MEMORANDUM

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

FROM: Elizabeth Beise
      Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Establish a Transportation Systems Option for the Post-Baccalaureate Certificate in Engineering Program (PCC log no. 15030)

At its meeting on December 4, 2015, the Senate Committee on Programs, Curricula and Courses approved the proposal to establish a Transportation Systems option for the existing Post-Baccalaureate Certificate in Engineering Program. A copy of the proposal is attached.

The change is effective Spring 2016. Please ensure that the change is fully described in the Graduate Catalog and in all relevant descriptive materials.

MDC/
Enclosure

cc: Andrew Harris, Chair, Senate PCC Committee
    Barbara Gill, Office of Enrollment Management
    Reka Montfort, University Senate
    Erin Taylor, Division of Information Technology
    Pam Phillips, Institutional Research, Planning & Assessment
    Anne Turkos, University Archives
    Linda Yokoi, Office of the Registrar
    Alex Chen, Graduate School
    William Fourney, A. James Clark School of Engineering
    George Syrmos, Office of Advanced Engineering Education
THE UNIVERSITY OF MARYLAND, COLLEGE PARK
PROGRAM/CURRICULUM/UNIT PROPOSAL

Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.

Please submit the signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.

College/School: ENGR
Please also add College/School Unit Code: First 8 digits: 01320101
Unit Codes can be found at: https://issprod.umd.edu/html_Home/units.htm

Department/Program: Office of Advanced Engineering Education
Please also add Department/Program Unit Code: Last 7 digits: 1322302

Type of Action (choose one):
- Curriculum change (including informal specializations)
- Curriculum change for an LEP Program
- Renaming of program or formal Area of Concentration
- Addition/deletion of formal Area of Concentration
- Suspend/delete program

Indices indicate that the proposed program action must be presented to the full University Senate for consideration.

Summary of Proposed Action:

Creation of an online academic option in Transportation Systems to the existing Graduate Certificate in Engineering Program (as Z0#) through the Office of Advanced Engineering Education.

Departmental/Unit Contact Person for Proposal: Ali Haghani

APPROVAL SIGNATURES - Please print name, sign, and date. Use additional lines for multi-unit programs.

1. Department Committee Chair: Ali Haghani
2. Department Chair: George Syrmos
3. College/School PCC Chair: Jenna Bucci
4. Dean: Darryl Pines
5. Dean of the Graduate School (if required):
6. Chair, Senate PCC:
7. University Senate Chair (if required):
8. Senior Vice President and Provost:
Proposal for a New Online Specialization in Transportation Systems in the Graduate Certificate in Engineering Program

I. Overview and Rationale

Established in 1994, the Office of Advanced Engineering Education (OAEE) in the Clark School of Engineering is responsible for lifelong learning programs designed for working engineers and technical professionals. OAEE offers both credit and non-credit programs, but our primary offerings are the Master of Engineering degree and the Post-Baccalaureate Graduate Certificate in Engineering degree. We refer to these degree programs as the Professional Master of Engineering (ENPM) Program and the Graduate Certificate in Engineering (GCEN) Program. The Master of Engineering degree is awarded with completion of ten courses (30 credits) and no thesis/research project, scholarly paper, or comprehensive exam are required. Each academic option has its own set of course requirements. The GCEN Program was developed to serve as a more highly focused area of study. It requires the completion of four specific courses (12 credits) by academic option. There are currently over 500 students in our programs with over 2000 graduates. Students take classes on campus, at regional education centers throughout Maryland, and seven programs are offered online. Enrollments have been averaging 55% on campus and 45% distance/online for the past few years.

OAEE currently offers eighteen academic options under these two programs (http://advancedengineering.umd.edu/degrees-certificates). Academic options were originally versions of the Master of Science programs in each academic department (i.e. Aerospace, Mechanical, Electrical, etc.). However, as the need grew for more interdisciplinary programs, we began working with research institutes and centers in the Clark School to develop and offer programs to meet the needs of the engineering/technology community. We have developed niche academic options in Sustainable Energy, Project Management, Robotics, Energetic Concepts, Software, Reliability, Fire Protection, Regulatory Science, and Cybersecurity. In 2003, we began offering our programs online to give national and worldwide access to the outstanding programs available at Maryland.

We propose the creation of a Transportation Systems academic option in the Graduate Certificate in Engineering Program that will be fully online and will be a complement to the academic options we currently offer and the research work being done in the Department of Civil and Environmental Engineering, the National Transportation Center, and the Center for Advanced Transportation Technology.

