The University of Georgia

Office of the President

February 27, 2009

Erroll B. Davis, Jr., Chancellor
Board of Regents of the University System of Georgia
270 Washington Street, S.W.
Atlanta, Georgia 30334

Dear Chancellor Davis:

Attached for consideration by the Board of Regents is a proposal from the Institute of the Faculty of Engineering to offer a major in Electrical and Electronics Engineering under the Bachelor of Science in Electrical and Electronics Engineering degree (B.S.E.E.). Establishing this major at the University of Georgia can be accommodated within funds presently anticipated and available.

Sincerely,

Michael F. Adams

Michael F. Adams
President

MFA/mab

Enclosure

cc: Dr. Marci Middleton
Dr. Arnett C. Mace, Jr.
Professor Jere W. Morehead
Dr. E. Dale Threadgill

The University System of Georgia
NEW PROGRAM PROPOSAL

Institution University of Georgia Date November 21, 2008

School/College/Division/Institute Faculty of Engineering

Department

Name of Proposed Program B.S. in Electrical and Electronics Engineering

Degree B.S. Major Electrical and Electronics Engineering CIP Code

Starting Date August, 2010

Institutional mission

1. Does this program further the mission of your institution? *Yes. One of the core characteristics of the University of Georgia's mission statement is a commitment to excellence in both economic development and the technical assistance activities designed to address the strategic needs of Georgia. B.S. in Electrical and Electronics Engineering graduates will be uniquely prepared to develop new technological solutions to deal with problems which are inherently coupled with Georgia's economic and strategic needs. The graduates of this program will have career opportunities in 1) power systems for the generation, conversion, transmission and distribution of electric power and design of electromechanical devices, 2) process control and industrial automation, and 3) electronics for designing advanced systems for bio-based industries related to energy generation, biomaterials, pharmaceuticals and health service and products.*

2. Will the proposed program require a significant alteration of the institutional mission? *No.*

3. Will the program require the addition of a new organizational unit to the institution (e.g. college, school, division or department)? *No.*

4. Is it likely that a SACS visit for substantive change will be necessary? *No.*

5. How does the proposed program help meet the priorities/goals of your strategic plan? *In 2000, the University of Georgia identified Comprehensive Engineering at UGA as one of the five strategic initiatives in its Strategic Plan for the First Decade of the 21st Century. The proposed B.S. in Electrical and Electronics Engineering degree program is a component of the University of Georgia's strategic initiative to develop comprehensive engineering.*

6. Will this proposal require an addition or change in your institution's strategic plan? *No.*

7. Will the program require an increase in state appropriation within the next five years? *Yes.*

8. If this is a baccalaureate program, will you be asking for an exception to the 120 hour expectation or to

the core curriculum? *Yes, we will be suggesting a degree program which will be approximately 130 hours in length at the undergraduate level. This is the typical number of semester hours in engineering degrees offered at UGA and Georgia Tech.*

9. Are there program delivery formats that will be new or different for your institution? *No.*

Need

1. Provide a brief justification for why the state needs graduates from this program and for why the University System needs this program. *The need to take actions for maintaining the technological leadership of the United States is progressively becoming more urgent. Many states are now recognizing a shortage of engineers and are taking actions to address this urgent problem. For example, in December 2007 the Governor of California announced a program to ramp up engineering education to train 20,000 new engineers in order to address the shortage of engineers in the state of California. In Georgia, as reported by a Washington Advisory Group commissioned by the Board of Regents in 2002, nearly half of all engineering jobs in the state are filled by graduates of out-of-state and foreign institutions. Since then Georgia Department of Labor has projected 12 to 14 percent increase for Electrical and Electronics Engineers between 2004 and 2014. The U.S. Bureau of Labor's December 18, 2007 report projects nearly 11% increase in national demand for all engineers in the coming ten years (2006-16). A strong increase in demand for electrical devices, consumer products and electronic goods for communication and medical equipment is projected for this ten year period. However, a slower than the average demand of 5% increase nationally in Electrical and Electronics Engineers (increase from 291,000 in 2006 to 306,000 in 2016) is due to anticipated increased foreign competition. While the additional job vacancies in this field could be filled by foreign engineers who are generally trained in a traditional way, the need for engineers who can innovate for the future can only be met when we graduate engineers who are educated under a new paradigm proposed in the National Academy of Engineering (NAE) report entitled, "The Engineer of 2020." The proposed BSEE degree will ramp up engineering education in Georgia for meeting its own need, and build the nation's capacity and provide incentives for graduating U.S. engineers in this critical area.*

Give a brief justification for why your institution should offer the program. *The UGA Faculty of Engineering is uniquely prepared to develop an Electrical and Electronics Engineering degree program that meets the expectations of the NAE report. Engineering graduates in the 21st Century must be technically competent and dedicated to the improvement of humankind. UGA is probably the only university among top ranked public research universities in the nation having the opportunity to design a brand new electrical engineering degree program at the dawn of the 21st Century without having to restructure engineering departments or an existing college of engineering. The proposed Electrical and Electronics Engineering academic program will be organized to educate engineers for careers devoted to the integration of discoveries from multiple fields and take advantage of multiple disciplines available in the University's liberal arts environment. UGA, as one of the premier liberal arts institutions in the region, provides an enriching environment in this regard.*

