



UNC CHARLOTTE

The University of North Carolina at Charlotte
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May 25, 2007

Office of the Chancellor
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Dr. Harold L. Martin
Senior Vice President for Academic Affairs
University of North Carolina General Administration
Post Office Box 2688
Chapel Hill, North Carolina 27515-2688

Dear Dr. Martin:

Enclosed are five copies of a request for authorization to establish a new Bachelor of Science in Systems Engineering (B.S.S.E.). This program responds to industry's need for professionals trained to integrate and manage engineering, engineered, and natural systems. The B.S.S.E. has been approved at all appropriate levels on campus.

Thank you for your consideration of this request. Provost Joan Lorden or I would be pleased to respond to any questions that you may have regarding this request.

Cordially,

Philip L. Dubois
Chancellor

Enclosures (5 copies)

cc: Provost Joan F. Lorden
Dr. Robert E. Johnson

The University of North Carolina at Charlotte

**Bachelor of Science in Systems
Engineering**

**Request for Authorization
to Establish**

THE UNIVERSITY OF NORTH CAROLINA
Request for Authorization to Establish a New Degree Program

***INSTRUCTIONS:** Please submit five copies of the proposal to the Senior Vice President for Academic Affairs, UNC Office of the President. Each proposal should include a 2-3 page executive summary. The signature of the Chancellor is required.*

Date January 24, 2007

Constituent Institution: The University of North Carolina at Charlotte

CIP Discipline Specialty Title: Systems Engineering

CIP Discipline Specialty Number: 14.2701 Level: B M 1st Prof D

Exact Title of Proposed Program: Bachelor of Science in Systems Engineering

Exact Degree Abbreviation (e.g. B.S., B.A., M.A., M.S., Ed.D., Ph.D.): B.S.S.E.

Does the proposed program constitute a substantive change as defined by SACS? Yes No

a) Is it at a more advanced level than those previously authorized? Yes No

b) Is the proposed program in a new discipline division? Yes No

Proposed date to establish degree program (allow at least 3-6 months for proposal review):

month 08 year 2007

Do you plan to offer the proposed program away from campus *during the first year of operation*?

Yes No

If so, complete the form to be used to request establishment of a distance learning program and submit it along with this request.

TABLE OF CONTENTS

Title Page	1
Table of Contents	2
Executive Summary	3
I. Description of the Program	5
II. Justification for the Program	9
III. Program Requirements and Curriculum	15
IV. Faculty	24
V. Library	25
VI. Facilities and Equipment	25
VII. Administration	26
VIII. Accreditation	27
IX. Supporting Fields	27
X. Additional Information	27
XI. Budget	28
XII. Evaluation Plans	28
XIII. Reporting Requirements	31

Appendices:

- Appendix A: Budget projections for the first three years of program operation
- Appendix B: Letters of Support
- Appendix C: Faculty Curriculum Vitas
- Appendix D: References
- Appendix E: Proposed BSSE Four-year Curriculum

Executive Summary

The changing global business environment is causing engineering companies in the U.S. to move from self-sufficient engineering operations toward the integration of various engineering operations, including design, production and manufacturing, logistics, sales, and services, at global locations and companies. The education of future engineers must reflect this changing trend and demand. The Systems Engineering (SE) discipline addresses the critical need to educate engineers to handle the increasing demands of systems efficiency, effectiveness, and integration in engineering and business operations. It is essential that current engineering education in the state of North Carolina and the U. S. remain competitive for engineering graduates in these global engineering operations. This need is reinforced by G. Wayne Clough in an editorial in the summer 2006 issue of the National Academy of Engineering's *The Bridge*. "The Engineer of 2020 ... offered ideas for (1) the teaching of introductory courses in ways that would engage students and arouse their curiosity, (2) encouragement of a systems approach rather than the traditional piecemeal approach, (3) interdisciplinary courses, and (4) internships and cooperative experiences to supplement classroom exercises." To meet this demand, the College of Engineering at UNC Charlotte requests permission to establish a Bachelor of Science degree program in Systems Engineering (BSSE) beginning in fall 2007.

The proposed BSSE program and curriculum take into account several key perspectives including industry needs and available programs. Based on our analysis, it is expected that the demand for Systems Engineers and SE education will grow due to economic and population growth in the Charlotte region. Benchmarking against the major SE programs nationally indicates growing enrollment trends in SE programs. Currently, in the state of North Carolina, there are no academic institutions offering a BSSE degree, and there are only a few programs at the undergraduate and graduate levels that relate to SE. This picture presents an opportunity to enhance SE education in the state of North Carolina. The proposed BSSE program will be timely and will also complement the existing Engineering Management Graduate Program.

As part of a strategic analysis, the UNC Charlotte Engineering Management Program identified the Charlotte area as home to the headquarters of nine Fortune 500 companies including Bank of America, Wachovia Corp., Duke Energy, Nucor Corp., Sonic Automotive, SPX, Family Dollar, Goodrich Corp., and Lowe's. In addition, 306 other Fortune 500 companies are represented in the Charlotte area covering a variety of industries in the manufacturing, transportation and distribution, and financial services. Due to ever-improving business opportunities and increasing population, this region is expected to have a growing need for educational services at both the undergraduate and graduate levels. Since the SE graduates will be prepared to work in a wide variety of industries, local industry needs from the major industrial sectors demonstrate that UNC Charlotte is an excellent location for the new BSSE program.

Based on our analysis, the following areas capture the main SE skills required in industry, both regionally and globally:

- Decision and Risk Analysis
- Systems Modeling and Optimization

- Systems Design, Planning and Analysis
- Supply Chain and Logistics Engineering
- Quality Engineering
- Engineering Management
- Effective Communication and Presentation
- Understanding of Global Business Dynamics

The Directorate for Engineering of the National Science Foundation (NSF) released a conceptual document for reorganization in June 2005 [1]. In the document, one of the main emphases in the three major Engineering divisions - Division of Electrical, Communications and Cyber Systems; Division of Civil, Manufacturing, and Mechanical Innovation; and Division of Chemical, Biological, Environmental and Transport Systems - is on research dealing with the complexity in integrating systems that include engineering, engineered, and natural systems. Hence, the systems engineering discipline plays an important role in current and future NSF research efforts.

For the Carolinas, with its growing business opportunities and increasing population in Charlotte and the surrounding areas, there is a need for educational services at the undergraduate and graduate levels in managing systems and global supply chain operations. Systems engineering and engineering management are the essential and complementary disciplines that produce graduates with interdisciplinary engineering, management, and business skills that are highly valued by many companies that compete in the global market.

Currently, there are no academic institutions offering the BSSE degree in the state of North Carolina. Among the 16 campuses of the UNC system, only four offer systems engineering-related programs within their engineering program offerings. Among these four, only two are established departments (NC State and NC A&T), while the other two are either a graduate-level program (UNC Charlotte) or an undergraduate-level concentration area (ECU). In addition, Duke University has a Master's-level Engineering Management Program.

This proposed BSSE program also is connected to a range of University goals including: (a) to provide services that impact positively the many challenges facing the region, state, and nation; (b) to train students who possess interdisciplinary skills and capacities that can be applied to a variety of situations and professions in an ever-changing global economy; (c) to improve educational opportunities that respond to the intellectual and professional needs of the region; (d) to increase both faculty and student research that will address fundamental and regional problems, (e) to provide a variety of services that respond to the ongoing and emerging regional needs, and (f) to graduate students with the breadth and depth of knowledge and the intellectual and professional skills that prepare them for a productive life in an ever-changing world.

The new BSSE program will meet the needs of citizens, industries, and businesses in this region and the state by building upon and expanding the mission of the current Engineering Management Program. This foundation and support from regional industry makes UNC Charlotte an appropriate place to establish a program in SE.

I. DESCRIPTION OF THE PROGRAM

A. Describe the proposed degree program (i.e., its nature, scope, and intended audience).

U.S. engineering/manufacturing companies are changing their engineering operations from in-house operations for design, production/manufacturing, logistics, sales, and services toward outsourcing some operations to various global locations in the current business environment. A major portion of engineers' functions is to involve the integration of engineering operations performed at multiple sites, often various international sites. With the shift of the business environment, the education of future engineers must reflect this changing trend and demand. The Systems Engineering (SE) discipline fills this critical educational need to handle the increasing demands of systems efficiency, effectiveness, and integration in engineering and business operations. Systems Engineering is critical if the State of North Carolina and the U.S. are to remain competitive and for engineering graduates in the twenty-first century to participate in global engineering operations. C. M. Vest in "Educating Engineers for 2020 and Beyond," [*Educating the Engineer of 2020: Adapting Engineering Education to the New Century*, National Academy Press pp 160-169 (2005)] states, "We need to establish a proper intellectual framework within which to study, understand, and develop large, complex engineered systems." To meet this demand, the College of Engineering at UNC Charlotte requests permission to establish a Bachelor of Science degree program in Systems Engineering (BSSE) beginning in fall 2007.

"Systems Engineering is an engineering discipline whose responsibility is creating and executing an interdisciplinary process to ensure that the customers' and stakeholders' needs are satisfied in a high quality, trustworthy, cost-efficient and schedule-compliant manner throughout a system's entire life cycle. This process usually comprises the following seven tasks: **S**tate the problem, **I**nvestigate alternatives, **M**odel the system, **I**ntegrate, **L**aunch the system, **A**ssess performance, and **R**e-evaluate. These functions can be summarized with the acronym SIMILAR: **S**tate, **I**nvestigate, **M**odel, **I**ntegrate, **L**aunch, **A**ssess and **R**e-evaluate. It is important to note that the Systems Engineering Process is not sequential. The functions are performed in a parallel and iterative manner." [2]

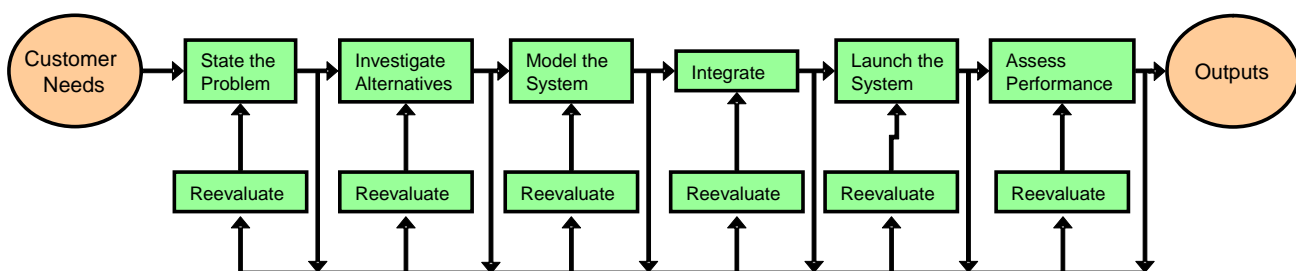


Figure 1. SIMILAR Process [3].

By following the SIMILAR process, Systems Engineers develop clear, concise, and comprehensive problem statements, resolve top-level system problems into simpler, solvable problems, and integrate the solutions to the simpler problems to solve the top-level problem [4]. Without loss of generality, SE concepts can be applied to any system including engineered (or human-made) systems and non-human-made systems or natural systems such as environmental systems (see e.g. [5]). As mentioned by Blanchard and Fabrycky (p.38, [6]):

SE as an engineering field has very broad applications in a wide variety of industries including energy, telecommunications, construction, manufacturing, transportation and distribution, information technology, financial services, automotive, retail, healthcare and airlines, at all levels from an entry position to top management. This wide applicability, along with a very strong focus to model, analyze and manage complex engineered systems with proven tools and techniques, can be considered as the primary strengths of SE. As mentioned by Wymore (p.5, [4]), it can be concluded that practically every organization requires Systems Engineers to identify, characterize and solve the right problems and to eliminate inefficiencies and root-causes that generate these problems.

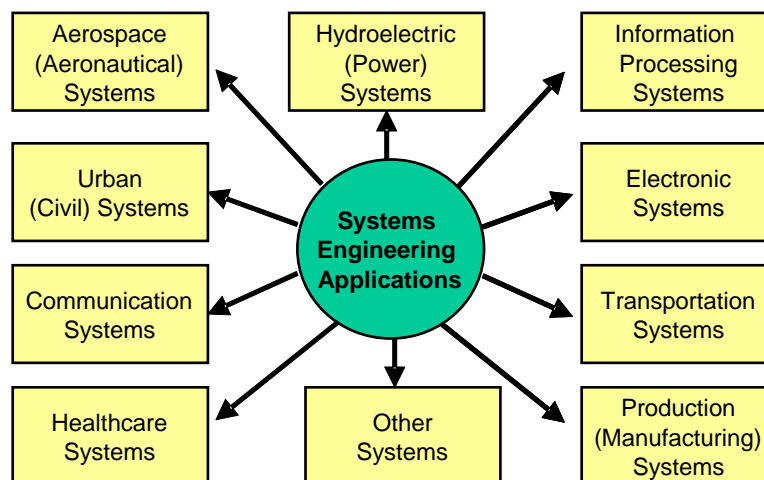


Figure 2. SE Applications [6]

The Institute for Systems Research at the University of Maryland [7] provides the following similarity and contrast between SE and other engineering disciplines:

As other engineering disciplines, systems engineering involves central concepts; uses specific methodologies; includes both analysis and synthesis or design; relies on mathematics to express knowledge; and stimulates research for further engineering benefit. However, systems engineering is qualitatively different. While other engineering disciplines concentrate on using knowledge of the real world (e.g., electrical circuits, materials, robotics), systems engineering finds its focus in constructs of analysis and synthesis for problems involving multiple aspects of the real world.

A strong curriculum needs to synthesize important perspectives from industry, other SE programs and other UNC Charlotte departments, and comply with the UNC Charlotte curriculum requirements. Figure 3 shows the BSSE curriculum design framework

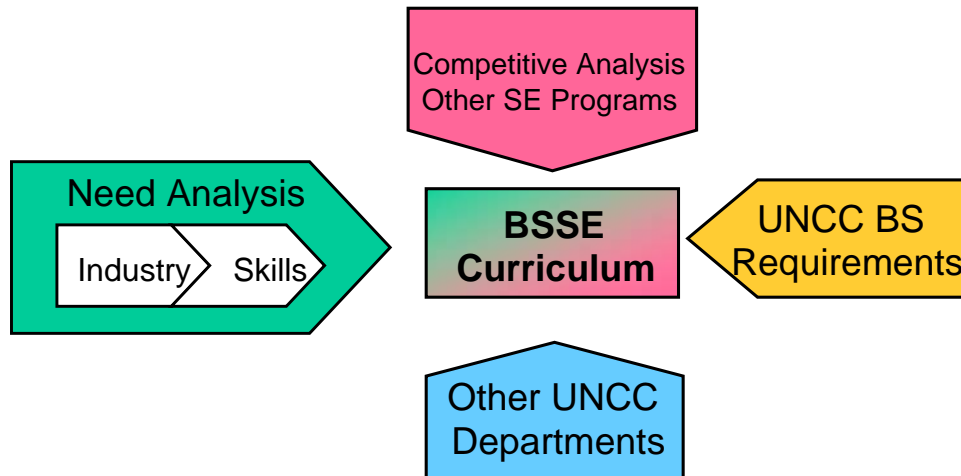


Figure 3. BSSE Curriculum Design Analysis Framework

As indicated in Figure 3, industry is the main driver and dictates the need for the skills gained through the completion of the BSSE degree program. The competitive analysis shows not only how the industry needs are addressed by academic institutions locally but also nationally. The input from other UNC Charlotte departments, especially within the College of Engineering provides benchmarking cases for the new BSSE curriculum. Other UNC Charlotte departments also provide courses that complement the core BSSE curriculum either as required or elective courses, as indicated in UNC Charlotte Undergraduate Requirements.