II. Program Audience

Based on our internal review, which included discussions with faculty, research sponsors, experts in industry and government as well as evaluation of competing higher education institutions, we believe there is a high-demand for this academic option. Transportation is an evolving field and most knowledge and expertise required for a successful career in transportation systems engineering is only available through graduate programs. The University of Maryland's Department of Civil and Environmental Engineering (CEE) has an immensely successful educational and research program in transportation as evidenced by the research activities currently underway in the Center for Advanced Transportation Technology (CATT), the federally-funded National Transportation Center (NTC) and the most recently funded project by ARPA-E entitled "Integrated, Personalized, Real-time Traveler Information and Incentive Technology for Optimizing Energy Efficiency in Multimodal Transportation Systems." The CEE graduate program in transportation is one of the top three in the nation and very unique in terms of the breadth and depth of the area of transportation that it covers. There is a high demand for employment for transportation professionals in the region, nationwide, and across the globe. Offering an online graduate program will expand our reach and allow us to attract qualified students who demand a high quality graduate education. The target audience is adults who have completed at least a Bachelor's degree in engineering or science. This program will be of interest to working engineers, technical professionals, as well as recent graduates, who desire a career in transportation systems as an opportunity to advance their knowledge their careers. We expect that due to the high demand for employment, the strength and reputation of the Clark School of Engineering and the CEE graduate, the research activities at the CATT and the NTC, and our highly
effective distance learning capabilities, we will provide an outstanding educational option for engineers and technical professionals regionally, nationwide, and across the globe.

Full admission as a degree seeking student requires the following:
- A bachelor's degree, with a GPA of 3.0 or better, in engineering or science from an accredited institution
- Two letters of recommendation are required for the GCEN Program if the GPA is slightly below 3.0.
- Applicants who have a GPA between 2.7 and 3.0 could be admitted provisionally which they must earn a grade of B or better in their first two courses in order to gain full admission. Failure to do so will result in dismissal from the program.

III. Program Administration
OAEE provides administrative oversight to all academic options, including student services within the GCEN Program, faculty support, proctoring, admissions, and academic outreach. In addition, OAEE works with faculty to develop new courses and programs that meet the needs of the engineering/technology communities. OAEE researches industry needs, meets with private and public sector leaders, attends various professional society and technology conferences to learn about possible program development areas. For each academic option there is an identified academic advisor/content matter expert who advises OAEE and our students on curriculum matters. For the traditional academic options (i.e. aerospace, bioengineering, mechanical, etc.) an advisor is assigned by that department Chair. For our interdisciplinary programs, the Chair/Director of the primary department/research center/institute assigns an academic advisor. These interdisciplinary areas also have curriculum committees that review student and faculty performance, course content, and curriculum development. As with all programs in OAEE, curriculum and academic oversight for the core and elective courses will be through a faculty advisory committee that will collaborate with the OAEE Executive Director, making sure that both commitment to support this new specialization and academic excellence are in place. Evaluation and assessment of this option will be performed by the faculty of Civil and Environmental Engineering, more specifically a faculty member in the National Transportation Center group will be the first academic advisor.

Professor Ali Haghani will be the first academic advisor and will work with the OAEE Executive Director to ensure that academic integrity is met (see the attached Assessment Plan approved for all OAEE academic options). The new specialization will comply with all UMCP policies and requirements for graduate admission, time of study, and graduation requirements.

IV. Curriculum
The curriculum identified represents the beginning of what will be an evolving program that will continue to offer the latest developments in this rapidly changing and critically important field of study.

Students in the online Graduate Certificate in Engineering in Transportation Systems Program will complete 4 courses/12 credits. Students must also meet the prerequisites for any course they wish to take.

V. Budget Resources
The Office of Advanced Engineering Education is a self-support unit and the Graduate Certificate in Engineering Programs are administered through its resources.

VI. Graduate Certificate in Engineering Courses

Any four courses out of the six courses identified below will satisfy the requirements for the Graduate Certificate in Engineering.