2. If the program is applied or professional in nature, describe the kind of data you will use to support the need for the program. *U.S. Bureau of Labor Statistics and Georgia Department of Labor data.*

3. Provide a brief description of whether and why students will enroll in the program. What kinds of data do you intend to use to show student demand for the program? *The U.S. Department of Labor, Bureau of Statistics, reported that nationwide 291,000 electrical and electronics (EE) engineers were employed 2006. Long-term occupational projections for Georgia reports 6750 EE engineers employed in 2004 and projected a 13% increase (910 new jobs or an average of 230 jobs per year) between 2004 and 2014. However, nationwide the projected growth of only 5% or 15,000 jobs by 2016 as against 11% average increase for engineers was attributed to competition from foreign graduates and transportability of these*

jobs to other countries as compared jobs related to hard infrastructures and local environmental issues. The state of Georgia graduated only 262 students in 2006 (usually about one-third of these are enrolled as non-residents). This trend of losing jobs in critical science and engineering disciplines needs to be reversed. Electrical and Electronics Engineering is one of the most desirable career paths and the availability of jobs both locally and nationally will continue. A survey by the National Association of Colleges and Employers reported the average 2007 starting salary of Bachelor's in Electrical/Electronics and Communication Engineering was $55,292.

Students

Estimate the number of students who will graduate annually from the program in the steady state. *60*
What percentage will likely be from other existing programs? *10%*

Which programs will the students come from? *Agricultural Engineering; Biological Engineering.*

Budget

1. Estimate the steady-state cost of the program (in current dollars) and indicate the percentages from reallocation, student fees, grants, and outside dollars.

Steady-state cost - *$890,580*
Percentage from:
- Reallocation - *66%*
- Student fees - *27%*
- Grants - *7%*
- Outside dollars -*0%*

2. Estimate start-up costs for the program and indicate possible fund sources. *$1,548,000; new funds and indirect cost funds.*

Facilities

If additional facilities are needed, how they will be acquired. *None required.*

Curriculum and delivery

1. Are there special characteristics of the curriculum (as compared to similar programs)? *No.*

2. Will the program require new or special student services? *No.*

3. Will the program be attractive to under served populations? *Groups that are commonly underrepresented in engineering disciplines will find electrical and electronics engineering very attractive, thus increasing the diversity of students within the University of Georgia.*

Collaboration

It should be noted here that efficient use of state resources is an essential ingredient in new program approval.
If there is any doubt about how you will address the questions below, a conference is recommended.
1. If there are similar programs in your service area, how will the proposed program affect them?
The Georgia Institute of Technology currently has B.S. degree programs in Electrical Engineering. Currently these programs graduate fewer Electrical Engineers than are needed by governmental agencies and engineering firms in this state. This program will enhance the needs of the electrical and electronics engineering community in this state and will have unique programs in infrastructure planning and design.

2. Do you plan a collaborative arrangement with another institution or entity? *No.*

Other

Are there other elements of the proposed program that might give the staff greater insight into the overall value of this program to the University System strategic plan?

University of Georgia

Proposal

for

Bachelor of Science in Electrical and Electronics Engineering

Institution: University of Georgia **Date:** November 21, 2008

College/Unit: Faculty of Engineering

Name of the Proposed Program: Bachelor of Science in Electrical and Electronics Engineering

Degree: B.S.E.E. **Major:** Electrical and Electronics Engineering

Starting Date: Fall 2010

Prepared by the Faculty of Engineering:
Guigen Zhang, Faculty of Engineering; Dept. of Biological and Agricultural Engineering (Chair)
Takoi Hamrita, Faculty of Engineering; Dept. of Biological and Agricultural Engineering
Mark Haidekker, Faculty of Engineering
Caner Kazanci, Faculty of Engineering and Department of Mathematics

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1. PROGRAM ABSTRACT

Provide in a one or two page abstract a summary of the proposed program. This section should be written in a manner suitable for presentation to the Board of Regents and should briefly state the objectives of the program, identify the needs which the program would meet, and include information related to costs, curriculum, faculty, facilities, desegregation impact, enrollment, etc.

The objective of this proposal is to offer the Bachelor of Science degree in Electrical and Electronics Engineering (BSEE) by the University of Georgia, Faculty of Engineering, to prepare engineers for meeting Georgia's increasing technological demands. Graduates of this program will contribute to Georgia's economic development, advance its competitive edge globally and contribute to improvement in the quality of life. Specifically, the proposed degree is targeted to graduate engineers educated for careers as:

1. Power systems engineers for the generation, conversion, transmission and distribution of electric power and design of electromechanical devices,
2. Control engineers for process control and industrial automation using microcontrollers and Programmable Logic Controllers (PLC), and
3. Electronic engineers for designing advanced systems for bio-based industries related to energy generation, biomaterials, pharmaceuticals and health service and products.

