>
Subject: Undergraduate certificate Power and Energy

This is a recommendation that the University Senate approve the establishment of a new undergraduate certificate: Power and Energy, in the Department of Electrical and Computer Engineering, within the College of Engineering.

------ End of Forwarded Message

Proposed Power and Energy Undergraduate Certificate

November 3, 2010
Revised February 22, 2013

Submitted by:

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(Note that the term "Power and Energy Institute of Kentucky", PEIK, as used above and in this report is a name of an organized faculty group, as allowed per Academic Regulation AR1:3 for a faculty group organized in response to external funding opportunity, in this case a $2.5M funding from the US Department of Energy. The request for official recognition of the PEIK name within the university has been filed but not yet approved. However, the requested approval of this certificate program should not be contingent on the final recognized name of the power and energy faculty group.)

Purpose and Rationale

Why is the Undergraduate Certificate in Power and Energy needed?

In the 2011 US Department of Energy Strategic Plan, Secretary of Energy Steven Chu, stated that:

"*American leadership in the clean energy revolution is essential to future economic competitiveness. Regrettably, the United States has lost its lead in many of the energy technologies that we developed. Electricity transmission and distribution systems were pioneered by Thomas Edison, George Westinghouse, and Nikola Tesla, but today Europeans are the leading manufacturers. China, also seeking to compete in this market, hopes to export expertise gained from installing the world's highest voltage alternating current and direct current lines. America built the first nuclear reactor as part of the Manhattan Project in the 1940s, but the major commercial suppliers today are headquartered in France, Japan, Russia, and Korea. China has broken ground on more than 20 new nuclear reactors (approximately half of all Gen III+ reactors under construction) and will construct two nuclear reactor foundries. Similar reports of lost advantages apply to photovoltaics, advanced wind turbines, and fuel-efficient automobiles. With the right government policies and effective RDD&D programs, the United States can lead the clean energy revolution*."

In the University of Kentucky Strategic Plan for 2009-2014, Strategy 2.1.2 mentions energy among other topics that have "emerging importance" and is worthy of targeted institutional attention.

The University of Kentucky recently received a $2.5M grant from the Department of Energy to develop and promote educational programs with the goal of increasing the number of graduates with expertise in power and energy. The Undergraduate Certificate in Power and Energy is a response to the strategic direction and funding of the US Department of Energy and the University of Kentucky Strategic Plan.

What will be the benefits of this certificate to the students, the University, and the academic units involved?

The Certificate gives students the recognition of competency in power and energy. In addition, the certificate will motivate innovative course development. In anticipation of the certificate, several experimental courses have been offered and some have been approved as regular courses. These include, but are not limited to EGR 240 – Energy Issues, EE 599 – Energy Systems (Power Generation), EGR 599 – Environmental Consequences of Energy Production, EGR 599 – Smart Grid Communications and Information Systems, BAE 599 – Efficient Design of Solar Buildings, BAE 599 – Biofuels, among others.

Therefore, the certificate in power and energy will address a critical need, give students recognition of a concentration of courses in this area (making them more employable in the power and energy field), and attract students to UK. Although not directly measurable, it may also improve retention.

What are the intended outcomes and how will they be determined?

The certificate is the result of an assessment process that identified the need to develop expertise in power and energy (summarized in the response to #1.) Consequently, the outcomes of the certificate are a demonstration of expertise in the power and energy field; and they are measured by successfully completing the requirements for the certificate.

What are the various disciplines that can be used to satisfy the breadth component?

Biosystems and Agricultural Engineering, Chemical and Materials Engineering, Civil Engineering, Computer Science, Electrical and Computer Engineering, Mechanical Engineering, and Mining Engineering are disciplines that can be used to satisfy the breadth component. Students in other majors are also eligible to pursue the certificate, but a background of advanced science and math courses is important for successfully completing the courses. Thus, it is unlikely that there will be many students pursuing the certificate from majors beyond engineering or possibly physical sciences.

Does the structure of the certificate consist only of a director or is a steering/advisory committee also involved?

The Director has primary responsibility for verifying that the certificate requirements have been met. A copy of a completed application is given to the College of Engineering Student Records Officer to confirm that the requirements have been met, and the completed application is included in the student's file.

