CLEMSON UNIVERSITY

College of Engineering and Science

REQUESTING TO OFFER A NEW DEGREE PROGRAM

Masters in Engineering

IN

Systems Engineering

Submitted to the South Carolina Commission on Higher Education
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Classification:

Program Title including options, concentrations, and tracks: Systems Engineering

Academic unit involved: College of Engineering and Science

Designation, type, and level of degree: Master of Engineering (M.Engr.)

Proposed date of implementation: July 1, 2012

CIP code from the current USDOE's Classification of Instructional Programs: 14.2701

Identification of Program as New or Modification: New

Site: Online Delivery

Program qualifies for supplemental Palmetto Fellows Scholarship and LIFE Scholarship awards: Yes _____ No: __x___

Delivery mode (See definition, p. 3): Online

The Masters of Engineering in Systems Engineering is intended to meet the expressed needs of South Carolina industries. Systems engineering is not broken out as a separate category by the Department of Labor but employment in systems and software engineering is expected to grow at well over 3% per year through 2018. It was rated the #1 Best Job in 2009 by CNN Money and is consistently in the top 50. A part of the rating is based on employment opportunities.

The Masters of Engineering in Systems Engineering has developed from a twelve hour graduate certificate in systems engineering that was instituted at the request of a number of South Carolina companies particularly those based in Charleston. The master's degree will be offered totally on-line. It is expected that the certificate will act as a feeder for the Master's program.

Justification:

Systems engineers work in a variety of domains. A recent scan of systems engineering job postings found positions in avionics, health care, defense applications,

telecommunications, power systems, and many others. This diversity means that employment as a system engineer is more robust than other more narrow engineering specialties.

The systems approach to problem solving is in increased demand as companies attempt to ship increasingly complex, sustainable products using innovative techniques and produced in less time. The systems engineer has a perspective that supports bringing together teams with diverse backgrounds to provide a complete solution to a customer's problem. They bridge the gap between management and technical personnel by translating customers' needs expressed in their vocabulary into the vocabulary understood by the engineering specialists. This requires training in techniques that bridge technical and managerial practices.

The Masters of Engineering in Systems Engineering is an interdisciplinary degree. It includes a concentration that may be selected from any of 11 areas. These areas cover the complete range of areas of emphasis at Clemson: Manufacturing and Composites, Software and Cybersecurity, Transportation, Infrastructure, Power Systems, Health Systems, and Sustainable Systems. The program content is administered by a curriculum committee that includes representatives from 11 different areas within the College:

Name	**Department**
John D. McGregor	School of Computing
Joel S. Greenstein	Industrial Engineering
Gregory M. Mocko	Mechanical Engineering
Robert J. Schalkoff	Electrical and Computer Engineering
Laine Mears	Automotive Engineering
Jiro Nagatomi	BioEngineering
Amod A. Ogale	ChemEngineering
Marian Kennedy	MaterialsSci
Cindy Lee	EEES
Hoke Hill	Mathematics and Civil Engineering

The program directly aligns with the university's emphasis areas which were chosen in part on the basis of societal need. The 11 discipline areas participating in the curriculum committee all see systems engineering as having a role in their discipline.

Proposed Curriculum:

The proposal calls for the curriculum to have three main sections:

1. A SYSE (System Engineering) core of 12 hours made up of SYSE 801, 802, and 2 other systems-oriented courses. 801 and 802 currently exist and have both been taught to students entering the Certificate in Systems Engineering program. SYSE 803 and 804 would be added when enrollment in the program supports them.
2. A SYSE emphasis area of 12 hours, chosen based on the individual's interests, in one of the university's emphasis areas
   - Manufacturing and Composites
   - Software and Cybersecurity
   - Transportation, Infrastructure
   - Power Systems
   - Health Systems
   - Sustainable Systems

3. A 6 hour capstone project.

Anticipated program demand: The number of students taking systems engineering courses has doubled in the last year from 4 to 9 students although not all of those students are actively pursuing the certificate. The number of students is expected to reach 20 by Fall 2012. This number will remain between 20 and 30 for the next 5 years. We anticipate an 80% graduation rate. We plan a national advertising program through the systems engineering professional organization INCOSE.

Program duplication: There is no other Masters of Engineering in Systems Engineering program in the state of South Carolina. There is a Graduate Certificate in Systems Engineering Management offered by the Citadel.

Other institutions: There are no formal arrangements with any other institution; however, one student taking the SYSE 802 course during the Fall 2011 semester will transfer those hours to the Citadel as part of her Certificate in Systems Engineering Management. Initial discussions have been held to allow Clemson students interested in an emphasis area in management to take a course or courses at the Citadel and for those Citadel students interested in some technical systems engineering courses to attend Clemson via the online courses.

Cost: The funding for the program will be through tuition and reallocation of resources. Enrollment in each course must be sufficient to cover the cost of the faculty and graduate teaching assistants. The College will reallocate funds for the start-up of the program during the first year. After this first year, it is anticipated that enrollment will cover all costs.