The proposed degree will graduate students ready for successful careers as practicing engineers as well as entering graduate programs for advanced research degrees, and it will increase Georgia's enrollment capacity to meet needs of additional Georgia high school graduates seeking careers in engineering.

The need to take actions for maintaining technological leadership of the United States is progressively becoming more urgent. Developing cutting-edge technology through cultivating innovation is critically important in the global competitive environment. Engineering education is one of the most important aspects of this innovation-cultivating process. Many states are now recognizing a shortage of engineers and are taking actions to address this urgent problem. For example, in December 2007 the Governor of California announced a program to ramp up engineering education to train 20,000 new engineers in order to address the shortage of engineers in the state of California. This action of California, a state that already educates nearly 17% of electrical and electronics engineers in the nation, is telling of the pressures to graduate more engineers in the U.S.

In Georgia, as reported by a *Washington Advisory Group commissioned by the Board of Regents* in 2002, nearly half of all engineering jobs in the state of Georgia are filled by graduates of out-of-state and foreign institutions. Georgia projected a 12 to 14 percent increase for Electrical and Electronics Engineers between 2004 and 2014. The U.S. Bureau of Labor's December 2007 report projects nearly 11% increase in national demand for all engineers in the coming ten years (2006-16). A strong increase in demand for electrical devices, consumer products and electronic goods for communication and medical equipment is projected for this ten year period. However, a slower than the average demand of 5% increase nationally in Electrical and Electronics Engineers (increase from 291,000 in 2006 to 306,000 in 2016) is due to anticipated increased foreign competition. While the additional job vacancies in this field could be filled by foreign engineers who are generally trained in a traditional way, the need for engineers who can innovate for the future can only be met when we graduate engineers who are educated under a new paradigm proposed in the National Academy of Engineering (NAE) report entitled, "The Engineer of

2020." The proposed degree will ramp up engineering education in Georgia for meeting its own needs, and build the nation's capacity and provide incentives for graduating U.S. engineers in this critical area.

The UGA Faculty of Engineering is uniquely prepared to develop an Electrical and Electronics Engineering degree program that meets the expectations of the NAE report. Engineering graduates in the 21st Century must be technically competent and dedicated to the improvement of humankind. UGA is probably the only university among top ranked public research universities in the nation having the opportunity to design a brand new electrical engineering degree program at the dawn of the 21st Century without having to restructure engineering departments or an existing college of engineering. The proposed Electrical and Electronics Engineering academic program will be organized to educate engineers for careers devoted to the integration of discoveries from multiple fields and take advantage of multiple disciplines available in the University's liberal arts environment. UGA, as one of the premier liberal arts institutions in the region, provides an enriching environment in this regard.

The University of Georgia already has all necessary academic units and also complementary engineering programs in computer systems engineering, environmental engineering, biochemical engineering, biological engineering and agricultural engineering to support this proposed degree program. UGA faculty and academic resources will support needs for the degree; however, 6 to 7 new faculty and eight new courses in the targeted Electrical and Electronic Engineering area will be needed. Especially important to this program are UGA's strong programs in bio-sciences, bio-based applied sciences and engineering. The approach for building this degree proposal has been to leverage UGA resources and complement engineering programs of other institutions to meet Georgia's needs for practicing engineers. The new electrical engineering program will bridge a wide variety of application domains especially for the future bio-based economy. The degree program will require approximately 20,000 sq. ft. of additional teaching laboratory space as well as addition of appropriate support staff. This new B.S. degree is projected to have 210 majors in its fourth year.

The University of Georgia has a very strong commitment to recruiting students from underrepresented groups. Under the leadership of President Michael Adams the University has made significant progress. This program will actively recruit students and faculty from the underrepresented groups and build partnerships with historically Black Colleges and Universities to advance this mission. UGA already has more than 50 percent women students who will be targeted for this degree program, especially for bio-based sustainable systems that are generally attractive to them.

2. OBJECTIVES OF THE PROGRAM

List the program objectives and indicate how they are related to the mission and strategic plan of the institution, as filed with the Office of the Vice Chancellor for Research and Planning.

The objective of this proposal is to offer the Bachelor of Science degree in Electrical and Electronics Engineering (BSEE) by the University of Georgia, Faculty of Engineering, to prepare engineers for meeting Georgia's increasing technological demands. Graduates of this program will contribute to Georgia's economic development, advance its competitive edge globally and contribute to improvements in the quality of life. Specifically the proposed degree is targeted to graduate engineers educated for careers as:

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3. Electronic engineers for designing advanced systems for bio-based industries related to energy generation, biomaterials, pharmaceuticals and health service and products.