As shown above, the proposed BSSE program and its curriculum takes into account several key perspectives including industry needs and available programs. Based on our analysis, it is expected that the need for Systems Engineers and SE education will grow due to economic and population growth in the Charlotte region. Benchmarking against the major SE programs nationally indicates growing enrollment trends in the SE programs. Currently, in the state of North Carolina, there are no academic institutions offering a BSSE degree, and there are only a few programs at undergraduate and graduate levels that relate to SE. This picture indicates a shortage in the BSSE education in the state of North Carolina. Therefore, the proposed BSSE program will be timely and will also complement the existing Engineering Management (EMGT) Graduate Program.

B. List the education objectives of the program.

The educational objectives of the proposed B.S. program in Systems Engineering are as follows:

- Provide students with knowledge and educational opportunities in dealing with systems issues in the competitive global engineering and business environment.

- Produce engineers who will lead in (1) improving the understanding of global engineering issues and (2) developing effective approaches for engineering operations.
- Train engineers to possess the critical thinking, methodological, and communication skills required to advance and disseminate knowledge of systems engineering in supply chain operations.
- Provide educational opportunities to train the workforce needed to sustain the growth of global engineering operations/business in the state of North Carolina and the U.S.
- Enhance the educational experience in systems, management, and engineering for all undergraduate students at the institution.

We expect that the SE graduates can:

- Handle operational issues from a system perspective,
- Manage units with technical functions,
- Manage units with business and management functions,
- Handle interdisciplinary issues and problems,
- Make decisions at all levels of an organization from the top management problems, to strategic planning, product development and launching, production, marketing and sales, logistics support, and field services,
- Understand future trends in global markets and economy, and
- Manage multinational units, projects, and global supply chains.

C. Describe the relationship of the program to other programs currently offered at the proposing institution, including the common use of: (1) courses, (2) faculty, (3) facilities, and (4) other resources.

(1) Courses:

This program will have a common lower division (freshman and sophomore year) curriculum similar to all existing engineering programs, thus maximizing resources and providing students with an opportunity to choose a technical or management oriented systems area in the upper division. In addition, some upper division SE courses are already developed by the faculty members in the Engineering Management Program. SE students will also take technical elective courses from other engineering, business, or science programs based on their interest in the types of systems they want to study.

(2) Faculty Resources:

This program will share faculty resources with the existing Engineering Management Program. Currently, four full-time and two adjunct faculty members deliver the M.S. in Engineering Management program. Students will take elective courses from other engineering programs so faculty in other engineering departments will also support the BSSE Program for some upper division elective courses.

(3) Facilities:

The BSSE Program will be housed in the Kennedy Building and share space with the Engineering Management Program and other engineering programs located in the Smith Building and Cameron Hall.

(4) Other resources:

Other resources such as Engineering Computing and Library resources are available for use by the BSSE program. Computing applications such as computer-aided drafting and design, cost estimating, project management, statistical analysis and control, and supply chain management will be in place soon for the proposed program. The program will also use the available engineering resources in the Smith Building, Cameron Hall, and Duke Centennial Hall.

II. JUSTIFICATION FOR THE PROGRAM

A. Describe the proposed program as it relates to:

1. The institutional mission and strategic plan

UNC Charlotte's Mission Statement, approved by the University's Board of Trustees on September 27, 2002, states that:

With a broad institutional commitment to liberal education as the foundation for constructive citizenship, professional practice, and lifelong learning, UNC Charlotte is prepared to focus interdisciplinary resources to address seven broad areas of concern to the Charlotte region: 1) Liberal Education; 2) **Business and Finance**; 3) **Urban and Regional Development**; 4) Children, Families, and Schools; 5) Health Care and Health Policy; 6) **International Understanding and Involvement**; and 7) **Applied Sciences and Technologies**.

The proposed BSSE program has a strong connection to the highlighted items of 2, 3, 6, and 7. Therefore, the development of the Systems Engineering program strongly supports the Mission of the University. It is also identified in the new program development plan of the UNC Charlotte 2004-2009 Institutional Plan and is part of the William States Lee College of Engineering's strategic plan.

The proposed program is connected to a range of university goals including: (a) to provide services that impact positively the many challenges facing the region, state, and nation; (b) to train students who possess interdisciplinary skills and capacities that can be applied to a variety of situations and professions in an ever-changing global economy; (c) to improve educational opportunities that respond to the intellectual and professional needs of the region; (d) to increase both faculty and student research that will address fundamental and regional problems, (e) to provide a variety of services that respond to the ongoing and emerging regional needs, and (f) to graduate students with the breadth and depth of knowledge and the intellectual and professional skills that prepare them for a productive life in an ever-changing world.

2. Student demand

It is estimated that initial enrollments at the freshman level would range from 20 to 40 students depending upon the timing of the approval and subsequent recruiting efforts. With reasonable marketing and brand development, freshman enrollments are expected to increase from 30 to 50 per year within a few years. The program enrollment will likely stabilize between 120 and 150 students. These estimates are considered conservative given the high demand in industry for engineers with SE skills. The industry needs in the Charlotte metropolitan area and in the state of North Carolina provide unique opportunities for a Systems Engineering program, including outreach and collaboration with Charlotte area industry. The Engineering Management Program frequently receives inquiries from the Charlotte community desiring graduates with SE skills. Internally, there is interest among the current student body of UNC Charlotte and the College of Engineering (COE) for such a program and courses. The members of the COE Board of Advisors and Engineering Management Program's Industrial Advisory Board have endorsed this initiative as needed by the University's constituents.

3. Societal need (For graduate, first professional, and baccalaureate professional programs, cite manpower needs in North Carolina and elsewhere.)

As part of a strategic analysis, the UNC Charlotte Engineering Management Program identified the Charlotte area as the home to the headquarters of nine Fortune 500 companies including Bank of America, Wachovia Corp., Duke Energy, Nucor Corp., Sonic Automotive, SPX, Family Dollar, Goodrich Corp., and Lowe's. In addition, 306 other Fortune 500 companies are represented in the Charlotte area covering a variety of industries in the manufacturing, transportation and distribution, and financial services as shown in Figure 4.

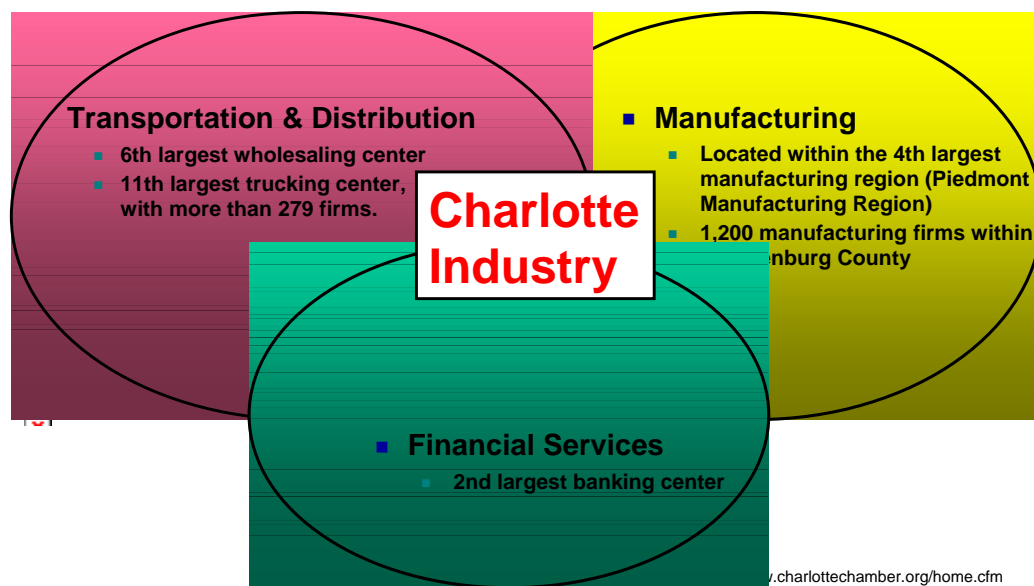


Figure 4. Local Industry Segmentation (based on [7])

According to the Charlotte Chamber of Commerce website, Charlotte is the 3rd best business location in the U.S. and accommodates the 7th highest new and expanded business activities [8]. Due to this dynamic business environment, 11,761 new jobs were generated in 2005. According to economic forecasts, the business index continues to be positive as it has been in the past five years, Figure 5. Because it also has one of the best real estate markets in the country with a cost of living lower than the national average and an active airport that facilitates easy access, migration to this area has increased dramatically over the past several years. The population of Mecklenburg County is expected to increase 19.3 percent from about 880,000 in 2007 to 1,050,000 in 2012, Figure 6. Due to the ever-improving business opportunities and increasing population, this region is expected to have a growing need for educational services at both the undergraduate and graduate levels.

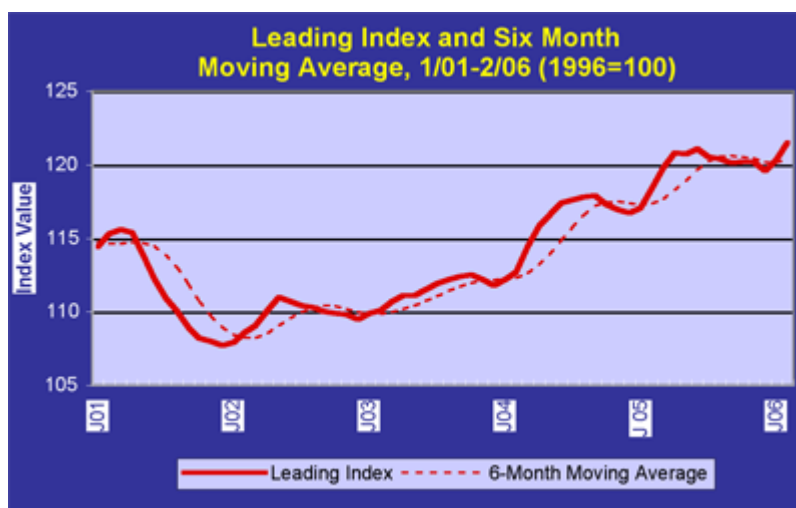


Figure 5. Business index for Charlotte (January 2001 – January 2006) [8].

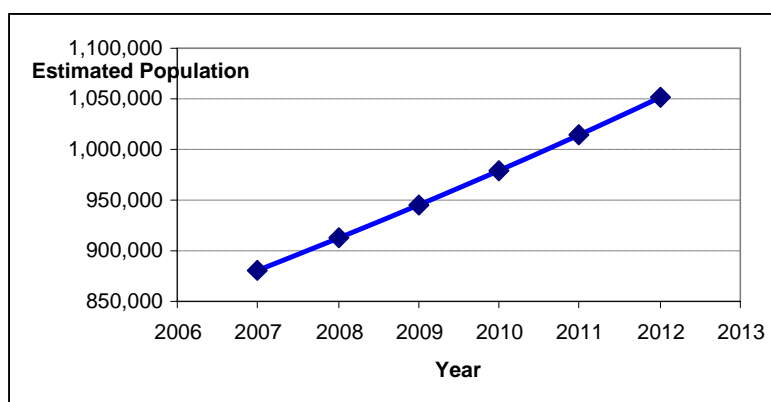


Figure 6. Estimated population growth for Mecklenburg County (2007-2012) [8].

Since the SE graduates will be prepared to work in a wide variety of industries, local industry needs from the major industrial sectors demonstrate that UNC Charlotte is an

excellent location for the new BSSE program. Based on our analysis, the following areas capture the main SE skills required in industry in the Charlotte area, in North Carolina, in the U.S., and globally:

- Decision and Risk Analysis
- Systems Modeling and Optimization
- Systems Design, Planning and Analysis
- Supply Chain and Logistics Engineering
- Quality Engineering
- Engineering Management
- Communication and Presentation
- Understanding of Global Business Dynamics

This shows that UNC Charlotte is a desired place to establish a program in SE. These skill needs were further mapped to different course requirements which helped us shape the final BSSE curriculum.

4. Impact on existing undergraduate and/or graduate academic programs of your institution. (e.g., Will the proposed program strengthen other programs? Will it stretch existing resources? How many of your programs at this level currently fail to meet Board of Governors' productivity criteria? Is there a danger of proliferation of low-productivity degree programs at the institution?)

This program in Systems Engineering will certainly strengthen the existing degree programs in the College of Engineering. Academic infrastructure is in place to support laboratory experiences and computing needs of the program. The existing engineering programs are growing quickly and will benefit from the synergy of the proposed Systems Engineering program. The SE elective courses will offer all engineering students some required knowledge in handling global business and engineering operations. All data indicate that this proposed program and all existing engineering programs will continue to grow at UNC Charlotte. All of the college's programs are high productivity programs and nearly 300 students graduate with BS degrees each year from the college's four departments. In addition, over 2400 students are enrolled in The William States Lee College of Engineering.

B. Discuss potential program duplication and program competitiveness

1. Identify similar programs offered elsewhere in North Carolina. Indicate the location and distance from the proposing institution. Include a) public and b) private institutions of higher education.

a) public institutions

Currently, there are no academic institutions offering BSSE degrees in the state of North Carolina. Among the 16 campuses of the UNC system, only four offer

systems engineering-related programs within their engineering program offerings. Among these four, only two are established departments (NC State and NC A&T), while the other two are either a graduate-level program (UNC Charlotte) or an undergraduate-level concentration area (ECU). These institutions and their programs are summarized in the following table. In addition, it is also noted that Duke University has a Master’s-level Engineering Management Program.

Institution	Program	Degrees Offered
North Carolina State University	Industrial & Systems Engineering Department	B.S., M.S. and Ph.D. in Industrial Engineering
North Carolina A&T State University	Industrial & Systems Engineering Department	B.S., M.S. and Ph.D. in Industrial Engineering
UNC Charlotte	The Engineering Management Program	M.S. in Engineering Management
East Carolina University (ECU)	Separate Systems Engineering and Engineering Management concentration areas under the undergraduate Engineering department that will be effective as of July 2006.	B.S. in Engineering
Duke University	The Engineering Management Program	Master of Engineering Management

Table 1. Systems Engineering-related programs within the state of North Carolina.

b) private institutions

Duke University has a Master’s-level Engineering Management Program and does not have a similar B.S. degree program in the Systems Engineering area.

This indicates an opportunity for systems engineering education in the state of North Carolina. The new BSSE program plans to meet the needs of citizens, industries, and businesses in this region and the state by building upon and expanding the mission of the current Engineering Management Program.

- 2. Indicate how the proposed new degree program differs from other programs like it in the University. If the program duplicates other UNC programs, explain a) why is it necessary or justified and b) why demand (if limited) might not be met through a collaborative arrangement (perhaps using distance education). If the program is a first professional or doctoral degree, compare it with other similar programs in public and private universities in North Carolina, in the region, and in the nation.**

As shown above, no similar programs exist in the state of North Carolina. Therefore, there is no issue of duplication. There are currently ten ABET accredited SE programs in the U.S. Systems Engineering programs currently are being accredited under

“Engineering: Other” category by ABET. ABET, Inc. is planning to establish a separated SE category for accreditation.

C. Enrollment (baccalaureate programs should include only upper division majors, juniors, and seniors).

Headcount enrollment

Show a five-year history of enrollments and degrees awarded in similar programs offered at other UNC institutions (using the format below for each institution with a similar program); indicate which of these institutions you consulted regarding their experience with student demand and (in the case of professional programs) job placement. Indicate how their experiences influenced your enrollment projections.

No other similar program existed in the UNC institutions.

Use the format in the chart below to project your enrollment in the proposed program for four years and explain the basis for the projections:

	Year 1 (2007-08)	Year 2 (2008-09)	Year 3 (2009-10)	Year 4 (2010-11)
Full-time	30	60	85	115
Part-time	0	0	5	5
TOTALS	30	60	90	120

Please indicate the anticipated steady-state headcount enrollment after four years:

Full-time 145 Part-time 5 Total 150

The projection is based on the discussions with executives and senior managers from local industry and the enrollment trends in major SE Programs discussed in Section III.A.1. The following student credit hour projection is based on 10 FTE upper division students in fall 2007, 20 FTE in fall 2008, 50 FTE in fall 2009, and 80 FTE in fall 2010.