The certificate program is established as part of a larger program in power and energy. This larger program, temporarily referred to as the Power and Energy Institute of Kentucky (PEIK, see earlier note regarding the name), is supported by a grant from the US Department of Energy, with the goal of preparing more students to enter the power and energy workforce through the development of courses, labs, certificates, and other programs. The certificate program has been developed with input from several groups:

1. The Power and Energy faculty working group in the college of engineering defined the structure of the certificate and will continue to provide oversight to its administration. The working group corresponds to faculty participants from multiple engineering disciplines who are involved in the Power and Energy Institute of Kentucky (PEIK) sponsored by the Department of Energy grant mentioned above. Beyond the existence of the grant, this advisory group membership will be defined by appointment of the Dean of Engineering. Leadership of this faculty group currently resides with the Chair of Electrical Engineering, as the Principal Investigator of the PEIK grant from DOE. The leadership of the group in the future will be by appointment of the Dean of Engineering.
2. There is also a Power and Energy External Advisory Board that was established as part of the initial grant. This group includes representatives from industry and government. This group reviewed and influenced the structure of this proposed certificate program. This advisory board will continue into the future to provide advice on power and energy courses and the undergraduate certificate.
3. As part of the requirements of the founding grant, there is a Power and Energy Internal Advisory Board, consisting of department chairs of each of the engineering departments most closely associated with the program (Biosystems Engineering, Chemical and Materials Engineering, Civil Engineering, Electrical and Computer Engineering, Mechanical Engineering, and Mining Engineering). This board has also reviewed and influenced this proposed certificate program.

Who is the director and how is the director selected?

Currently, the Director of the Undergraduate Certificate is Dr. Joseph Sottile. The Director is appointed by the Dean of the College of Engineering.

Which faculty teach courses for the certificate, and which departments/colleges do they represent?

The list blow shows the Faculty of Record responsible for the certificate implementation and development:

Dr. Colliver (Biosystems and Agricultural Engineering**)**
Dr. Taylor (Civil Engineering)
Dr. Cheng (Chemical and Materials Engineering)
Dr. Fei (Computer Science)
Dr. Cramer, Dr. Dolloff, Dr. Holloway, Dr. Liao, Dr. Singh (Electrical and Computer Engineering)
Dr. Sekulic (Mechanical Engineering)
Dr. Sottile (Mining Engineering)

As members of this group depart, the remaining members will recommend replacements to the Dean of the College of Engineering, who will make the appointment.

Requirements for the Undergraduate Certificate in Power and Energy

The purpose of the Power and Energy Undergraduate Certificate is to provide students with a formalized recognition of an emphasis in power and energy as part of their undergraduate degree program. The certificate consists of a series of foundational courses, supplemented with a broad array of elective courses related to power and energy. The elective courses cover a wide variety of areas, including fundamentals, conventional and emerging technologies, smart grid systems, distributed generation, power system protection, energy storage, solar power, biofuels, and others. This certificate is an important part of the new Power and Energy Institute of Kentucky (PEIK), created through a recent grant from the US Department of Energy.

Structure

The Director of the Power and Energy Undergraduate Certificate is responsible for admitting students into the certificate, approving each student's curriculum for completing the certificate, and notifying the Registrar when certificate requirements have been completed. Students completing the certificate will receive a paper certificate and the certification will also be posted on the student's official transcript. The certification will not appear on the student's diploma.