The proposed degree will graduate students ready for successful careers as practicing engineers as well as entering graduate program for advanced research degrees and will increase Georgia's enrollment capacity to meet needs of additional students seeking careers in engineering.

The University of Georgia is a land-grant and sea-grant university with state-wide commitments and responsibilities for higher education. It has a unique social contract with the citizens of Georgia to provide educational opportunities and conduct studies in engineering for improving the quality of life, while committing to extend knowledge and technology through it public service and outreach mission.

UGA's Strategic Plan for the First Decade of the 21st Century includes Comprehensive Engineering: A Strategic Institutional Initiative with the goal to establish a new unit and initiate academic studies in several use-inspired engineering areas. An important aspect of the Plan was the creation of a new engineering unit with the characteristics that does not pursue a "boilerplate" model with pigeonholed departments, but rather implements an evolutionary approach which is primarily driven by and focused on meeting societal needs. In this approach, engineering programs should demonstrate two attributes: 1) the needs being addressed are real, and 2) the desired excellence for potential success is achievable.

The UGA Faculty of Engineering models this approach and was established on October 1, 2001, and in accordance with the Strategic Plan, new academic degrees have been added progressively to meet Georgia's needs in engineering education. This proposal for an Electrical and Electronics Engineering degree is also inspired by the same goals and it not only meets UGA's Strategic Plan, but also serves USG Strategic Goals as follows:

USG Strategic Goal 1. Excellence in undergraduate engineering education is achieved by educating UGA engineers in a liberal arts environment, while simultaneously all UGA students will have an enhanced undergraduate experience as they will

understand and interact with students in a profession who are likely to be a part of their life-long work environment.

USG Strategic Goal 2. The proposed BSEE degree will add enrollment capacity to meet the increasing enrollment demand in USG institutions and it will fulfill the need for additional U.S.-educated engineers in Georgia as well as in the nation.

USG Strategic Goal 3. The BSEE graduates will be prepared as practicing engineers who will create technology and solutions that contribute to economic development. Graduates also will be ready for advanced graduate work leading to research careers. Electrical and electronics engineers' domain of application is ubiquitous and by focusing on energy, efficiency of industry and advanced electronic systems for bio-based industries, the graduates of this program will position Georgia to compete globally.

USG Strategic Goal 4. By selecting the focus areas within electrical and electronics engineering with the greatest demand and not directly duplicating other engineering programs, the proposed degree will complement and create an environment for forging partnerships with the state's other education agencies.

UGA has an extensive network of partnerships with governmental agencies, private industries, businesses and USG institutions. This program will leverage these partnerships for enhancing the educational experiences of students and faculty.

Finally, based on the U.S. Department of Labor statistics, the median salary for an electrical engineer is $75,483, arguably among the highest average for any engineering discipline.

3. JUSTIFICATION AND NEED FOR THE PROGRAM

a. Indicate the societal need for graduates prepared by this program. Describe the process used to reach these conclusions, the basis for estimating this need, and those factors that were considered in documenting the program need.

Thomas Friedman in his highly acclaimed book "The World is Flat" highlights staggering statistics showing how far the U.S. trails the world in meeting its science and technology needs. Societal need for graduates of science and engineering has been a concern of policy makers and educators for many years and now this concern is exacerbated with advances in China and India. Foreign graduates are being sought for high-paying, knowledge-based jobs or the work is being out-sourced because of a lack of qualified U.S. educated engineers.

The need to take actions for maintaining the technological leadership of the United States is progressively becoming more urgent. Developing cutting-edge technology by cultivating innovation is critically important in this competitive environment. Engineering education is one of the most important aspects of this innovation-cultivating process. Many states are now recognizing a shortage of engineers and are taking actions to address this urgent problem. For example, in December 2007 the Governor of California announced a program to ramp up engineering education to train 20,000 new engineers in order to address the shortage of engineers in the state of California. This action of California, a state that already educates nearly 17% of electrical and electronics engineers in the nation, is telling of the pressures to

graduate more engineers in the U.S.

In Georgia, as reported by a *Washington Advisory Group commissioned by the Board of Regents* in 2002, nearly half of all engineering jobs in the state are filled by graduates of out-of-state and foreign institutions. Since then the Georgia Department of Labor has projected a 12 to 14 percent increase for Electrical and Electronics Engineers between 2004 and 2014. The U.S. Bureau of Labor's December 18, 2007, report projects nearly 11% increase in national demand for all engineers in the coming ten years (2006-16). A strong increase in demand for electrical devices, consumer products and electronic goods for communication and medical equipment is projected for this ten year period. However, a slower than the average demand of 5% increase nationally in Electrical and Electronics Engineers (increase from 291,000 in 2006 to 306,000 in 2016) is due to anticipated increased foreign competition. While the additional job vacancies in this field could be filled by foreign engineers who are generally trained in a traditional way, the need for engineers who can innovate for the future can only be met when we graduate engineers who are educated under a new paradigm proposed in the National Academy of Engineering (NAE) report entitled, "The Engineer of 2020." The proposed BSEE degree will ramp up engineering education in Georgia for meeting its own need, and build the nation's capacity and provide incentives for graduating U.S. engineers in this critical area.