SCH production (upper division program majors, juniors and seniors *only*, for baccalaureate programs). Use the format in the chart below to project the SCH production for four years. Explain how projections were derived from enrollment projections (see UNC website for a list of disciplines comprising each of the four categories).

Year 1: 2007-08	Student Credit Hours (SCH)		
Program Category	UG	Master's	Doctoral
Category I			
Category II			
Category III			
Category IV	320		

Year 2: 2008-09	Student Credit Hours (SCH)		
Program Category	UG	Master's	Doctoral
Category I			
Category II			
Category III			
Category IV	640		

Year 3: 2009-10	Student Credit Hours (SCH)		
Program Category	UG	Master's	Doctoral
Category I			
Category II			
Category III			
Category IV	1600		

Year 4: 2010-11	Student Credit Hours (SCH)		
Program Category	UG	Master's	Doctoral
Category I			
Category II			
Category III			
Category IV	2560		

III. Program Requirements and Curriculum

A. Program Planning

- 1. List the names of institutions with similar offerings regarded as high quality programs by the developers of the proposed program.**

In order to perform benchmarking and competitive analysis, a list of SE academic programs was obtained from the International Council of Systems Engineers' (INCOSE) web site (<http://www.incose.org/educationcareers/academicprogramdirectory.aspx>).

From the list of universities listed on the INCOSE web site, our analysis focused on the national universities that emphasized SE-related undergraduate studies. The following programs were analyzed to benchmark enrollment trends, SE course offerings and to identify concentration tracks:

1. Stanford University, Department of Management Science and Engineering
2. Virginia Polytechnic and State University, Grado Department of Industrial and Systems Engineering
3. University of Arizona, Department of Systems and Industrial Engineering
4. George Mason University, Department of Systems Engineering and Operations Research
5. Ohio State University, Department of Industrial, Welding and Systems Engineering
6. University of Virginia, Department of Systems and Information Engineering
7. University of Florida, Department of Industrial and Systems Engineering

Figure 7 shows an analysis of enrollment trends from these schools. In general, the trend shows an increase between 1998 and 2005. This trend can be considered a direct indicator for the increased need for Systems Engineers in the industry.

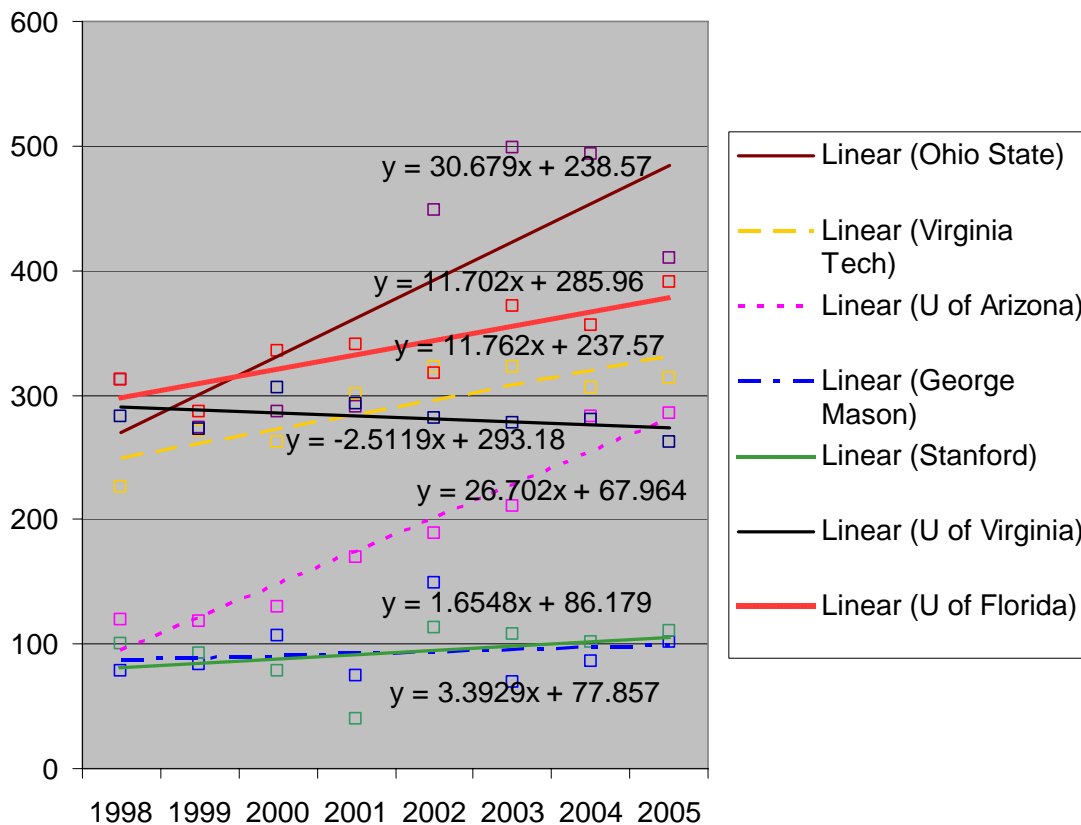


Figure 7. Enrollment Trends in Major SE Programs.

(Notes on Figure 7:

- 1) Trend lines are computed based on actual enrollment data
- 2) University of Arizona started posting Industrial Engineering, Systems Engineering and Engineering Management enrollment separately in 2005 but here all are added to make it comparable to previous years' data
- 3) Ohio State started posting Industrial and Systems Engineering and Welding Engineering separately in 2005 but here all are added to make it comparable to previous years' data.)

Based on the analysis of the curriculum and courses offered by each of these SE departments, the conclusions are:

1. The number of courses and concentration tracks vary from university to university, but their entire core curriculum addresses the major required SE skill areas identified in Section II.A.3.
 2. Stanford and George Mason offer as many as five concentration tracks. University of Arizona, Virginia Tech, and Ohio State do not create specific concentration tracks but allow their students to take elective courses to specialize in an area of their interest.
 3. The "total required number of credits" for graduation varies. The University of Arizona requires 128 credit hours, Virginia Tech requires 136 credit hours and George Mason requires 120 credit hours.
- 2. List other institutions visited or consulted in developing this proposal. Also list any consultants' reports, committee findings, and simulations (cost, enrollment shift, induced course load matrix, etc.) generated in planning the proposed program.**

None.

B. Admission. List the following:

- 1. Admissions requirements for proposed program (indicate minimum requirements and general requirements).**

Admissions requirements are the same as UNC Charlotte's The William States Lee College of Engineering admission requirements.

- 2. Documents to be submitted for admission (listing or sample).**

There are no documents required beyond those for general admission to UNC Charlotte's The William States Lee College of Engineering.

C. Degree requirements. List the following:

- 1. Total hours required. Major. Minor.**

The proposed program leading to the Bachelor of Science degree in Systems Engineering is a 123 semester-hour program.

2. Proportion of courses open only to graduate students to be required in program (graduate programs only).

Not applicable.

3. Grades required.

All candidates must earn an overall 2.0 to graduate. In addition, all candidates must meet The William States Lee College of Engineering progression requirements which require a C or better in all freshman classes and complete all Systems Engineering core courses (43 credits) with a C or better.

4. Amount of transfer credit accepted.

The Systems Engineering program at UNC Charlotte will provide three paths to earning the Bachelor of Science in Systems Engineering degree. Students may enroll in our programs in several ways: 1) as freshmen; 2) as transfers without a degree in engineering; or 3) as upper division transfers after completing a two-year Associate of Science (AS) degree in a relevant engineering curriculum at a community or technical college. Incoming students with an AS degree in related engineering areas will generally receive junior class standing, with 64 semester credit hours applied toward the 123 credits required for the Bachelor of Science in Systems Engineering degree. AS transfer student admission requires a 2.5 GPA at the community college.

5. Other requirements (e.g. residence, comprehensive exams, thesis, dissertation, clinical or field experience, second major, etc.)

None.

6. Language and/or research requirements.

None.

7. Any time limits for completion.

Not applicable.

D. List existing courses by title and number and indicate (*) those that are required. Include an explanation of numbering system. List (under a heading marked “new”) and describe new courses proposed.

Courses:	Credits
*ENGR 1201 Introduction to Engineering I	2
*ENGR 1202 Introduction to Engineering II	2
*ENGL 1101 English I	3
*ENGL 1102 English II	3
*MATH 1241 Calculus I	3
*MATH 1242 Calculus II	3
*MATH 2241 Calculus III	3
*MATH 2164 Matrices & Linear Algebra	3
*PHYS 2101 Physics I	3
*PHYS 2101 Lab Physics I Lab	1

*PHYS 2102 Physics II	3
*PHYS 2102 Lab Physics II Lab	1
*CHEM 1251 Chemistry I	3
*CHEM 1251L Chemistry I Lab	1
*ECON 1101 Economics for Non-Majors	3
*LBST 110X	3
*LBST 2101 Western Cultural and Historical Awareness	3
*LBST 2102 Global and Intercultural Connections	3
*LBST 221X	3
*STAT 3128 Prob. & Stat. for Engr.	3
*OPRS 3111 Operations Research -Deterministic	3
*OPRS 3113 Operations Research - Probabilistic	3
*ENGR 3295 Prof. Development	1
*ENGL 2116 Intro to Tech Comm. (W)	3
SE Core Courses (new):	
*SEGR 3111 Project Management (W)(O)	3
*SEGR 3290 Systems Design Project I (W)(O)	1
*SEGR 3291 Systems Design Project II (W)(O)	3
*SEGR 2101 Systems Engineering Concepts	3
*SEGR 2105 Computational Methods for Systems Engineering I	3
*SEGR 2106 Engineering Economic Analysis	3
*SEGR 3101 System Design and Deployment	3
*SEGR 3102 System Simulation, Modeling & Analysis	3
*SEGR 3103 Human System Interface	3
*SEGR 3105 Computational Methods for Systems Engineering II	3
*SEGR 3141 Quality Engineering	3
*SEGR 4102 Decision and Risk Analysis	3
*SEGR 4103 Network Modeling & Analysis	3
*SEGR 4113 Production Planning and Inventory Control	3
*SEGR 4141 Engineering Experimental Design	3
SE Technical Elective Courses (new):	
SEGR 2111 Introduction to Engineering Management	3
SEGR 2121 Introduction to Logistics Systems and Supply Chains	3
SEGR 4101 Engineering System Optimization	3
SEGR 4111 Value Engineering Management	3
SEGR 4112 Organizational Systems Management	3
SEGR 4121 Design & Planning of Logistics Sys. and Supply Chains	3
SEGR 4122 Implementation of Logistics Systems and Supply Chains	3
SEGR 4131 Computer Aided Design & Manufacturing	3
SEGR 4132 Facilities Planning & Material Handling Systems	3
SEGR 4133 Product and Process Design	3
SEGR 4134 Automation & Systems Design	3
SEGR 4135 Lean Manufacturing Systems	3
SEGR 4142 Reliability Management	3

New Course Descriptions:

SEGR 2101 Systems Engineering Concepts. (3) Prerequisite: Sophomore standing. This course provides the foundation for systems engineering processes and practices. The contents cover the discussion of current systems issues, basic systems engineering processes, and the roles of systems engineering professionals in a global business environment. It also will cover the principles of mechanical drawing and computer aided design (CAD) for systems engineering applications.

SEGR 2105 Computational Methods for Systems Engineering I. (3) Prerequisite: Sophomore standing. This course will introduce programming languages and computational tools that are often used by Systems Engineers. Programming in C and Matlab will be emphasized. Spreadsheet-based modeling will be introduced.

SEGR 2106 Engineering Economic Analysis. (3) Prerequisite: Sophomore standing and students should possess basic proficiency in Excel or SEGR 2105. Covers economic analysis of engineering alternatives, including time value of money, cash flow analysis, cost estimation, project evaluation, accounting and budgeting tools.

SEGR 2111 Introduction to Engineering Management. (3) Prerequisite: Sophomore standing. Focuses on the fundamentals in engineering management. It provides students the understanding of engineering management principles and practices and the roles of engineering management professionals in a global business environment.

SEGR 2121 Introduction to Logistics Systems and Supply Chains. (3) Prerequisite: Sophomore standing. Focuses on the fundamentals in logistics systems and supply chain operations. It provides students the understanding of the operations in logistics systems and global supply chains and the roles of logistics/supply chain professionals in global business environment.

SEGR 3101 System Design and Deployment. (3) Prerequisite: Senior standing and consent of instructor. Focuses on the basics of systems design, analysis, and implementation. It covers system design elements, system interface issues, system decomposition, and system integration. The emphasis is on the effective design and integration of system operations and successful deployment of systems design results.

SEGR 3102 System Simulation, Modeling and Analysis. (3) Prerequisite: STAT 3128. Focuses on the study of discrete-event simulation and its use in the analysis and design of systems. The emphasis is on using simulation software for simulation modeling and analysis with practical applications to design, analysis, and improvement of diverse systems.

SEGR 3103 Human System Interface. (3) Prerequisite: Senior standing and consent of instructor. Focuses on the interfacing issues between human, organization, and systems operations. The emphasis is on the influence of human and cultural factors related to the effectiveness of system operations in a global business environment.

SEGR 3105 Computational Methods for Systems Engineering II. (3) Prerequisite: SEGR 2105. This course covers numerical techniques for systems engineers such as

Polynomial interpolation, Numerical differentiation and integration, Newton and simple gradient methods for nonlinear equations.

SEGR 3111 Project Management. (3) Prerequisite: Junior or senior standing and consent of instructor. Focuses on the study of various aspects of project management techniques and issues, and the use of conceptual, analytical, and systems approaches in managing engineering projects and activities. It includes the development and writing of project plans and reports for engineering and business operations.

SEGR 3141 Quality Engineering. (3) Prerequisite: STAT 3128 and students should possess high proficiency in Excel or SEGR 2105. Topics include quality concepts, total quality management, statistical process control, continuous improvement, technology evaluation and selection, and additional quality tools and techniques.

SEGR 3290 Systems Design Project I. (1) Prerequisite: SE senior standing and consent of instructor. First of a two-semester sequence leading to a major integrative system design experience in applying the principles of systems design and analysis and project management to the design of a system. Teamwork and communication skills are emphasized. It focuses on the development of the project plan and proposal for the capstone systems design project. Each student develops a complete systems design project plan and proposal and makes an oral presentation of the proposal to the faculty. It runs in conjunction with the project management course.

SEGR 3291 Systems Design Project II. (3) Prerequisite: SEGR 3290. A continuation of SEGR 3290 for the execution of the proposed systems design project. This course includes a mid-term written progress report with an oral presentation and a final written report plus the final oral presentation to demonstrate project results.

SEGR 4090 Special Topics. (1-6) Directed study of current topics of special interest. (On demand)

SEGR 4101 Engineering System Optimization. (3) Prerequisite: Senior standing and consent of instructor. A systems engineering approach will be followed to analyze practical applications from different engineering disciplines and to optimize complex systems. Model formulation, sensitivity analysis, special cases, solutions using commercially available software applications and practical implementation considerations will be emphasized.

SEGR 4102 Decision and Risk Analysis. (3) Prerequisite: Senior standing and consent of instructor. This course aims to provide some useful tools for analyzing difficult decisions and making the right choice. After introducing components and challenges of decision making, the course will proceed with the discussion of structuring decisions using decision trees and influence diagrams. Decisions under conflicting objectives and multiple criteria will be covered as well as sensitivity and risk analysis.

SEGR 4103 Network Modeling and Analysis. (3) Prerequisite: Senior standing and OPRS 3111 or EMGT 4101. This course covers formulation and solution of optimization problems using network flow algorithms. Topics include minimum flow problems, shortest path, maximum flow, transportation, assignment, minimum spanning trees. Efficient solution algorithms are investigated.

SEGR 4111 Value Engineering Management. (3) Prerequisite: Senior standing and consent of instructor. Analyzes the requirements of a project to achieve the highest performance for essential functions at the lowest costs over the life of the project. The “best value” is achieved by a multidisciplinary team effort through the study of alternative design concepts, materials, and methods.