Courses have already begun to be webcast through the DETS office in the Clark School of Engineering in preparation for this new offering. We will request a new online course section be created to correspond to this new specialization – potentially TSO* – under which students would take these courses.
Students choose 4 of the following 6 courses:

- **ENCE 670 Highway Traffic Characteristics and Measurements (3 credits)**
  Prerequisite: Permission of Instructor.
  The study of the fundamental traits and behavior patterns of road users and their vehicles in traffic. The basic characteristics of the pedestrian, the driver, the vehicle, traffic volume and speed, stream flow and intersection operation, parking, and accidents.

- **ENCE 672 Regional Transportation Planning (3 credits)**
  Prerequisite: Permission of Instructor.
  Factors involved and the components of the process for planning statewide and regional transportation systems, encompassing all modes. Transportation planning studies, statewide traffic models, investment models, programming and scheduling.

- **ENCE 673 Urban Transportation (3 credits)**
  Prerequisite: Permission of Instructor.
  The contemporary methodology of urban transportation planning. The urban transportation planning process, interdependence between the urban transportation system and the activity system, urban travel demand models, evaluation of urban transportation alternatives and their implementation.

- **ENCE 677 OR Models for Transportation Systems Analysis (3 credits)**
  Prerequisite: Permission of Instructor.
  Fundamental skills and concepts of the quantitative techniques of operations research including: mathematical modeling, linear programming, integer programming, network optimization (shortest paths, minimum spanning trees, minimum cost network flows, maximum flows), heuristics, and basics of probabilistic modeling. Emphasis on the application of these techniques to problems arising in transportation.

- **ENCE 688I Discrete Choice Analysis (3 Credits)**
  Prerequisite: Permission of Instructor.
  Methods and statistics of model estimation; maximum-likelihood estimation; individual choice theory; binary choice models; multi-dimensional choice models; sampling theory and sample design; aggregate prediction with choice models; joint stated preference and revealed preference modeling, and longitudinal choice analysis; review of state-of-the-art and future directions.

- **ENCE 688T Transportation Network Algorithms and Implementations (3 Credits)**
  Prerequisite: Permission of Instructor.
  This course will focus on network optimization algorithms for transportation and logistics systems. The application of these techniques to the determination of optimal routes and tours for various transportation and logistics applications will be stressed. In addition to introducing a wide variety of network-related problems and existing techniques for solving a number of these problems, one of the goals of the course is to help the class participants to develop skills in creating and evaluating new algorithms and heuristics.
# Assessment Methods, Criteria & Results

**Graduate Certificate in Engineering (GCEN)**

For Time Period: Academic Year

Program Contact: Dr. George Syrmos  
Phone: 301-405-3633  
E-mail: syrmos@umd.edu

Date submitted to Academic Unit Head: 

<table>
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<tr>
<th>Student Learning Outcomes for assessments that will occur during the academic year</th>
<th>Assessment Methods &amp; Criteria</th>
<th>Assessment Results</th>
<th>Impact of Results</th>
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| 1. Demonstrate knowledge of advanced principles in engineering. | **Criterion:** All ENPM courses offered during any given semester. The final exam in all these courses will include a question specifically tailored to demonstrate understanding of a fundamental principle in engineering.  
**Measure:** At least 70% of the students in every ENPM course offered during any given semester would be expected to successfully answer this question posed on the final exam. |  |  |
| 2. Demonstrate knowledge of advanced principles in engineering. | **Criterion:** 90% of the Graduate Certificate in Engineering students should have a GPA equal or greater than 3.0  
**Measure:** GPA |  |  |
<p>| 3. Demonstrate continued retention of students and progress towards degree completion. | <strong>Criterion:</strong> 80% enrollment by existing students each semester. |  |  |</p>
<table>
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<tr>
<th>Measure: Registrar’s Enrollment Records.</th>
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<td><strong>4. Demonstrate completion of degree program.</strong></td>
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<td><strong>Criterion:</strong> 80% graduation rate of students within the five year limit for Graduate Certificate in Engineering students.</td>
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<td><strong>Measure:</strong> Registrar’s Graduation Records.</td>
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<td><strong>5. Point-of-graduation survey.</strong> The survey is web based. Graduating students, prior to the end of the semester, are sent the web site in which to fill in the appropriate information and submit the survey electronically. The survey seeks to ascertain a student’s experiences in the GCEN Program regarding the quality of courses, the general program, faculty, and staff. The survey also collects information on employment (position, salary, etc.) at graduation.</td>
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<tr>
<td><strong>Criterion:</strong> 50% response rate by graduating students.</td>
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<td><strong>Measure:</strong> Graduation Survey.</td>
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10/23/2013