The 1998 Board of Regents report on Engineering Education in Georgia identified that fewer than two-thirds of Georgia high school graduates with over 1100 SAT scores who had declared engineering as their first choice for college enrolled in an engineering degree program in Georgia; over one-third went out of state for their higher education. In the following nine years while USG total enrollment increased from nearly 200,000 to 270,000 students, a nearly 33% increase, there was only a 15% increase in the number of new students admitted to engineering programs at USG institutions. Now USG is strategically preparing to expand its capacity by up to 40% to serve an additional 100,000 students by 2020. Additionally, the 1998 BOR report accurately projected a substantial increase in graduating high school students from 1998 through 2007 which has only exacerbated the situation. These trends suggest that as many as one-half of Georgia high school graduates interested in and qualified for an engineering degree either currently do not or soon will not have the opportunity to enroll in an engineering degree program at a USG institution. The dilemma for us on how to provide additional engineering educational opportunity for the increasing number of high school graduates and provide engineers for high-paying and high-impacting jobs in a technology-savvy future can be addressed by adding capacity at the University of Georgia for educating engineers. The proposed BSEE degree will greatly benefit Georgia high school graduates by providing them with the opportunity to obtain their engineering education in Georgia and also add to the number of individuals practicing engineering in Georgia's workforce in such promising areas as health, energy and bio-based industries.

These conclusions have been reached through a deliberate process to study the current state of engineering education in the state and country, future trends and needs of society, role of the U.S. in the knowledge-based society and global competition for high-impacting jobs and markets, need of the state for economic development and the role of the University of Georgia as the state's flagship university in economic development.

b. Indicate the student demand for the program in the region served by the institution. What evidence exists of this demand?

Georgia needs engineers and currently relies on in-migration from other states and other countries to fill nearly half of all engineering jobs in the state. As stated in the previous section, fewer than two-thirds of Georgia's 1998 high school graduates with over 1100 SAT scores who had declared engineering as their first choice for college enrolled in an engineering degree program in Georgia; over one-third went out of state for their higher education. In the following nine years while USG total enrollment increased from nearly 200,000 to 270,000 students, a nearly 33% increase, there was only a 15% increase in the number of new students admitted to engineering programs at USG institutions. Now USG is strategically preparing to expand its capacity by up to 40% to serve an additional 100,000 students by 2020. The recent and projected substantial increase in the number of Georgia high school graduates portends an even greater demand. These trends suggest that as many as one-half of Georgia high school graduates interested in and qualified for an engineering degree either currently do not or soon will not have the opportunity to enroll in an engineering degree program at a USG institution.

The U.S. Department of Labor, Bureau of Statistics, reported that nationwide 291,000 electrical and electronics (EE) engineers were employed in 2006. Long-term occupational projections for Georgia reports 6750 EE engineers employed in 2004 and projected a 13% increase (910 new jobs or an average of 230 jobs per year) between 2004 and 2014. However, nationwide the projected growth of only 5% or 15,000 jobs by 2016 as against 11% average increase for engineers was attributed to competition from foreign graduates and transportability of these jobs to other countries as compared to jobs related to hard infrastructures and local environmental issues. The state of Georgia graduated only 262 students in 2006 (usually about one-third of these are enrolled as non-residents). This trend of losing jobs in critical science and engineering disciplines needs to be reversed. Electrical and Electronics Engineering is one of the most desirable career paths, and the availability of jobs both locally and nationally will continue. A survey by the National Association of Colleges and Employers reported the average 2007 starting salary of Bachelor's in Electrical/Electronics and Communication Engineering was $55,292.

The University of Georgia's strengths as a comprehensive university and its extensive leadership in many issues affecting this state's economic and human development will provide a unique opportunity for students enrolled in the proposed degree program. They will have an opportunity to learn to integrate discoveries from many different disciplines in ways that provide futurist technological solutions.

c. Give any additional reasons that make the program desirable (for example, exceptional qualifications of the faculty, special facilities, etc.)

A 2000 strategic institutional initiative for the first decade of the 21st century of the University of Georgia is to establish *Comprehensive Engineering at UGA*. This is an innovative approach to prepare students for careers devoted to integration of discoveries from multiple fields. The goal for the *UGA Engineer* is to prepare engineers for 2020 who are ready to engage in life-long learning (a continuum of learning, unlearning and relearning), to create through awakening/recognition of

unexpected complementarity among disparate systems and synthesize new ideas, and to adapt for the changing environment. The University of Georgia is the state's oldest, most comprehensive and most diversified institution of higher education. It has exceptional faculty with finest facilities in all areas that will complement the proposed degree program. Its student body is of the highest quality and its Honors program is rated in the top five in the country. The University's intellectual, cultural and environmental heritage provides our engineering students a rich liberal arts learning environment. ABET (formerly the Accreditation Board for Engineering and Technology) and National Academy of Engineering commissioned reports articulate vigorously the need to broaden, deepen and integrate liberal arts in engineering education. The University's engineering program is among a limited few building engineering education in a liberal arts environment.