Entrance Requirements

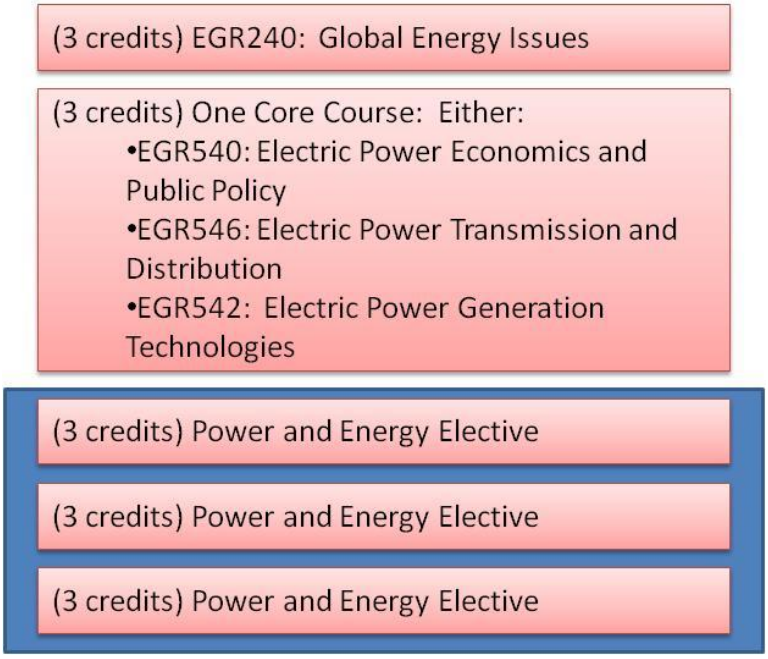
To be accepted into the University of Kentucky Power and Energy Undergraduate Certificate, the student must be pursuing an undergraduate degree and have completed at least 24 credits with a UK cumulative GPA of at least 2.500. A transfer student can be accepted into the certificate if he/she has completed at least 24 credits with a weighted cumulative GPA from all other institutions of at least 2.500.

Exit Requirements

- The student must complete a minimum of ***15 credits*** of course work in the certificate curriculum taken for a letter grade. Courses taken prior to admission into the certificate can be applied to the certificate.
- A minimum of nine credits must be at, or above, the 300-level.
- The student must earn a C or better in each course used to satisfy the certificate.
- The student must complete a three-credit breadth component. The breadth component requires that a student take courses in at least two disciplines, with a minimum of three credits completed in the second discipline.
- The certificate will be awarded to students who complete the certificate curriculum and also complete an undergraduate degree.
- No more than nine credits of the Power and Energy Undergraduate Certificate can be used as required courses in the student's major, minor, or other certificate. Courses used to satisfy the certificate can be used as electives (including technical electives) in a student's degree program.
- Courses applied to the Power and Energy Undergraduate Certificate cannot also be applied to the Power and Energy Graduate Certificate.
- The Power and Energy Undergraduate Certificate Director must approve the certificate curriculum for each student.

Power and Energy Undergraduate Certificate Curriculum

The structure of the certificate curriculum is shown in the figure below.



Required Course (3 credits)

- EGR 240 Inquiry into Global Energy Issues

Core Elective (3 credits)

A student must choose one of the following courses (each of the below show proposed course numbers, but are currently taught as EGR599):

- EGR 540 – Electric Power Economics and Public Policy
- EGR 546 – Electric Power Transmission and Distribution
- EGR 542 – Electric Power Generation Technologies

Power and Energy Electives (9 credits)

A student must choose three courses from the approved list of Power and Energy Electives. The selected courses must be approved by the Director of the Power and Energy Undergraduate Certificate to ensure that the selections maintain a thematic consistency and fulfill the certificate breadth requirement. A partial list of approved power and energy courses is provided below. Additional courses will be added as they are approved for the power and energy certificate curriculum.

BAE 503 – Fundamentals of Biorenewable Resource Engineering
BAE 504 – Biofuels
CE 351 – Intro to Environmental Engineering
CME 200 – Process Principles
CME 320 – Engineering Thermodynamics
CME 515 – Air Pollution Control
EE 415G – Electromechanics
EE 416G – Energy Conversion Lab
EE 518 – Electric Drives
EE 531 – Alternative and Renewable Energy Systems
EE 535 – Power Generation, Operation, and Control
EE 536 – Power System Fault Analysis and Protection
EE 537 – Electric Power Systems I
EE 538 – Electric Power Systems II
EE 539 – Power Distribution Systems
EGR 540* – Electric Power Economics and Public Policy
EGR 546* – Electric Power Transmission and Distribution
EGR 542* – Electric Power Generation Technologies
ME 321 – Engineering Thermodynamics II
ME 530 – Gas Dynamics
ME 548 – Aerodynamics of Turbomachinery
ME 549 – Power Generation
ME 563 – Combustion I
MNG 511 – Mine Power System Design
MNG 575 – Coal Processing Plant Design

* The courses EGR 540, EGR 546, and EGR 542 are proposed course numbers. These courses are currently taught as different courses under the number EGR 599.