SEGR 4112 Organizational Systems Management. (3) Prerequisite: Senior standing and consent of instructor. Managing organizations from a complex systems perspective. Topics include systems analysis, strategic management, business environments and organizational transformation, and organizational behavior.

SEGR 4113 Production Planning and Inventory Control. (3) Prerequisite: Senior standing and OPRS 3111 or SEGR 4101. This course covers inventory control for constant and dynamic demand, deterministic and stochastic demand, single- and multi-period, continuous and period review policies. Production planning, aggregate planning, as well as material requirements planning are investigated.

SEGR 4121 Design and Planning of Logistics Systems and Supply Chains. (3) Prerequisite: Senior standing and SEGR 2121. This course focuses on key issues such as the supply chain strategy, logistics network design, contract management, demand and supply planning.

SEGR 4122 Implementation of Logistics Systems and Supply Chains. (3) Prerequisite: Senior standing and SEGR 4121. This course reviews and analyzes real-life logistics and supply chain implementation cases. Different industry supply chains are compared and benchmarking is emphasized through review of industry best practices.

SEGR 4131 Computer Aided Design and Manufacturing. (3) Prerequisite: Senior standing and consent of instructor. Focuses on the basics of hardware and software implementation in the design and manufacturing processes. The emphasis is in making the design and manufacturing processes effective and efficient for global business competition.

SEGR 4132 Facilities Planning and Material Handling Systems. (3) Prerequisite: Senior standing and consent of instructor. Focuses on the basics in facility planning, plant layout design, material handling systems design and integration, and warehousing. The emphasis is on the effective design and integration of plant layout, material handling systems, and warehousing for supply chain operations.

SEGR 4133 Product and Process Design. (3) Prerequisite: Senior standing and consent of instructor. Focuses on how to achieve a high-quality, customer-oriented product development process, from technology and product innovation, to design and development, leading up to production. Design for Six Sigma (DFSS) is the main technology and product design approach discussed in this class, among other design for x (DFx) approaches such as design for cost, safety, and environment.

SEGR 4134 Automation and Systems Design. (3) Prerequisite: Senior standing and consent of instructor. Focuses on the concepts of systems design, manufacturing systems design, manufacturing process control, shop floor control, and automation. The emphasis is on automation for economic and flexible manufacturing operations that can handle frequently changing global manufacturing requirements.

SEGR 4135 Lean Manufacturing Systems. (3) Prerequisite: Senior standing. This course helps students understand the fundamentals of how manufacturing operations work, and explore the latest techniques to make a manufacturing organization successful. This course discusses how lean methodology can eliminate waste and increase the speed in manufacturing while reducing cycle times.

SEGR 4141 Engineering Experimental Design. (3) Prerequisite: STAT 3128. Focuses on how to achieve high-quality/low-cost systems based on Taguchi methods, design of experiments methods, and statistical analysis of data. Also includes introduction to response surface methods.

SEGR 4142 Reliability Management. (3) Prerequisite: STAT 3128. Focuses on measuring, evaluating, improving and managing reliability. Topics include basic reliability models, hazard rate functions, system reliability, and fault tree analysis.

Proposed Course Numbering:

New courses within the BSSE program will be numbered to conform to the following numerical identification system:

1st number references the year the course is offered:

- 1 = Freshman
- 2 = Sophomore
- 3 = Junior and Senior
- 4 = Senior

2nd number references the type of the course that is offered:

- 0 = Special Topics
- 1 = Regular Lecture Courses
- 2 = Design and Project related courses

3rd number references the curriculum content area:

- 0 = General Systems area
- 1 = Systems Management area
- 2 = Logistics Systems area
- 3 = Production/Manufacturing area
- 4 = Quality/Reliability area
- 9 = Project/Professional development

4th number references the sequence the course holds within the curriculum content area:

- 1 = first course in curriculum content area sequence
- 2 = second course in curriculum content area sequence, etc.

IV. FACULTY

- A. List the names of persons on the faculty who will be directly involved in the proposed program. Provide complete information on each faculty member's education, teaching experience, research experience, publications, and experience in directing student research, including the number of theses and dissertations directed for graduate programs. The official roster forms approved by SACS can be submitted rather than actual faculty vita.**

Faculty Name	Highest Degree and Institution	Other degrees and Institutions
S. Gary Teng Professor & Director	Ph.D., Auburn University	M.S.I.E., Texas Tech University
Churlzu Lim Assistant Professor	Ph.D., Virginia Tech	M.S., Korea Advanced Institute of Science and Technology
Ertunga Ozelkan Assistant Professor	Ph.D., University of Arizona	M.S., University of Arizona
Yesim Sireli Assistant Professor	Ph.D., Old Dominion University	M.S., Istanbul Technical University

See attached faculty vita for complete information on each faculty member.

- B. Estimate the need for new faculty for the proposed program for the first four years. If the teaching responsibilities for the proposed program will be absorbed in part or in whole by the present faculty, explain how this will be done without weakening existing programs.**

Four current Engineering Management faculty members will be responsible for teaching for the BSSE program. It is anticipated that this new enrollment stream will warrant the additional new faculty members over the next five years to adequately deliver the program. The following table shows the staffing plan for the BSSE program and the planned SEEM Department between Year 2007 and Year 2012.

	2007-08	2008-09	2009-10	2010-11	2011-12
Number of new professors	0	1	1-2	1-2	1-2

- C. If acquisition of new faculty requires additional funds, please explain where and how these funds will be obtained.**

Faculty in the Systems Engineering program will be added through the campus' faculty-line allocation process. These positions will be justified through enrollment growth and student credit hour production targets being met.

- D. Explain how the program will affect faculty activity including course load, public service and scholarly research.**

No adverse effect is anticipated. In fact, the addition of new faculty hires will provide an additional catalyst for Systems Engineering research, scholarly publication, and community outreach activity.

V. LIBRARY

A. Provide a general statement as to the adequacy of present library holdings for the proposed program.

Present library holdings are adequate to support the proposed program. The needs for this program area are very similar to the needs of Engineering Management area. The Library owns or has electronic access to sufficient journals and electronic resources specific to the Engineering Management area and this area. In addition, the library has approximately 40 electronic databases, many with links to full text articles.

B. State how the library will be improved to meet program requirements for the next five years. The explanation should discuss the need for books, periodicals, reference materials, primary source materials, etc. What additional library support must be added to areas supporting the proposed program?

No additional library support, other than the ongoing purchases for materials in this and the interrelated Engineering and Engineering Management programs, is necessary to support the program. Holdings are current and quite adequate to support this new degree program as is.

C. Discuss the use of other institutional libraries

The library's participation in an interlibrary loan consortium provides another means of effectively supporting research and instructional needs.

VI. FACILITIES AND EQUIPMENT

A. Describe facilities available for the proposed program.

The proposed program will share facilities with the existing Engineering Management program in the Kennedy Building and other College of Engineering facilities including the Smith Building, Cameron Hall, Woodward Hall, and Duke Centennial Hall. A SE computing laboratory is currently being built in the Kennedy Building for SE computing needs. Additional laboratories will be developed to support the SE area.

B. Describe the effect of this new program on existing facilities and indicate whether they will be adequate, both at the commencement of the program and during the next decade.

Existing facilities are adequate to support the program at its commencement and during the next decade.

C. Discuss any information technology services needed and/or available.

Existing information technology services and engineering computing capabilities are adequate to support the program. The Lee College provides an integrated computing

environment termed Mosaic that supports the 2400 students enrolled in the College. This computing network has the capacity to handle the additional students indicated in this proposal.

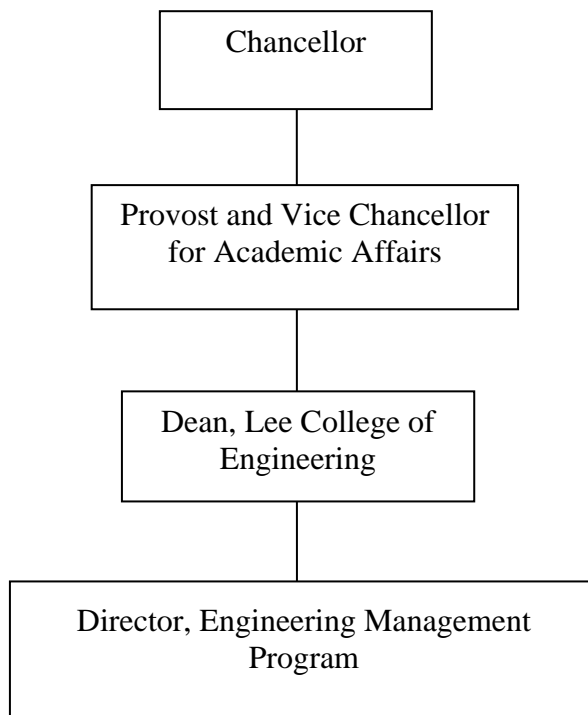
D. Discuss sources of financial support for any new facilities and equipment.

Existing facilities and equipment are in place. Any additional new facilities or equipment will be funded through normal University funding sources. Supplemental funding from private sources and industry will also be used for program enhancements.

VII. ADMINISTRATION

Describe how the proposed program will be administered giving the responsibilities of each department, division, school, or college. Explain any inter-disciplinary or inter-unit administrative plans. Include an organizational chart showing the “location” of the proposed program.

The proposed program will be administered by the Engineering Management Program that reports to the Engineering Dean’s Office. A new department, Department of Systems Engineering and Engineering Management is planned to ultimately house the program.



VIII. ACCREDITATION

Indicate the names of all accrediting agencies normally concerned with programs similar to the one proposed. Describe plans to request professional accreditation. If the proposed new degree program is at a more advanced level than those previously authorized or if it is in a new discipline division, was SACS notified of a potential “substantive change” during the planning process? If so, describe the response from SACS and the steps that have been taken to date with reference to the applicable procedure.

The program will seek accreditation by ABET. ABET, Inc., is the recognized U.S. accreditor of college and university programs in applied science, computing, engineering, and technology. The BSSE program will seek an ABET visit and accreditation in Systems Engineering under “Engineering: Other” category after the first cohort of students graduate. There may be a Systems Engineering category at that time since ABET is working on establishing such a category.

IX. SUPPORTING FIELDS

Are other subject-matter fields at the proposing institution necessary or valuable in support of the proposed program? Is there needed improvement or expansion of these fields? To what extent will such improvement or expansion be necessary for the proposed program?

Beyond general education and major field coursework, the proposed program includes additional supporting coursework in mathematics, physics, chemistry, and economics consistent with other engineering majors on campus. In addition, this program requires completion of a set of technical electives from SE, other engineering areas, business areas, and science areas. Anticipated growth of the program might require additional faculty resources in support of the program and these will be supported through the normal enrollment mechanisms.

X. ADDITIONAL INFORMATION

Include any additional information deemed pertinent to the review of this new degree program proposal.

Not applicable.

XI. BUDGET

Provide estimates (using the attached form) of the **additional costs** required to implement the program and identify the proposed sources of the additional required funds. *Use SCH projections (section II.C.) to estimate new state appropriations through enrollment increase funds.* Prepare a budget schedule for each of the first three years of the program, indicating the account number and name for all additional amounts required. Identify EPA and SPA positions immediately below the account listing. New SPA positions should be listed at the first step in the salary range using the SPA classification rates currently in effect. Identify any larger or specialized equipment and any **unusual** supplies requirements.

For the purposes of the second and third year estimates, project faculty and SPA position rates and fringe benefits rates at first year levels. *Include the continuation of previous year(s) costs in second and third year estimates.*

Additional state-appropriated funds for new programs may be limited. Except in exceptional circumstances, institutions should request such funds for no more than three years (e.g., for start-up equipment, new faculty positions, etc.), at which time enrollment increase funds should be adequate to support the new program. Therefore it will be assumed that requests (in the “New Allocations” columns of the following worksheet) are for one, two, or three years unless the institution indicates a continuing need and attaches a compelling justification. However, funds for new programs are more likely to be allocated for limited periods of time.

See Appendix A for detailed estimates of additional costs in the first three years of program operation.

XII. EVALUATION PLANS

All new degree program proposals and degree program track descriptions must include an evaluation plan which includes: (a) the criteria to be used to evaluate the quality and effectiveness of the program, (b) measures to be used to evaluate the program, (c) expected levels of productivity of the proposed program/track for the first four years of the program (numbers of graduates), (d) the names, addresses, and telephone numbers of at least three persons...qualified to review this proposal and to evaluate the program once operational, and (e) the plan and schedule to evaluate the proposed new degree program prior to the completion of its fifth year of operation once fully established.

A. Criteria to be used to evaluate the proposed program (not in an order of priority).

This program will be assessed by The William States Lee College of Engineering’s existing robust assessment process that was developed to satisfy ABET guidelines as well as internal requirements. The existing engineering programs are assessed with this integrated program and course assessment process that external consultants have described as outstanding based upon their recent evaluation of the programs and processes. Criteria which will be used include but are not limited to the:

1. ability to attract students
2. quality of instruction
3. quality of program faculty
4. ability to produce graduates
5. quality and competence of graduates
6. career mobility and success
7. satisfaction of construction industry employers

B. Measures to be used to evaluate the program:

Various measures, both direct and indirect, are currently used to evaluate our existing programs. Those same measures will be applied to the proposed systems engineering program. Those measures include, but are not limited to:

1. student enrollments
2. scores on student course evaluations
3. annual and post-tenure reviews of faculty
4. number of graduates produced
5. graduate grade point averages and results of nationally-normed tests where applicable
6. satisfaction of alumni on surveys
7. satisfaction of employers on surveys

The college has instituted a hierarchy of processes for evaluating performance of all its programs. This hierarchy includes an Individual Course Assessment Process (ICAP), Focus Area Improvement Teams (FAIT) for review content areas and Program Objective Evaluation (PROBE) that engages external constituencies to review objectives at the highest level.

C. Projected productivity levels (numbers of graduates):

	Year 1 (2007-2008)	Year 2 (2008-2009)	Year 3 (2009-2010)	Year 4 (2010-2011)	TOTALS
B	0	0	5-10	10-20	15-30
M					
I/P					
D					

Ultimately, graduation rates are expected on the order of 40 to 50 students per year when the program has reached full maturity within six to eight years.

D. Recommended consultants/reviewers: Names, titles, addresses, e-mail addresses, and telephone numbers. May not be employees of the University of North Carolina.

- 1. Dr. John V. Farr, P.E.**
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Stevens Institute of Technology
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Phone: (201)-216-8103/8025
FAX: (201) 216-5541
- 2. Dr. William J. Daughton**
Professor and Chair
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Phone: (573) 341-7555
FAX: (573) 341-6567
- 3. Dr. J T. Black, P.E.**
Professor Emeritus
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Phone: (334) 844-1375
Fax: (334) 844-1381
- 4. Dr. Donald N. Merino, P.E.**
Alexander Crombie Humphreys Chair of Economics of Engineering
Department of Systems Engineering and Engineering Management
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Phone: (201) 216-5504
FAX: (201) 216-8355

E. Plan for evaluation prior to sixth operational year.

Normal program/department level assessments will occur as outlined in the Strategic Plan. ABET accreditation is based on an ongoing continuous improvement process that is implemented college-wide. In addition, during year 5 of this new program, a comprehensive program review, which will include external evaluators, will be conducted. Also, it is anticipated that the program will seek ABET accreditation within this five-year window which will require a comprehensive self-assessment and assessment by a visiting team. The current Program Director has gone through two ABET evaluator trainings and has a clear understanding of the ABET evaluation process. Hence,

other engineering department chairs, and engineering deans can provide guidance for assessment and compliance with ABET accreditation requirements.

IX. REPORTING REQUIREMENTS

Institutions will be expected to report on program productivity after one year and three years of operation. This information will be solicited as a part of the biennial long-range planning revision.

Proposed date of initiation of proposed degree program: August 13, 2007

This proposal to establish a new program has been reviewed and approved by the appropriate campus committees and authorities.