The University's programs in biological engineering, biochemical engineering, agricultural engineering, environmental engineering and computer systems engineering and many recent faculty appointments in partnership with other disciplines are assets for the kind of education planned in the proposed degree. One example for the unique environment of the UGA electrical and electronic engineering program can be given by the presence of a strong environmental engineering program. An in-depth understanding of electrical machines and power distribution and various forms of renewable energy sources along with their ecological and environmental impacts allows the electrical engineers to address the emerging need for new forms of energy and new systems of power distribution. The Electrical and Electronics Engineering graduates will be able to analyze a problem from a systems perspective and be able to interface existing electronic and microprocessor based components to solve the problem. In turn, these graduates will be able and ready to provide leadership in a team environment and to communicate and function across the disciplines of electrical engineering, industrial engineering, and other applied science fields. Thus, the graduates can serve Georgia's power distribution companies and therefore satisfy an immediate need. The available engineering facilities and infrastructure will launch a BSEE degree program that will graduate practicing engineers most needed for the state's development.

Clearly, the addition of the B.S. in Electrical and Electronics Engineering degree program will make UGA a more effective public university. The electrical and electronics engineering students and faculty will be able to contribute to programs in mathematics and the sciences in areas such as bioenergy, nanotechnology, and biomedical engineering, and the research work of these areas will be more readily transformed for use in the development of the state.

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d. Include reports of advisory committees and supporting statements of consultants, if available.

Georgia needs more engineers. While Georgia's growth and its stature among states rose in the decade of the 90's in some important categories (for example, 4th in population growth, 8th in venture capital investment, 8th in start-up companies), it ranked 40th in the nation in percentage of engineers and scientists in its workforce [From the 2000 Report of the U.S. Council of Competitiveness]. According to a February 2002 report by the Washington Advisory Group [Commissioned by the University System of Georgia Board of Regents], Georgia relies on in-migration from other states and other countries to fill nearly half of all engineering jobs in the state.

There is also a need to increase the state of Georgia's capacity for engineering education. Another University System of Georgia-commissioned report on

engineering education needs that was published in 1998 presented data showing that fewer than two-thirds of the qualified Georgia high school graduates (SAT scores of 1100 to 1600) with an expressed interest in majoring in engineering were enrolled in engineering in USG institutions of higher education. The same report projected a 25% increase in the number of Georgia high school graduates from 1998 to 2007. The Georgia Financial Commission recognized the need for Georgia to graduate more engineers when it created, under the HOPE Scholarship Program, a "Scholarship for Engineering Education (SEE)" with the objective "To provide service-cancelable loans to Georgia residents who are engineering students at private accredited engineering universities in Georgia and retain them as engineers in the State."

The University of Georgia organized an engineering symposium, *Towards 2010: Faculty of Engineering at UGA*, held in April 2002. Prominent leaders invited from industry, business, agency and academia expressed a need for engineers in the development of the state. They identified three major opportunity areas: biobased products and industries, information systems, and management of the environment and natural resources. They observed that the UGA Faculty of Engineering is uniquely structured to develop engineering research, outreach and academic programs in ways that permit advances by interfacing disciplines. This degree program is proposed to meet an important opportunity in a highlighted area. This program will add new dimensions to the University of Georgia's existing programs, increase the quest for use-inspired research and reduce the time between knowledge discovery and use.

e. List all public and private institutions in the state offering similar programs. If no such program exists, so indicate.

Georgia Institute of Technology offers an ABET-accredited Bachelor of Electrical Engineering degree from the School of Electrical & Computer Engineering. There are no other public or private institutions in the State of Georgia offering a B.S. in Electrical and Electronics Engineering. The Electrical Engineering program at Georgia Tech is involved in 10 areas of research and education - bio-engineering, computer engineering, digital signal processing, electric power, electromagnetics, electronic design and applications, microsystems, optics and photonics, systems and controls and telecommunications. In contrast, the proposed B.S. in Electrical and Electronics Engineering degree program at UGA emphasizes the areas of power systems, control engineering and designing advanced control systems for bio-based industries related to energy generation, biomaterials, pharmaceuticals and health services and products.

4. PROCEDURE USED TO DEVELOP THE PROGRAM

Describe the process by which the committee developed the proposed program.

This proposal for a new degree is a result of a deliberate process initiated in 1999 in response to the University's Strategic Plan for the First Decade of the 21st Century.

In February 2000, the Department of Biological and Agricultural Engineering submitted a position paper prepared by Professors Brahm Verma and Dale Threadgill entitled "Comprehensive Engineering at UGA" to the Vice President for Strategic Planning with the request that Engineering be included as a Strategic Issue in the University's Strategic Plan. The "Comprehensive Engineering at UGA" paper identified areas of engineering opportunity and a strategic approach to build the institution's capacity. It demonstrated that advancing Engineering will add new dimensions to the University in related fields for meeting the needs of the state of

Georgia. The University Strategic Planning Advisory Board included Engineering as a new Strategic Institutional Initiative and it is now a part of the Plan for the first decade of the millennium.

In April 2001, a Symposium, *Towards 2010: Comprehensive Engineering at UGA*, was held to engage UGA faculty from across campus in a daylong effort to identify engineering initiatives of significance and to articulate ways in which Comprehensive Engineering will strengthen a range of the University of Georgia programs. More than 100 faculty members from 9 Colleges/Schools participated in the Symposium. Thirteen faculty members highlighted engineering opportunities in research, graduate and undergraduate studies and outreach. Their perspectives represented the disciplines of physics, chemistry, pharmacy and health sciences, biochemistry and molecular biology, veterinary sciences, computer science, mathematics, ecology, marine sciences, environmental sciences, textile science, food science, business and engineering. They identified the important dimensions in which the University's current programs are unable to grow due to lack of Comprehensive Engineering at UGA and shared experiences on how the University has been handicapped in capitalizing on opportunities for meeting the needs of the state of Georgia. At that time (i.e., in 2001) the UGA faculty identified the following nine engineering program areas as high priority needs and opportunities: nanotechnology, sensors and controls, ecological/environmental engineering, pharmaceutical engineering, information/computer systems engineering, marine engineering, metabolic engineering, engineering management and bioprocess/biochemical engineering. A task committee with membership including UGA faculty from diverse but related disciplines was formed for each of these program areas and charged with further developing the needs and opportunities. Another task committee was charged with proposing ideas to create an innovative approach for organizing Comprehensive Engineering at UGA. The concept of a Faculty of Engineering originally proposed in the "Comprehensive Engineering at UGA" document was recommended. The UGA Faculty of Engineering was formally established on October 1, 2001, with Dr. E. Dale Threadgill appointed as its Director.

To gain insight from state and national leaders about building programs in the UGA Faculty of Engineering, a second daylong Symposium, *Towards 2010: Faculty of Engineering at UGA*, was organized with invited leaders from industry, business, government agencies and academia participating. The Symposium, held in April 2002, was open to the UGA faculty. More than 100 individuals attended the Symposium. UGA President Michael Adams in his opening remarks explained the needs for engineers in the state of Georgia. He cited a February 2002 report, prepared by a Washington Advisory Group commissioned by the Board of Regents, conclusively stating that Georgia relies on in-migration from other states and other countries to fill nearly half of all engineering jobs in the state. President Adams further stated, "UGA has a social and charter responsibility as Georgia's flagship institution to provide innovative services for the economic development of the state. Engineering is a key linchpin in this effort." Dean Kristina Johnson from Duke University stated that a "modern research university is incomplete and obsolete without comprehensive engineering." Discussions during breakout sessions reinforced the need for engineering in the program areas identified at the 2001 Symposium as well as identified new opportunities with biomedical engineering.

At the conclusion of the April 2002 Symposium, the UGA Faculty of Engineering established several task groups and charged them with developing academic programs and other recommendations for meeting the identified engineering needs.

In the continuing development of the Faculty of Engineering and Comprehensive Engineering at UGA, the need for electrical and electronics engineering at UGA was recognized in 2007 by UGA faculty and administrators, and a committee was formed and charged with the task to develop a curriculum and proposal for the B.S. degree in Electrical and Electronics Engineering.

An Electrical and Electronics Engineering Degree Program Proposal Committee comprised of persons with diverse academic backgrounds, with input from the greater engineering faculty, developed this program proposal. Programs from other institutions were studied to determine possible course content and curriculum. The philosophy of engineering on the UGA campus was also taken into account. The proposal was prepared with the support of the UGA engineering faculty and the faculty in related UGA Colleges/Schools. The proposal was then submitted for approval following the established procedures of the University of Georgia and the Board of Regents for approving new degree proposals.

5. CURRICULUM

List the entire course of study required and recommended to complete this degree program. Give a sample program of study that might be followed by a representative student. Indicate also the existing courses and any new courses that will be added. Append a course description for existing courses as well as new courses that will be added.

Most of the computer science and engineering courses necessary for implementing the proposed degree program are already developed and currently being offered. Courses in the humanities, social sciences, sciences and math to support these programs are available from the Franklin College of Arts and Sciences. Courses in engineering science and engineering design are also available within the existing ABET-accredited engineering degree programs.