Chancellor Philip J. Ambrose Date 5/28/07

Appendices:

Appendix A: Budget projections for the first three years of program operation

Appendix B: Letters of Support

Appendix C: Faculty Curriculum Vitas

Appendix D: References

Appendix E: Proposed BSSE Four-Year Curriculum

Appendix A

Budget projections for the first three years of program operation

**Projected Funding for New Degree Program
 Bachelor of Science in Systems Engineering
 Regular Term 2007-2008
 (Based on 2006-2007 Change in Student Credit Hours)**

Program Category	Change in Student Credit Hours			Instructional - Position Funding Factors			Instructional Positions Required		
	Undergrad	Masters	Doctoral	Undergrad	Masters	Doctoral	Undergrad	Masters	Doctoral
Category I				708.64	169.52	115.56	0.000	0.000	0.000
Category II				535.74	303.93	110.16	0.000	0.000	0.000
Category III				406.24	186.23	109.86	0.000	0.000	0.000
Category IV				232.25	90.17	80.91	0.000	0.000	0.000

Fringe rates for staff
 FICA @ 7.65%
 Retirement @ 7.14%
 Medical @ \$3,854

Fringes for faculty salaries
 FICA @ 7.65%
 Retirement @ 11.16%
 Medical @ \$3,854

	\$0
	\$0
	\$0
	<u>\$0</u>

Total Positions Required		0.000
Instructional - Position Salary Rate	(FY 02)	<u>\$72,431</u>
101-1310 Instructional Salary Amount		\$0
Other Academic Costs	44.89300%	<u>0</u>
Purpose 101 Total Academic Requirements		\$0
Purpose 151 Library	11.48462%	0
Purposes 152, 160, 170 180 General Instit Support	54.04980%	0
Neg Adj Factor	50.00000%	n/a
In-state SCHs	0	
Financial Aid (in-state)	67.99800%	<u>0</u>
Total Requirements		<u>\$0</u>

SUMMARY OF ESTIMATED ADDITIONAL COSTS FOR PROPOSED PROGRAM/TRACK

<i>Institution</i>	UNC Charlotte			<i>Date</i>	April 16, 2007	
<i>Program (API#, Name, Level)</i>	14.2701 Systems Engineering					
<i>Degree(s) to be Granted</i>	B.S.S.E.			<i>Program Year</i>	2007-08	
ADDITIONAL FUNDING REQUIRED - BY SOURCE						
	Reallocation of Present Institutional Resources	Enrollment Increase Funds	Federal/State or Other Non-state Funds (Identify)	New Allocations	Total	
101 Regular Term Instruction						
1210 SPA Regular Salaries	\$0				\$0	
1110 EPA Non-teaching Salaries					0	
1310 EPA Academic Salaries	0				0	
1810 Social Security	0				0	
1820 State Retirement	0				0	
1830 Medical Insurance (3432*X)	0				0	
2000 Supplies and Materials	1,000				1,000	
2300 Educational Supplies					0	
2600 Office Supplies	1,000				1,000	
3000 Current Services	1,700				1,700	
3100 Travel	1,000					
3200 Communications	200					
3400 Printing & Binding	500					
5000 Capital Outlay (Equipment)	0				0	
5100 Office Equipment	0					
5200 EDP Equipment	0					
TOTAL Regular Term Instruction	\$2,700	\$0	\$0	\$0	\$2,700	
151 Libraries						
5000 Capital Outlay (Equipment)		0			0	
5600 Library Book/Journal						
TOTAL Libraries	\$0	\$0	\$0	\$0	\$0	
189 General Institutional Support						
2000 Supplies and Materials					0	
2600 Office Supplies						
3000 Current Services					0	
3200 Communications						
3400 Printing & Binding						
5000 Capital Outlay (Equipment)					0	
5100 Office Equipment						
5200 EDP Equipment						
TOTAL General Inst. Support	\$0	\$0	\$0	\$0	\$0	
TOTAL ADDITIONAL COSTS	\$2,700	\$0	\$0	\$0	\$2,700	

NOTE: Accounts may be added or deleted as required.

**Projected Funding for New Degree Program
Bachelor of Science in Systems Engineering
Regular Term 2008-2009
(Based on 2007-2008 Change in Student Credit Hours)**

Program Category	Change in Student Credit Hours			Instructional - Position Funding Factors			Instructional Positions Required		
	Undergrad	Masters	Doctoral	Undergrad	Masters	Doctoral	Undergrad	Masters	Doctoral
Category I				708.64	169.52	115.56	0.000	0.000	0.000
Category II				535.74	303.93	110.16	0.000	0.000	0.000
Category III				406.24	186.23	109.86	0.000	0.000	0.000
Category IV	320			232.25	90.17	80.91	1.378	0.000	0.000

Fringe rates for staff
FICA @ 7.65%
Retirement @ 7.14%
Medical @ \$3,854

Fringes for faculty salaries
FICA @ 7.65%
Retirement @ 11.16%
Medical @ \$3,854

	\$7,634
	\$11,137
	\$5,310
	<hr/>
	\$24,082
	<hr/>

Total Positions Required		1.378
Instructional - Position Salary Rate	(FY 02)	\$72,431
101-1310 Instructional Salary Amount		\$99,797
Other Academic Costs	44.89300%	44,802
Purpose 101 Total Academic Requirements		\$144,599
Purpose 151 Library	11.48462%	16,607
Purposes 152, 160, 170 180 General Instit Support	54.04980%	78,156
Neg Adj Factor	50.00000%	n/a
In-state SCHs	0	
Financial Aid (in-state)	67.99800%	0
Total Requirements		\$239,362

SUMMARY OF ESTIMATED ADDITIONAL COSTS FOR PROPOSED PROGRAM/TRACK

Institution UNC Charlotte Date April 16, 2007
 Program (API#, Name, Level) 14.2701 Systems Engineering
 Degree(s) to be Granted B.S.S.E. Program Year 2008-09

ADDITIONAL FUNDING REQUIRED - BY SOURCE

	Reallocation of Present Institutional Resources	Enrollment Increase Funds	Federal/State or Other Non-state Funds (Identify)	New Allocations	Total
101 Regular Term Instruction					
1210 SPA Regular Salaries					\$0
1110 EPA Non-teaching Salaries					0
1310 EPA Academic Salaries	0	99,797	0		99,797
Associate Professor		90,000			
Adjunct		9,797			
1810 Social Security	0	7,634			7,634
1820 State Retirement	0	10,044			10,044
1830 Medical Insurance		3,854			3,854
2000 Supplies and Materials		9,000			9,000
2300 Educational Supplies		6,000			
2600 Office Supplies		3,000			
3000 Current Services		12,270			12,270
3100 Travel		6,000			
3200 Communications		3,000			
3400 Printing & Binding		3,270			
5000 Capital Outlay (Equipment)		2,000			2,000
5100 Office Equipment		2,000			
5200 EDP Equipment		0			
TOTAL Regular Term Instruction	\$0	\$144,599	\$0	\$0	\$144,599
151 Libraries					
5000 Capital Outlay (Equipment)		16,607			16,607
5600 Library Book/Journal		16,607			
TOTAL Libraries	\$0	\$16,607	\$0	\$0	\$16,607
189 General Institutional Support					
2000 Supplies and Materials		26,100			26,100
2600 Office Supplies		20,000			
3000 Current Services		26,100			26,100
3200 Communications		13,050			
3400 Printing & Binding		13,050			
5000 Capital Outlay (Equipment)		25,956			25,956
5100 Office Equipment		13,000			
5200 EDP Equipment		26,000			
TOTAL General Inst. Support	\$0	\$78,156	\$0	\$0	\$78,156
TOTAL ADDITIONAL COSTS	\$0	\$239,362	\$0	\$0	\$239,362

NOTE: Accounts may be added or deleted as required.

**Projected Funding for New Degree Program
Bachelor of Science in Systems Engineering
Regular Term 2009-2010
(Based on 2008-2009 Change in Student Credit Hours)**

Program Category	Change in Student Credit Hours			Instructional - Position Funding Factors			Instructional Positions Required		
	Undergrad	Masters	Doctoral	Undergrad	Masters	Doctoral	Undergrad	Masters	Doctoral
Category I				708.64	169.52	115.56	0.000	0.000	0.000
Category II				535.74	303.93	110.16	0.000	0.000	0.000
Category III				406.24	186.23	109.86	0.000	0.000	0.000
Category IV	320			232.25	90.17	80.91	1.378	0.000	0.000

Fringe rates for staff
FICA @ 7.65%
Retirement @ 7.14%
Medical @ \$3,854

Fringes for faculty salaries
FICA @ 7.65%
Retirement @ 11.16%
Medical @ \$3,854

	\$7,634
	\$11,137
	\$5,310
	<hr/>
	\$24,082

Total Positions Required		1.378
Instructional - Position Salary Rate	(FY 02)	<u>\$72,431</u>
101-1310 Instructional Salary Amount		\$99,797
Other Academic Costs	44.89300%	<u>44,802</u>
Purpose 101 Total Academic Requirements		\$144,599
Purpose 151 Library	11.48462%	16,607
Purposes 152, 160, 170 180 General Instit Support	54.04980%	78,156
Neg Adj Factor	50.00000%	n/a
In-state SCHs	0	
Financial Aid (in-state)	67.99800%	<u>0</u>
Total Requirements		<u>\$239,362</u>

SUMMARY OF ESTIMATED ADDITIONAL COSTS FOR PROPOSED PROGRAM/TRACK

Institution		UNC Charlotte		Date		April 16, 2007	
Program (API#, Name, Level)		14.2701 Systems Engineering		Program Year		2009-2010	
Degree(s) to be Granted		B.S.S.E.					
ADDITIONAL FUNDING REQUIRED - BY SOURCE							
	Reallocation of Present Institutional Resources	Enrollment Increase Funds	Federal/State or Other Non-state Funds (Identify)	New Allocations	Total		
101 Regular Term Instruction							
1210 SPA Regular Salaries							\$0
1110 EPA Non-teaching Salaries							0
1310 EPA Academic Salaries	0	99,797					99,797
Assistant Professor		85,000					
Adjunct		14,797					
1810 Social Security	0	7,634					7,634
1820 State Retirement	0	9,486					9,486
1830 Medical Insurance		3,854					3,854
2000 Supplies and Materials		9,000					9,000
2300 Educational Supplies		6,000					
2600 Office Supplies		3,000					
3000 Current Services		8,500					8,500
3100 Travel		4,000					
3200 Communications		3,500					
3400 Printing & Binding		1,000					
5000 Capital Outlay (Equipment)		6,328					6,328
5100 Office Equipment		2,000					
5200 EDP Equipment		4,328					
TOTAL Regular Term Instruction	\$0	\$144,599	\$0	\$0	\$0	\$144,599	
151 Libraries							
5000 Capital Outlay (Equipment)		16,607					16,607
5600 Library Book/Journal		16,607					
TOTAL Libraries	\$0	\$16,607	\$0	\$0	\$0	\$16,607	
189 General Institutional Support							
2000 Supplies and Materials		26,100					26,100
2600 Office Supplies		26,100					
3000 Current Services		26,100					26,100
3200 Communications		13,050					
3400 Printing & Binding		13,050					
5000 Capital Outlay (Equipment)		25,956					25,956
5100 Office Equipment		13,000					
5200 EDP Equipment		12,956					
TOTAL General Inst. Support	\$0	\$78,156	\$0	\$0	\$0	\$78,156	
TOTAL ADDITIONAL COSTS	\$0	\$239,362	\$0	\$0	\$0	\$239,362	

NOTE: Accounts may be added or deleted as required.

Appendix B

Letters of Support

J. Murrey Atkins Library

Consultation on Library Holdings

To: Dr. Gary Teng
College of Engineering Management Program &
Center for Lean Logistics & Engineered Systems

From: Joanne S. Klein
Reference Librarian, Engineering and Information Technology

Date: January 31, 2007

Subject: New Undergraduate Program in Systems Engineering

Summary of Librarian's Evaluation of Holdings:

Evaluator: Joanne S. Klein **Date:** 1/31/07

Check One:

1. Holdings are superior
2. **Holdings are adequate (Please see comments) YES**
3. Holdings are adequate only if Dept. purchases additional items.
4. Holdings are inadequate

Comments:

A search of the Atkins Library online catalog reveals the following holdings in support of this program. See the table that follows. A search in the areas of Systems Engineering and related subjects retrieved 6347 pertinent items. Of this total, 1038 have been acquired since 2000, so this is a current and relevant collection. Because there is some overlap of subject headings, the actual total number of titles will be less than this, but the collection, especially if bolstered by ongoing purchases, is quite adequate to support this program. The Library owns or has electronic access to 126 journals and 753 other electronic resources that support this program. In addition, the library has approximately 10 electronic databases, many with links to full text articles, supporting the overall Engineering Management program.

Joanne S. Klein

Evaluator's Signature

January 31, 2007

Date

**Atkins Library Holdings in Areas Related to
 Systems Engineering
 1/31/07**

Subject Heading	All Books	Post 2000	Journals	Electronic Resources
Automation	1351	132	41	122
CAD/CAM Systems	71	9	0	5
Computer Aided Design	292	40	4	36
Decision Support Systems	67	15	0	7
Engineering Management	91	7	5	16
Facility Management	20	7	0	1
Industrial Engineering	109	7	6	12
Inventory Control	273	51	6	57
Logistics	167	30	3	42
Manufacturing Processes	86	15	0	10
Materials Handling	59	1	0	4
Mathematical Model*	84	8	0	5
Numerical Analysis	500	31	17	42
Process Control	154	18	0	14
Product Management	132	32	0	15
Production Management	393	81	11	38
Project Management	408	174	0	63
Quality Assurance	148	21	0	14
Quality Control	1055	209	13	135
Risk Assessment	108	89	3	45
Simulation Methods	506	40	9	31
Systems Engineering	221	15	8	35
Value Analysis	52	6	0	4
Totals	6347	1038	126	753

GENERAL DYNAMICS
Armament and Technical Products

November 3, 2006

S. Gary Teng, Ph.D., P.E.
Professor and Director
Engineering Management Program &
Center for Lean Logistics & Engineered Systems
The University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223

Dear Dr. Teng:

GDATP strongly supports the development of a systems engineering program at the College of Engineering at The University of North Carolina at Charlotte. The success of our business depends on our ability to meet the product and service needs of the United States Department of Defense. Systems engineering plays a critical role in defining our customers' needs and required functionality. System engineering concepts, processes, methods, and tools enable our engineers and managers to manage the ever increasing array of technologies employed in today's defense products and services.

Our organization depends on an educated workforce prepared to solve complex problems. The inter-disciplinary education and training of systems engineering develops individuals ready to meet the challenges of global competition. System engineering is an urgent need and critical element of our strategy. A system engineering program at the University will provide the technical expertise vital to our company.

Sincerely,



Steve Elgin
Sr. Director, Detection Systems Operations
General Dynamics Armament and Technical Products

William H. Bath Jr.
3410 Twelve Oaks Place
Charlotte, NC 28270
704.302.6800
billbath@hotmail.com

26 October 2006

S. Gary Teng, Ph.D., P.E.
Professor & Director
Engineering Management Program & CLLES
The University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223

Dear Dr. Teng,

Recently, at our semi-annual UNCC EMGT Advisory Board meeting, the Board had a chance to review the proposed Bachelor of Science in Systems Engineering (BSSE) goals and curriculum outline. The Systems Engineering and the Engineering Management Department and Degree Programs are critical to the future success of UNCC.

Good supply chain design (inventory minimization while maximizing fill rates and customer satisfaction, for example) does not happen by chance. The abilities to understand complex supply chains and to design system solutions are valuable skills that many companies and industries are in need of today. When put in real-world situations, graduates from this program will be able to align multiple functions across entire businesses – from customers through multiple tiers in the supply base. The ability to comprehend the extended enterprise's supply chain will position students to manage financial and decision risk - the most critical skill needed in business today.

The future of manufacturing and order fulfillment in the US relies on flexibility and the ability for companies to deliver customized product in a compressed timeframe. These degree programs will help them develop a broader understanding of business beyond the traditional silo functions of companies today (i.e. purchasing, planning, manufacturing, etc.) These programs will teach the tools for UNCC students to design efficient and effective supply chains and to become business leaders for the future.

I fully endorse the creation of the Systems Engineering and the Engineering Management Department and Degree Programs at the University of North Carolina at Charlotte.

Best Regards,



William H. Bath Jr.
Independent Management Consultant
Member, UNCC EMGT Advisory Board
Member, Monroe Economic Development Commission



October 20, 2006

S. Gary Teng, Ph.D., P.E.
Professor & Director, Engineering Management Program &
Center for Lean Logistics & Engineered Systems
The University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223

Dear Dr. Teng:

On behalf of the Material Handling Industry of America (MHIA) trade association and its national/international membership, I am pleased to endorse the University of North Carolina at Charlotte's proposal to establish a B.S. in Systems Engineering degree program, particularly one with an application and research concentration on logistics systems.

Given the rate of expansion of warehousing, distribution and logistics services in Charlotte and the surrounding region, the Systems Engineering program will be a valuable addition to the area, the state of North Carolina and the Southeast. The techniques that are learned and utilized in such programs are also widely applicable to many other engineering and business issues faced by our member companies.

The proposals for the BSSE degree program and the Systems Engineering and Engineering Management Department contain a mix of courses and experiences that closely match what we feel are the key components for understanding how to solve real world systems problems while setting a firm foundation for advanced graduate and research work.

Since our association is based in Charlotte, this degree program and department would serve as a valuable local resource. Our association pledges its support to work with the new degree program as a strong resource for interesting industry applications. We look forward to many valuable interactions with the program and department.

Sincerely,

Michael Ogle, Ph.D.
Managing Director, College Industry Council on Material Handling Education
Senior Director of Technical & Engineering Services, Material Handling Industry of America

Teng, Sheng-hsien

From: baorr@charter.net [baorr@charter.net]
To: Teng, Sheng-hsien
Cc:
Subject:
Attachments:

Sent: Mon 11/20/2006 8:59 PM

S. Gary Teng, Ph.D., P.E.
Professor & Director
Engineering Management Program &
Center for Lean Logistics & Engineered Systems
The University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223 TEL: (704) 687-3989

Dear Dr Teng,

This letter is to express my support for the establishment of the B.S. in Systems Engineering degree program and the new Systems Engineering and Engineering Management Department. The need of this BSSE program in industry, in the US, the State of NC, and the Charlotte region is evident and required in order to enhance the education of our workforce, promote the economic attractiveness to new industry of the region and to work in concert with existing industry to firm up and help sustain a competitive advantage in the global marketplace. UNCC is strategically located in the largest metropolitan and fastest growing area in the Carolinas. The engineering school provides a much needed venue to provide a platform for this new and significantly needed curriculum and BSEE program. I appreciate your great leadership, consideration and support of this effort.

Sincerely
Barbara B. Orr, P.E.
VP Duke Energy Power Delivery(retired)

November 21, 2006

To whom it may concern:

Dr. Gary Teng's positive energy and organizational thought to create an engineering program for students to have a working body of knowledge from operational issues, technical and administrative functions and the important role they play within systems engineering and managing across multinational lines of supply and communication is what businesses will require from the engineering community in the immediate future. Engineers who graduate with the full compliment of interdisciplinary and technical skills will be better prepared to meet the challenges facing any business today.

Businesses whether they are in medical, automotive, transportation, construction, or environmental, areas will require the engineer to have the skills necessary to problem solve, work in group settings, handle change effortlessly, and communicate the issues. The Systems Engineering and Engineering Management degree program that will be offered by UNCC will be on the leading edge of tomorrow's engineering programs across the country.

I have been associated for over thirty years with steel, automotive and consumer goods industries and recognize how critical the engineering function is to an organization. I personally believe that the investment in UNCC Systems Engineering and Engineering Management degree program will further advance the engineering student to be better prepared for any business environment chosen.

I support Dr. Teng's effort at the UNCC for this type of Engineering initiative.

With kind regards,

Debra L. Shumar
President and Founder

December 4, 2006

Dr. S. Gary Teng, PhD, PE
Engineering Management Program, Center for Lean Logistics & Engr. Systems
The University of North Carolina
9201 University City Boulevard
Charlotte, NC 28223

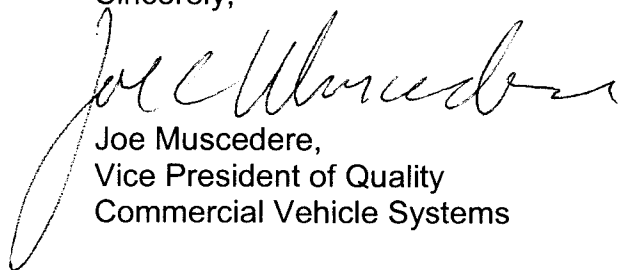
Dear Dr. Teng:

ArvinMeritor strongly supports the development of a systems engineering program at the University of North Carolina. The success of ArvinMeritor depends on our ability to realize successful systems validation, define customer needs, and document all required functionality early in the developmental cycle while taking into consideration the automotive industry standards.

ArvinMeritor depends on an educated workforce to manage the decision-making and problem-solving process. System engineering is a critical element of our organizational needs, and provides the technical expertise vital to our company and this industry.

If I can be of any further assistance, please contact me.

Sincerely,



Joe Muscedere,
Vice President of Quality
Commercial Vehicle Systems



Post Office Box 10100
Matthews, N.C. 28106-0100
Telephone: (704) 844-3100

December 12, 2006

Dr. S. Gary Teng
Professor & Director
Engineering Management Program &
Center for Lean Logistics & Engineered Systems
The University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223

Dr. Teng,

I wanted to take this opportunity to show my support for the proposed Systems Engineering program at The University of North Carolina at Charlotte. This is an academic function that is not represented at all in the metropolitan Charlotte area, and is sorely needed. With this region being the headquarters for a number of Fortune 500 companies as well as numerous manufacturing and service organizations, there is clearly a need.

In addition to this proposed department being able to provide the academic foundation in Systems and Industrial Engineering, it should also be used as a building block to forging stronger ties between the University and local / regional industry. Having graduate programs in Systems Engineering will also allow for the development of working engineers in this area to continue their professional development while not having to necessarily quit working – truly a win/win situation for both the University and their employer.

Please let me know if there is anything that I can do to further help in this endeavor.

Sincerely,

Bill Rhyne
Director of Supply Chain and Labor Management

PHILIP MORRIS

U.S.A.

P.O. BOX 1098, CONCORD, NORTH CAROLINA 28026-1098

GARY R. RUTH

VICE PRESIDENT/GENERAL MANAGER
CABARRUS OPERATIONS

January 10, 2007

S. Gary Teng, Ph.D., P.E.
Professor & Director
Engineering Management Program &
Center for Lean Logistics & Engineered Systems
The University of North Carolina at Charlotte
9201 University City Blvd.
Charlotte, NC 28223

Dear Dr. Teng:

As a major employer in Cabarrus County, Philip Morris USA has a vested interest in the education and economic health of the greater Charlotte region. To that end, we support UNC-Charlotte's (UNCC) decision to develop programs aimed at readying tomorrow's workforce, and believe that offering degree programs in Systems Engineering and establishing a Systems Engineering & Engineering Management Department at UNCC will contribute to the economic success of the entire region and ensure that its residents are able to meet the demands of tomorrow's changing economy.

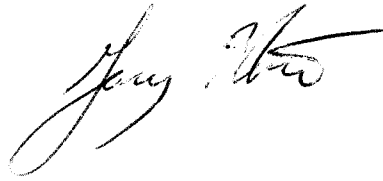
We value UNCC's commitment toward improving secondary education in the Charlotte region, and we support your efforts to provide greater economic and employment opportunities for the people in the entire state.

We believe that there is a need in North Carolina for more systems engineering graduates to effectively transition from the agricultural and textile businesses to more technological and service oriented industries. At the same time, there is a need for more creative and talented systems engineers who can develop innovative products and processes that will make companies more efficient, cost effective and competitive in today's dynamic global market place.

UNCC's ability to recognize the need to develop a Systems Engineering & Engineering Management Department to meet society's need for additional systems engineers is a credit to your University's vision.

We hope that UNCC is successful in its endeavors.

Sincerely,

A handwritten signature in black ink, appearing to read "Jerry Ables". The signature is written in a cursive style with a long horizontal flourish extending to the right.

GRR/vp

Appendix C
Faculty Curriculum Vitas

CHURLZU LIM

Degrees & Professional Registrations

- Ph.D. in Industrial and Systems Engineering, Virginia Tech, 2004
- M.S. in Management Engineering, Korea Advanced Institute of Science and Technology, 1997
- B.S. in Management Science, Korea Advanced Institute of Science and Technology, 1995

Number of years service on this faculty, including date of original appointment and dates of advancement in rank

5 months, Engineering Management Program

Original Appointment August 2006 at the rank of Assistant Professor

Related Teaching and Other Work Experience

- University of Florida, Department of Industrial and Systems Engineering, Adjunct Assistant Professor, 2006
- University of Arizona, Department of Systems and Industrial Engineering, Research Associate, 2004-2006
- Virginia Tech, Department of Industrial and Systems Engineering, Research Assistant, 2001-2004
- Virginia Tech, Department of Industrial and Systems Engineering, Teaching Assistant, 2001, 2003-2004
- Korea Air Force Academy, Department of Industrial Engineering, Lecturer, 1997-2000

Active Membership in Professional and Scientific Societies

- Institute for Operations Research and the Management Sciences
- Institute of Industrial Engineers
- American Society for Engineering Education

Honors / Awards / Recognition

- IIE Pritsker Doctoral Dissertation Award, 2nd Place, 2005
- Grado Graduate Fellowship, 2001-2004
- Selected Doctoral Colloquium Participant, INFORMS, Atlanta, GA, 2003

Selected Recent Publications / Presentations / Grant Awards

- Journal: J.C. Smith, C. Lim, and F. Sudargho, "Survivable Multicommodity Flow Network Design", *Journal of Global Optimization*, (to appear)
- Journal: J.C. Smith, C. Lim, and J.N. Bearden "On the Optimality of a Threshold Policy for Multi-attribute Stopping Problem with General Value Functions", *Operations Research Letters* (to appear)
- Journal: H.D. Sherali and C. Lim, "Enhancing Lagrangian Dual Optimization for Linear Programs by Obviating Nondifferentiability", *INFORMS Journal on Computing* (to appear)
- Journal: C. Lim and J.C. Smith, "Algorithms for Discrete and Continuous Multicommodity Flow Network Interdiction Problems", *IIE Transactions*, 39 (1), 15-25, 2007
- Journal: C. Lim and H.D. Sherali, "A Trust Region Target Value Method for Optimizing Nondifferentiable Lagrangian Duals of Linear Programs", *Mathematical Methods of Operations Research*, 64 (1), 33-53, 2006
- Journal: C. Lim and H.D. Sherali, "Convergence Analyses for Some Variable Target Value and Subgradient Deflection Methods: VTVM and Level Algorithm", *Computational Optimization and Applications*, 34 (3), 409-428, 2006
- Journal: C. Lim, J.N. Bearden, and J.C. Smith, "Sequential Search with Multi-Attribute Options", *Decision Analysis*, 3 (1), 3-15, 2006
- Journal: H.D. Sherali and C. Lim, "On Embedding the Volume Algorithm in a Variable Target Value Method", *Operations Research Letters*, 32 (5), 455-462, 2004
- Book Chapter: J.C. Smith and C. Lim, "Algorithms for Network Interdiction and Fortification Games", *IIE Pareto Optimality, Game Theory and Equilibria*, Edited by A. Migdalas, P.M. Pardalos, L. Pitsoulis, and A. Chinchuluun, (to appear)
- Presentation: *Multicommodity Flow Network Design Problems under Varying Attacker Strategies*, INFORMS Annual Meeting, San Francisco, November, 2005
- Presentation: *Variable Target Value Techniques for Solving Large-Scale Nondifferentiable Optimization Problems*, Seminar Series, Industrial and Systems Engineering, University of Florida, September, 2005
- Presentation: *Discrete and Continuous Multicommodity Flow Network Interdiction*, Complementarity Duality Global Optimization Conference, Blacksburg, Virginia, August, 2005
- Presentation: *A Network Design Problem with Continuous Enemy Interdiction*, IFORS, Honolulu, Hawaii, July, 2005
- Presentation: *Nondifferentiable Optimization for Lagrangian Duals of Linear Programs*, Department Seminar Series, Systems and Industrial Engineering, The University of Arizona, October, 2004
- Presentation: *Solving Nondifferentiable Lagrangian Duals of LPs by Obviating Nondifferentiability*, Virginia Tech INFORMS Student Chapter Seminar Series, Virginia Polytechnic Institute and State University, March, 2004

- Presentation: *Variable Target Value Methods for Solving Lagrangian Duals of Linear Programs*, Virginia Tech INFORMS Student Chapter Seminar Series, Virginia Polytechnic Institute and State University, November, 2003

Institutional and Professional Service (last five years)

- Session Chair, Applications of Global Optimization, IIE Annual Conference, Nashville, TN, 2007
- Vice President, Virginia Tech INFORMS Student Chapter, 2003-2004
- M.S. Thesis Committee Member, F. Sudargho, University of Arizona, 2005
- Refereed Journal Papers for *IIE Transactions*, *Networks*, *Journal of Global Optimization*, *Journal of Industrial and Management Optimization*

Professional Development Activities (last five years)

- Attended INFORMS Annual Meeting, Pittsburgh, PA, 2006
- Attended INFORMS Annual Meeting, San Francisco, CA, 2005
- Attended CDGO Conference, Blacksburg, VA, 2005
- Attended IFORS Conference, Honolulu, HI, 2005
- Attended IIE Annual Conference, Atlanta, GA, 2005
- Attended INFORMS Annual Meeting, Denver, CO, 2004
- Attended INFORMS Annual Meeting, Atlanta, GA, 2003

ERTUNGA C. OZELKAN

Degrees & Professional Registrations

- Ph.D., Systems and Industrial Engineering, The University of Arizona, 1997
- M.S., Systems Engineering, The University of Arizona, 1994
- B.S., Civil Engineering, The Bogazici University, Istanbul, Turkey, 1991

Number of years service on this faculty, including date of original appointment and dates of advancement in rank:

3 years, Engineering Management Program

Original appointment January 2004 at the rank of Assistant Professor

Related Teaching and Other Work Experience

- University of Texas at Dallas, Department of Information Systems and Operations Management, Visiting Assistant Professor, Fall 2002 – Fall 2003
- i2 Technologies, Manager, Curriculum Development/Customer Service, 2001 - 2002
- i2 Technologies, Sr. Consultant/Solution Architect, 1999 – 2001
- i2 Technologies, Applications Engineer, 1998 - 1999
- Tefen Ltd., Project Manager, 1997 - 1998
- Tefen Ltd., Consultant, 1996 - 1997

Active Membership in Professional and Scientific Societies

- Institute for Operations Research and the Management Sciences (INFORMS)
- Production and Operations Management Society (POMS)
- Institute for Industrial Engineers (IIE)
- American Society for Engineering Education (ASEE)

Honors / Awards / Recognitions

- IIE Lean Division Excellence in Teaching Award, Institute for Industrial Engineers, 2006, for the nominated EMGT 6090 003 Lean Supply Networks course.
- Outstanding Teaching Award, Center for Intelligent Supply Networks (C4ISN)-University of Texas at Dallas, Fall 2004, for contributions in the Professional Supply Chain Management Program
- Top Gun Award, i2 Technologies Education Services, 2000, One of the three employees to receive the award for outstanding performance
- Joint Development Award, Compaq Computers, 1999, for meeting Compaq's supply chain software development needs.
- Tucson Mayor's Award - Honorary Citizen of Tucson, Mayor of Tucson, Arizona, 1996, for contributions in cultural exchange.
- Fellowship / Tuition/Graduate Scholarship, The University of Arizona, 1995-1997, Limited awards to students with superior academic record.
- Scholarship, Von Karman Institute for Fluid Dynamics, Brussels, Belgium, 1990, Limited awards to students for scientific research and training.
- Scholarship, TUBITAK: The Scientific & Technologic Research Council of Turkey, 1985, one of the three students selected from the Tarsus American Highschool for the Mathematics Olympics summer preparation courses in Gokceada, Turkey.

Selected Recent Publications / Presentations / Grant Awards

- Ozelkan E. C., and M. Cakanyildirim, 2007, Resource Downgrading, European Journal of Operational Research, 177 (1), 572-590.
- Ozelkan E. C., and M. Cakanyildirim, 2006, Test Wafer Management in Semiconductor Manufacturing, IEEE Transactions on Semiconductor Manufacturing, 19 (2), 241-251.
- Ozelkan, E. C. and L. Duckstein, 2000, Multi-objective fuzzy regression: a general framework, Computers and Operations Research, Special Issue on Artificial Intelligence and Decision Support with Multiple Criteria 27(7-8), 635-652
- Ozelkan, E. C. and L. Duckstein, 1999, Optimal fuzzy counterparts of scheduling rules, European Journal of Operational Research, 113 (3), 593-599.
- Ozelkan E. C., A. Galambosi, E. Fernandes, and L. Duckstein, 1997, Linear quadratic dynamic programming for water reservoir management, Applied Mathematical Modeling, 21, 591-598.
- Ozelkan, E. C. and L. Duckstein, 1996, Analyzing water resources alternatives and handling criteria by multicriterion decision techniques, Journal of Environmental Management, 48, 69-96.
- Ozelkan, E. C. and L. Duckstein, 2001, Fuzzy Conceptual Rainfall-Runoff Models, Journal of Hydrology 253, 41-68
- Galambosi, A., L. Duckstein, E.C. Ozelkan, and I. Bogardi, 1999, Fuzzified effect of ENSO and macrocirculation patterns on precipitation: an Arizona case study", International Journal of Climatology, 19(13-15).
- Ozelkan E. C., L. Duckstein, A. Galambosi, and, A. Bardossy, 1998, A multi-objective fuzzy classification of large scale atmospheric circulation patterns for precipitation modeling, Applied Mathematics and Computation, 91(2), 127-142.
- Ozelkan, E. C., Ni, F. and L. Duckstein, 1996, Relationship between monthly atmospheric circulation patterns and precipitation: fuzzy logic and regression approaches, Water Resources Research, 32(7), 2097-2103.
- Ozelkan E. C., A Combinatorial Optimization Model for Group Buying in Supply Chains, Proceedings of the IIE Research Conference (IERC), Paper No. 1635, Orlando, FL, May 20-24, 2006.

- Ozelkan E. C. and D. Rajamani, 5P Framework for Teaching and Characterizing Supply Chains Effectively, Proceedings of the IIE Research Conference (IERC), Paper No. 1757, Orlando, FL, May 20-24, 2006.
- Ozelkan E. C., T. Sireli, M. P. Munoz, S. Mahadevan, A Decision Model to Analyze Costs and Benefits of RFID for Superior Supply Chain Performance, Proceedings of the PICMET Conference: Technology Management for the Global Future, Istanbul, Turkey, July 8-13, 2006.
- Ozelkan E. C. and D. Rajamani, An Effective Framework for Teaching Supply Chain Management, Proceedings of the American Society for Engineering Education (ASEE) Annual Conference & Exposition, Chicago, IL, June 18-21, 2006.
- Ozelkan, E. C., O. Harel, D. Meyersdorf, J. Mercier, and R. Rao, 1998, Simulation methodology for WIP management in semiconductor manufacturing, in Proceedings of the AutoSimulations Symposium, Bountiful, UT, June 21-26.
- Ozelkan E. C., L. Duckstein, and A. Galambosi, 1998, Analysis of trade off between data outliers and prediction vagueness in fuzzy regression using a bi-objective framework, Proceedings of the EUFIT '98 – Sixth European Congress on Intelligent Techniques and Soft Computing, 7-10 September, Aachen, Germany.
- Ozelkan E. C. and M. Cakanyildirim. Reverse Bullwhip Effect in Pricing. Proceedings of the 2005 POMS OM Frontiers: Winds of Change Conference, April 29 - May 2, 2005.
- Ozelkan E. C., and M. Cakanyildirim, 2004, Resource Downgrading, Proceedings of the Second World Conference on POM and 15th Annual POM Conference, Cancun, Mexico, April 30 - May 3.
- Ozelkan E. C., Geismar, N. and Srikandarajah, C., 2003, Optimal procurement in a group buying framework, Proceedings of the POM 2003 Conference - Production and Operation Management in Service Economy, Savannah, Georgia, April 4-7.
- 5-40454: Supply Chain Management Certificate Workshop, PI: E. C. Ozelkan, Co-PIs: S. G. Teng, Y. Sireli, Tyco/Scott Health and Safety, \$17,280, May-August 2006.
- 5-52925: Supply Chain Management Workshop, PI: E. C. Ozelkan, Center for Intelligent Supply Networks, \$10,500, Sept 10 - Oct 23 2004.
- 5-52948: Supply Chain Management Workshop, PI: E. C. Ozelkan, Center for Intelligent Supply Networks, \$6,500, Jan 14 – Feb 26 2005.

Institutional and Professional Service (last five years)

- Associate Director of Center for Lean Logistics and Engineered Systems-CLLES, Spring 2005 - Present
- Chair of the Curriculum Committee for the EMGT Program, 2005-present
- EMGT Program Representative for the Col. of Eng. Computing Facilities Advisory Committee (CFAC), 2006- present
- Program Coordinator for the Supply Chain Management (SCM) Professional Certificate Program
- Web Administrator for the EMGT Program and CLLES, 2004-present
- EMGT Program Faculty Search Committee Member – Spring 2006
- EMGT Program Strategic Planning Committee Member – Summer 2006
- Organized EMGT Program Information Sessions (Dec 6, 2004; Mar 14, 2005)
- Chair of the Member Selection Committee for the EMGT Program, Spring 2005.
- Collaborated with American Society for Quality (ASQ), Pass & Seymour/Iegrand and Johnson Lean Enterprise Consultancy to jointly complete a “Lean Case Study and Simulation Project”, Spring 2006.
- Conducted the “Lean Day and Social” event on campus in collaboration with the Society of Manufacturing Engineers (SME) and other UNCC faculty.
- Delivered short courses for UNCC Intercultural Programs on for international students from KNU University, South Korea during July 2005 and January 2006.
- Secretary for the ASEE Engineering Management Division, 2006-2007
- Member of the Editorial Review Board of the International Journal of Information Systems and Supply Chain Management 2007-2009

Professional Development Activities (last five years)

Attended numerous presentations during the following conferences

- INFORMS Conference, Pittsburgh, PA, November 5-8, 2006
- PICMET Conference: Technology Management for the Global Future, Istanbul, Turkey, July 8-13, 2006.
- ASEE Annual Conference & Exposition, Chicago, IL, June 18-21, 2006.
- IIE Annual Research Conference, Orlando, FL, May 20-24, 2006.
- IIE Annual Research Conference, Atlanta, May 14-18, 2005.
- POMS OM Frontiers: Winds of Change Conference, April 29 - May 2, 2005.
- Second World Conference on POM and 15th Annual POM Conference, Cancun, Mexico, April 30 - May 3, 2004.
- POM Conference - Production and Operation Management in Service Economy, Savannah, Georgia, April 4-7, 2003.
- EURO/INFORMS Joint International Conference – Istanbul, July 6-10, 2003.
- INFORMS Conference – San Jose, November 16-20, 2002.

Attended several grant development workshops at UNCC.

A. YESIM SIRELI

Degrees

- Ph.D. in Engineering Management, Old Dominion University, 2003.
- M.S. in Electrical Engineering, Istanbul Technical University, 1992.
- B.S. in Electrical Engineering, Istanbul Technical University, 1990.

Number of years service on this faculty, including date of original appointment and dates of advancement in rank

3.5 years, Engineering Management Program.

Original appointment July 2003 at the rank of Assistant Professor; reappointed 2006.

Related Teaching and other Work Experience

- Old Dominion University, Norfolk, Va., Department of Engineering Management & Systems Engineering, Graduate Research and Teaching Assistant, January 1999 – July 2003.
- Arcelik A.S., Istanbul, Turkey, Research & Development Engineer, January 1995 – October 1998.
- Arcelik A.S., Istanbul, Turkey, Product Development Engineer, January 1994 – January 1995.

Active Membership in Professional and Scientific Societies

- IEEE Engineering Management Society, Member and Reviewer for the IEEE Transactions on Engineering Management
- Decision Sciences Institute (DSI), Member
- American Society for Engineering Education (ASEE), Member and Peer Reviewer for National Conferences
- Marketing Science Institute (MSI), Member
- American Society for Engineering Management (ASEM), Reviewer, National Conference 2005
- The Honor Society of Phi Kappa Phi, Member
- Internet Society (ISOC), Member

Honors / Awards / Recognitions

- Invited membership to the Honor Society of Phi Kappa Phi
- Invited membership to the American Society for Engineering Management (ASEM) Honor Society

Selected Recent Publications / Presentations / Grant Awards in chronological order

- Y. Sireli, J. Conrad, M. Kane, and F. Skinner, "Contribution of Engineering Management & Systems Engineering Concepts to Engineering Design," accepted abstract for the ASEE Annual Conference 2007.
- G. Teng, E. Ozelkan, Y. Sireli, and K. Elmore, "Achieving Success for the Development of Systems Engineering & Engineering Management Department & Degree Programs," accepted abstract for the ASEE Annual Conference 2007.
- Y. Sireli, "Challenges in Global Product Development," accepted abstract for the Institute of Industrial Engineers (IIE) Annual Conference 2007.
- P. Kauffmann, Y. Sireli, and E. Ozan, "A Quality Function Deployment-based Decision Model for the Avionics Industry," invited presentation by the IIE Annual Conference, 2007.
- Y. Sireli, P. Kauffmann, and E. Ozan, "Integration of Kano's Model into QFD for Multiple Product Design." *IEEE Transactions on Engineering Management*, accepted to appear in May 2007.
- E. Ozan, Y. Sireli, and P. Kauffmann, "A New Market Adoption Model for the Information Systems Industry," *Engineering Management Journal*, accepted to appear in March 2007.
- S. Mahadevan and Y. Sireli, "Six Sigma and Project Management for Small and Medium-Sized Enterprises." *Review of Business Research*, vol. 6, no. 4, pp.176-181, 2006.
- E. Ozelkan (PI), Y. Sireli and G. Teng (Co-PIs), Supply Chain Management Certification Workshop, Grant supported by Tyco/Scott Health & Safety, Monroe, 05/2006 – 08/2006.
- E. Ozelkan, Y. Sireli, M. P. Munoz, and S. Mahadevan, "A Decision Model to Analyze Cost and Benefits of RFID for Superior Supply Chain Performance," *Proc. Portland International Center for Management of Engineering and Technology (PICMET) Conference*, July 8-13, 2006, Istanbul, Turkey.

- Y. Sireli, G. Teng, and E. Ozelkan, "Growth of a Young Engineering Management Program," *Proc. the 113th Annual American Society for Engineering Education (ASEE) Conference & Exposition*, June 18-21, 2006, Chicago, IL.
- Y. Sireli (PI at UNCC), in collaboration with East Carolina University, Longitudinal Study of the Market Penetration of Cockpit Weather Information Systems – Phase 2, Grant supported by NASA Langley Research Center, 01/2005 – 01/2006.
- E. Ozan, Y. Sireli, and P. Kauffmann, "A Framework Architecture for a Five Dimensional Weather System," *Proc. the 26th American Society for Engineering Management (ASEM) National Conference*, October 26-29, 2005, Virginia Beach, VA.
- Y. Sireli, E. Ozan, and P. Kauffmann, "A Quality Function Deployment-Based Decision Model for the Avionics Industry in the U.S.," *Proc. 35th International Conference on Computers and Industrial Engineering*, June 19-22, 2005, Istanbul, Turkey.
- Y. Sireli, E. Ozan, and P. Kauffmann, "Kano's Model for Multiple Product Development," *Journal of Academy of Business and Economics*, vol. 5, no. 3, pp. 30-40, 2005.
- Y. Sireli (PI at UNCC), in collaboration with East Carolina University, Longitudinal Study of the Market Penetration of Cockpit Weather Information Systems – Phase 1, Grant supported by NASA Langley Research Center, 10/2003 – 01/2005.
- J. Conrad and Y. Sireli, "Learning Project Management Skills in Senior Design Courses," *Proc. the 35th ASEE / IEEE Frontiers in Education (FIE) Conference*, October 19-22, 2005. Indianapolis, IN.
- Y. Sireli, E. Ozan, and P. Kauffmann, *Longitudinal Study of the Market Penetration of Cockpit Weather Information Systems*, project report, NASA Langley Research Center, Hampton, VA, 11/2005.
- P. Kauffmann, E. Ozan, and Y. Sireli, "Feasibility of TAMDAR: An Aircraft-based Weather Data Collection System," *Journal of Air Transport Management*, vol. 10, no.3, pp. 207-215, 2004.
- Y. Sireli (PI), Identification of Market Adoption Factors and Product Positioning for Cockpit Weather Information Systems, Grant supported by Junior Faculty Research Program, UNCC, 11/2003 – 06/2004.
- Y. Sireli, E. Ozan, P. Kauffmann, and C. Rosul, "A Review of Market Adoption Models for the Information Systems Industry," *Proc. the 25th ASEM National Conference*, October 20-23, 2004, Alexandria, VA.
- E. Ozan, Y. Sireli, and P. Kauffmann, "A Diffusion Model for a New Product Group in the Avionics Industry," *Proc. the 25th ASEM National Conference*, October 20-23, 2004, Alexandria, VA.
- Y. Sireli, E. Ozan, and P. Kauffmann, "A New Product Planning and Forecasting Model for the Avionics Market in the United States," *Proc. the 10th International Conference on Industry, Engineering, and Management Systems*, March 15-17, 2004, Cocoa Beach, FL.
- Y. Sireli and C. Rosul, *Identification of Market Adoption Factors and Product Positioning for Cockpit Weather Information Systems*, final project report, Junior Faculty Research Program, UNCC, 06/2004.
- E. Ozan, Y. Sireli, and P. Kauffmann, "How to Design Multicriteria Spatial Decision Support Systems," *Proc. the 24th ASEM National Conference*, October 15-18, 2003, St. Louis, MO.
- Y. Sireli, E. Ozan, and P. Kauffmann, *Longitudinal Study of the Market Penetration of Cockpit Weather Information Systems*, project report, NASA Langley Research Center, Hampton, VA, 08/11/2003.
- Y. Sireli and P. Kauffmann, "Future Trends for General Aviation In-Cockpit Weather Information Systems," *Proc. the Society of Automotive Engineers (SAE) General Aviation Technology Conference & Exhibition*, April 16-18, 2002, Wichita, KS.
- Y. Sireli, S. Gupta, P. Kauffmann, and P. Kachroo, *A Product Development Decision Model for Cockpit Weather Information Systems*, project report, NASA Langley Research Center, Hampton, VA, 12/2002.
- Y. Sireli, E. Ozan, and P. Kauffmann, "A Market Research Study for Future Weather Information Systems in General Aviation," *Proc. the 22nd ASEM National Conference*, October 11-13, 2001, Huntsville, AL.
- Y. Sireli, S. Gupta, P. Kauffmann, and P. Kachroo, *Implications of Automotive and Trucking On-Board Information Systems for General Aviation Cockpit Weather Systems*, project report, NASA Langley Research Center, Hampton, VA, 10/2001.
- P. Kauffmann, A. Sousa-Poza, and Y. Sireli, *Business Case Analysis of Low Cost Terminal Radar*, project report, NASA Langley Research Center, Hampton, VA, 05/2001.

Institutional and Professional Service (last 3.5 years)

University Service:

- Member of the Minority Faculty Recruitment and Retention Planning Committee, Fall 2003 - Spring 2006.

- Director of the Systems Engineering Department Planning Committee, Fall 2004 – present.
 - Organizer of new EMGT information sessions that will focus on the needs of graduate students of other engineering departments (first session will be held in Spring 2007 for ECE grad students).
 - Writer of the following Department of Systems Engineering & Engineering Management (SEEM) documents: Five-year Strategic Plan and Promotion and Tenure Policy, Fall 2005 - Spring 2006.
 - Contributor to the curriculum development of the future SEEM Department.
 - EMGT Program liaison to the Office of International Admissions for promoting the program overseas, Spring 2004 – present.
 - Presenter and facilitator at the EMGT Program information sessions, Spring 2004 – present.
- Co-founder of the Alpha Eta Chapter of Epsilon Mu Eta, the Engineering Management Honor Society, Spring 2004 – present.
- Member of the EMGT Program new faculty search committee, Fall 2005 – Spring 2006.
- Mechanical Engineering Department coordinator of the Arts and Science Council Campaign, 2004 - 2005.
- Graduate and Professional Schools Fair coordinator, Fall 2003.

Advising, Mentoring, and Additional Teaching:

- Instructor of individual studies for engineering management master's students, Spring 2006 – present.
- Mentor to an EMGT master's student (NC-LSAMP Bridge to the Doctorate program), Spring 2005 - Spring 2006.
- Faculty advisor in an Electrical Engineering Ph.D. committee, Spring 2004 – present.
- Faculty advisor in a Mechanical Engineering master's thesis committee, Fall 2005.
- Advisor to EMGT master's students / research assistants, Spring & Fall 2004, Fall 2005.
- Faculty advisor in an EMGT master's thesis committee, Fall 2003.

Professional Services:

- Reviewer for the IEEE Transactions on Engineering Management, and for ASEE and ASEM Annual Conferences.
- Session chair at several conferences.

Professional Development Activities (last 3.5 years)

- Published several journal and conference articles, a selection of which is referenced above.
- Presented / will present at the conferences referenced above.
- Written and co-written several grant proposals, some of which are pending.
- Presented NASA-funded work to various audiences related to decision support systems in aviation.
- Attended the National Effective Teaching Institute workshop by ASEE, Salt Lake City, UT, 06/17-19/2004.

S. GARY TENG

Degrees & Professional Registrations

- Ph.D., Industrial Engineering, Auburn University, 1989
- M.S.I.E., Texas Tech University, 1983
- B.E., Industrial Engineering, Chung Yuan University, 1979
- Registered Professional Engineer (State of Wisconsin, since 1991)
- American Society for Quality Certified Reliability Engineer (since 1993) and Certified Quality Engineer (since 1993)

Number of years service on this faculty, including date of original appointment and dates of advancement in rank:

6.5 years, Engineering Management Program

Original appointment July 2000 at the rank of Associate Professor

Related Teaching and Other Work Experience

- Western New England College, Department of Industrial & Manufacturing Engineering, Associate Professor, 1996 – 2000
- North Carolina A&T State University, Department of Manufacturing Systems, Associate Professor, 1995 - 1996
- University of Wisconsin-Milwaukee, Department of Industrial & Manufacturing Engineering, Assistant Professor, 1989 – 1995
- Auburn University, Advanced Manufacturing Technology Center, Research & Teaching Assistant, 1985 - 1989
- Formosa Plastics Group, Industrial Engineer, 1981 - 1982
- Army (Taiwan), Platoon Leader and Acting Deputy Company Commander, 1979 - 1981

Active Membership in Professional and Scientific Societies

- Alpha Pi Mu (Industrial Engineering Honor Society)
- Sigma Xi (The Scientific Research Society)
- Epsilon Mu Eta (Engineering Management Honor Society)
- American Society for Engineering Education
- American Society for Engineering Management
- American Society for Quality
- Institute of Industrial Engineers
- Institute for Supply Management
- Institute for Operations Research and the Management Sciences

Honors / Awards / Recognitions

- Army Commander-In-Chief Award (Taiwan, 1981)
- Outstanding Faculty Advisor Award (Society of Manufacturing Engineers, 1993)
- UWM Faculty International Travel Award (1994)
- IIE Chapter Recognition Silver Award (Faculty Advisor, 1999 & 2000)

Selected Recent Publications / Presentations / Grant Awards

- **S. Teng**, S. Ho, D. Shumar, and P. Liu, "Implementing FMEA in a Collaborative Supply Chain Environment," *Intl. Journal of Quality and Reliability Management*, Vol. 23, No. 2, 2006.
- **S. Teng** and H. Jaramillo, "Integrating the US Textile and Apparel Supply Chain with Small Companies in South America," *Supply Chain Management: An International Journal*, Vol. 11, No. 1, 2006.
- Y. Sireli, **S. Teng**, and E. Özelkan, "Growth of A Young Engineering Management Program," *Proc. of 2006 ASEE Annual Conference*, Chicago, Illinois, 6/2006.
- **S. Teng** and S. Ho, "A Lean Robust Product Design Approach for Lean Supply Chain Operations," *Proc. of International Conference on Logistics and Supply Chain Management 2006*, Hong Kong, 1/2006.
- **S. Teng** and H. Jaramillo, "A Model for Evaluation and Selection of Suppliers in Global Textile and Apparel Supply Chains," *International Journal of Physical Distribution and Logistics Management*, Vol. 35, No. 7, 2005.
- **S. Teng** and H. Jaramillo, "Enhancing Quality Management in the Globalization of U.S. Textile and Apparel Supply Chains," *International Journal of Logistics Systems and Management*, Vol. 1, No. 4, 2005.
- **S. Teng**, S. Ho, and D. Shumar, "Enhancing Supply Chain Operations through Effective Classification of Warranty Returns," *Intl. Journal of Quality and Reliability Management*, Vol. 22, No. 2, 2005.
- **S. Teng** and H. Jaramillo, "Linking Tactical and Operational Decision-Makings to Strengthen Textile/Apparel Supply Chains," *International Journal of Logistics Systems and Management*, Vol. 1, Nos. 2/3, 2005.
- **S. Teng**, "Center for Lean Logistics & Engineered Systems – CLLES and Supply Chain Management," presented in *Charlotte Regional Logistics Networking Alliance Meeting*, Charlotte, 11/2005.
- **S. Teng** and H. Jaramillo, "An Effective Supplier Evaluation Process for Textile/Apparel Supply Chains," *Proc. of 2005 Portland International Conference on Management of Engineering and Technology*, Portland, Oregon, 8/2005.

- **S. Teng** and J. Niebles, "The Role of Supply Chain Management for System Management in Utility Industry," *Proc. of 2005 Portland International Conference on Management of Engineering and Technology*, Portland, Oregon, 8/2005.
- A. D'Ambrosio, E. Özelkan, and **S. Teng**, "Impact of Supply Chain Capabilities on Liquefied Natural Gas Terminal Design," *Proc. of International Conference on Energy, Environment and Disasters (INCEED 2005)*, Charlotte, North Carolina, 7/2005.
- A. D'Ambrosio, E. Özelkan, and **S. Teng**, "Commodity Price Risk Management in the Natural Gas Supply Chain," *Proc. of International Conference on Energy, Environment and Disasters (INCEED 2005)*, Charlotte, North Carolina, 7/2005.
- **S. Teng**, "Designing Lean, Low Cost, and Reliable Systems for Global Manufacturing," presented in *Spotlight on Research, Engineering Design in a Global Economy*, UNC Charlotte, 7/2005.
- **S. Teng**, "Achieving Success through Effective Management of Engineering Design Projects in Global Business Environment," presented in *Executive Dialogue, Engineering Design in a Global Economy*, UNC Charlotte, 7/2005.
- **S. Teng** and E. Özelkan, "Supply Chain Management and Center for Lean Logistics and Engineered Systems (CLLES)," presented at *the Industrial and Technology Management Seminar Series*, UNCC, 3/2005.
- **S. Teng** and H. Jaramillo, "Integrating Forecasting and Inventory Management Decisions for Textile/Apparel Supply Chain Management," *Proc. of the 34th International Conference on Computers and Industrial Engineering*, San Francisco, California, 11/2004.
- **S. Teng** and H. Jaramillo, "Quality Management Issues in Current U.S. Textile and Apparel Supply Chains," *Proc. of the 8th Annual International Conference on Industrial Engineering Theory, Applications and Practice*, Las Vegas, Nevada, 11/2003.
- **S. Teng** and H. Jaramillo, "The Potential Role of South American Companies in the U.S. Textile/Apparel Supply Chain," *Proc. of ASEM 2003 National Conference*, St. Louis, Missouri, 10/2003.
- **S. Teng**, S. Ho, and D. Shumar, "Effective Classification of Warranty Returned Parts in a Supply Chain," *Proc. of 2003 Portland International Conference on Management of Engineering and Technology*, Portland, Oregon, 7/2003.
- **S. Teng** and P. Liu, "Collaborative Environments for Managing Industrial Projects," *Proc. of 2003 ASEE Annual Conference*, Nashville, Tennessee, 6/2003.
- P. Liu, H. Tsai, and **S. Teng**, "Web-Based Collaboration for the Rest of Us," *Design Management Journal*, Vol. 13, No. 2, Spring 2002.
- **S. Teng** and S. Ho, "Industrial Designed Experimentation --- Design of Experiments," presented at *the Industrial and Technology Management Seminar Series*, UNCC, 9/2002.
- P. Liu, **S. Teng** and H. Tsai, "A Low Cost Team Collaborative Environment for Student Product Design," *Proc. of the 2002 ASEE Annual Conference*, Montréal, Québec, Canada, 6/2002.
- **S. Teng** and J. Shelnutt, "The Development of an MSEM Program with a Close Tie to Industry," *Proc. of the 2002 ASEE Annual Conference*, Montréal, Québec, Canada, 6/2002.
- H. Tsai, P. Liu, and **S. Teng**, "A Collaborative Product Design Environment for Small to Medium Size Companies," *Proc. of the 2002 IE Research Conference*, Orlando, Florida, 5/2002.
- **S. Teng**, S. Schreiner, and J. Nelson, "Teaching in the Factory: Connecting Industry to Engineering Education," *Industry & Higher Education*, Vol. 15, No. 5, 10/2001.
- **S. Teng**, "Using Statistical Methods to Improve Design and Production at FUZETEC," invited presentation at FUZETEC Technology Co., Ltd., Hsin Chung, Taiwan, 6/2001.
- **S. Teng**, "The Elements for Being a Good Engineering Manger - Using the Concept of Six Sigma," invited presentation at Dept. of Industrial Management Science and Institute of Information Management, National Cheng Kung University, Taiwan, 6/2001.

Institutional and Professional Service (last five years)

- Director, Engineering Management Program, 2000 - 2007
- Director, Center for Lean Logistics and Engineered Systems, 2005 - 2007
- Member of the task force (2002-2003) and Program Committee (2003-2007) for Infrastructure and Environmental Systems Ph.D. Program, College of Engineering
- Member of the task force for Construction Management Institute, College of Engineering, 2003-2005
- Chair of Ad Hoc Committee to develop processes for promotion and tenure review for faculty participating in college-wide programs (2003-2005) and Chair of Systems Engineering and Engineering Management Department Planning Committee (2001-2002), College of Engineering
- Member of the University Hearing Committee (2001-2002) and Faculty Executive Committee (2005-2007), UNCC.
- Division Chair (2006-2007), Program Chair (2005-2006), Secretary/Treasurer (2004-2005), and Newsletter Editor (2003-2004), Engineering Management Division, ASEE
- Chair, Student Section Development Committee, American Society for Engineering Management, 2004-2007
- Membership Chair (2002-2003) and Publicity Chair (2001-2002), ASQ Charlotte Section
- Proposal Review Panelist for NSF, 2005
- Proposal Reviewer, Louisiana State Board of Regents, 2007
- Paper Reviewer for 12 research journals, 2001 - 2007

Appendix D

References

References:

- [1] Directorate for Engineering, National Science Foundation, Conceptual Framework for Reorganization: Overview and Rationale, Version 2.3, <http://www.nsf.gov/attachments/104206/public/MasterReorg.doc>, June 5, 2005.
- [2] International Council on Systems Engineering (INCOSE), <http://www.incose.org/practice/fellowconsensus.aspx>
- [3] A. T. Bahill and B. Gissing, Re-evaluating systems engineering concepts using systems thinking, IEEE Transaction on Systems, Man and Cybernetics, Part C: Applications and Reviews, 28 (4), 516-527, 1998.
- [4] Wymore, A. W., Model-Based Systems Engineering, CRC Press, 1993.
- [5] Singh, V. P., Hydrologic Systems, Rainfall-Runoff Modeling, Prentice Hall, 1988.
- [6] Blanchard, B. S. and W. J. Fabrycky, Systems Engineering and Analysis, 3rd Edition, Prentice Hall, 738 pp.
- [7] The Institute for Systems Research, What is systems engineering? University of Maryland, <http://www.isr.umd.edu/ISR/about/definese.html>
- [8] Charlotte Chamber of Commerce, www.charlottechamber.org.

Appendix E
Proposed BSSE Four-year Curriculum

The following table summarizes the proposed BSSE Study Plan:

Freshman Year			
ENGR 1201 Intro to Engr I	2	ENGR 1202 Intro to Engr II	2
CHEM 1251 Chemistry I	3	PHYS 2101 Physics I	3
CHEM 1251L Chemistry I Lab	1	PHYS 2101L Physics I Lab	1
MATH 1241 Calculus I	3	MATH 1242 Calculus II	3
ENGL 1101 English Composition	3	ENGL 1102 Writing in the Academic Community	3
Liberal Studies Elective*	3	ECON 1101 Economics for Non-Majors	3
	15		15
Sophomore Year			
PHYS 2102 Physics II	3	SEGR 2105 Comp. Meth. for Sys Engr. I	3
PHYS 2102L Physics II Lab	1	STAT 3128 Prob. & Stat. for Engr.	3
SEGR 2101 Systems Engr. Concepts	3	MATH 2164 Matrices & Linear Algebra	3
MATH 2241 Calculus III	3	Liberal Studies Elective*	3
ENGL 2116 Intro to Tech Comm (W)	3	<i>Track Course*</i>	3
SEGR 2106 Engr. Economic Analysis	3		
	16		15
Junior Year			
SEGR 3141 Quality Engineering	3	SEGR 3102 Sys. Simul., Modeling & Anal.	3
SEGR 3105 Comp. Meth. for Sys Engr. II	3	SEGR 3103 Human System Interface	3
SEGR 3101 System Design and Deployment	3	OPRS 3113 Operations Res.- Probabilistic	3
OPRS 3111 Operations Res.-Deterministic	3	<i>Track Course*</i>	3
<i>Technical Elective*</i>	3	<i>Technical Elective*</i>	3
	15		15
Senior Year			
SEGR 3290 Systems Design Project I (W)(O)	1	SEGR 3291 Systems Design Project II (W)(O)	3
ENGR 3295 Prof. Development	1	SEGR 4141 Engr. Exper. Design	3
Liberal Studies Elective*	3	SEGR 4103 Network Modeling & Analysis	3
SEGR 4102 Decision and Risk Analysis	3	Liberal Studies Elective*	3
SEGR 3111 Project Management (W)(O)	3	<i>Technical Elective*</i>	3
SEGR 4113 Production Planning and Inventory Control	3		
<i>Track Course*</i>	3		
	17		15
*Notes:			Total Hours
1. (W) indicates courses with emphasis on writing and (O) indicates courses with emphasis on oral communication			123
2. SEGR/ENGR 3295 Prof. Development can be taken in Fall or Spring during the senior year			