Curriculum – Bachelor of Science in Electrical and Electronics Engineering (BSEE)

Proposed Program Requirements

BSEE CORE CURRICULUM REQUIREMENTS

Course Number	Course Name	Hours
I: Foundation Courses (9 hours with a grade of C or better in each course)		
MATH 2250	Calculus I for Science and Engineering	4
ENGL 1101 (1)	English Composition I	3
ENGL 1102 (1)	English Composition II	3
	Total	10
II. Sciences (7-8 hours)		
Physical Sciences (3-4 hrs.)		
PHYS 1211-1211L	Introductory Physics for Science and Engineering Students-Mechanics, Waves, Thermodynamics	4

Life Sciences (3-4 hrs.)

BIOL 1104	Organismal Biology	3
	Total	7

III. Quantitative Reasoning (3-4 hours)

MATH 2260	Calculus II for Science and Engineering	4
	Total	4

IV. World Languages and Culture, Humanities and the Arts (12 hours)

World Languages and Culture (9 hrs.)

World Languages and Culture		3
World Languages and Culture		3
World Languages and Culture		3

Humanities and the Arts (3 hrs.)

Select one course from the following: CMLT 2111, CMLT 2400, CMLT 2500, ENGL 2400 (3)		3
	Total	12

V. Social Sciences (12 hrs)

Social Science Elective		3
Social Science Elective		3
ECON 2105	Principles of Macroeconomics	3
ECON 2106	Principles of Microeconomics	3
	Total	12

Entrance Requirements

Grade of "C" or better in each of the following courses and a 2.5 GPA for this pool of courses: MATH 2250; MATH 2260; MATH 2500; MATH 2700; PHYS 1211-1211L; PHYS 1212-1212L; BIOL 1104. Overall GPA 2.5.

VI. Courses Related to the Major: (13 hours)

MATH 2500	Multivariable Calculus	3
MATH 2700	Elementary Differential Equations	3
MATH 3000	Introduction to Linear Algebra	3
PHYS 1212-1212L	Introductory Physics for Science and Engineering Students-Electricity and Magnetism, Optics, Modern Physics	4

VII. Requirements in the major (54 hours)

ENGR 1120	Engineering Graphics and Design	3
CSEE 2220	Fundamentals of Logic Design	3
CSEE 4270	Design of Digital Systems	3

ENGR 2170	Electrical Circuits	3
ENGR 3140	Thermodynamics	2
ENGR 3150	Heat Transfer	3
ENGR 3210	Electrical Machines and Power Distribution	3
ENGR 4210/6210	Linear Systems	3
ENGR 4220/6220	Feedback Control Systems	3
ENGR 4230/6230	Sensors and Transducers	3
ELECTRICAL ENGR (new)	Electromagnetics	3
ENGR 3270	Electronics I	3
ENGR 4240	Introduction to Microcontrollers	3
ENGR 4250/6250	Advanced Microcontrollers	3
ENGR 4270	Electronics II	3
ELECTRICAL ENGR (new)	Design Laboratory	2
ELECTRICAL ENGR (new)	Programming for Engineers	4
ELECTRICAL ENGR (new)	Capstone Design (2 semesters)	4

VIII. Electrical Engineering Electives (18 hours)

ELECTRICAL ENGINEERING ELECTIVE 1- (New) Wireless and RF electronics
ELECTRICAL ENGINEERING ELECTIVE 2- (New) Engineering Entrepreneurship I
ELECTRICAL ENGINEERING ELECTIVE 3- (New) Engineering Entrepreneurship II
ELECTRICAL ENGINEERING ELECTIVE 4- ENGR 4260/6260 Introduction to Nanoelectronics
ELECTRICAL ENGINEERING ELECTIVE 5- (New) Power and Energy Systems
ELECTRICAL ENGINEERING ELECTIVE 6- CSEE 4210 Digital Signal Processing
ELECTRICAL ENGINEERING ELECTIVE 7- ENGR 4980 Special Topics in Engineering
ELECTRICAL ENGINEERING ELECTIVE 8- BCHE 4460 Biorefinery Engineering

The following distribution of hours will require 130 hours for completing the degree requirements:

General Education Abilities 45 hours

- Foundation Courses 10 hours
- Physical Science 4 hours
- Life Science 3 hours
- Quantitative Reasoning 4 hours
- World Language and Culture 9 hours
- Humanities and the Arts 3 hours
- Social Sciences 12 hours

Courses Related to the Major 13 hours

Requirements in the Major 54 hours

Electrical Engineering Electives 18 hours

TOTAL FOR THE DEGREE 130 hours

B.S. in Electrical Engineering
130 Semester hours

Year One:

Fall Semester Course	Credit Hours	**Spring Semester** Course	Credit Hours
MATH 2250 Calculus I	4	MATH 2260 Calculus II	4
ENGL 1101 English Comp. I	3	ENGL 1102 English Comp. II	3
BIOL 1104 Organismal Biology	3	World Languages and Culture	3
PHYS 1211-1211L Intro. Physics	4	PHYS 1212-1212L Intro. Physics	4
ENGR 1120 Engr. Graphics and Design	3	Social Science Elective	3
Total Credit Hours	17	Total Credit Hours	17

Year Two:

Fall Semester Course	Credit Hours	**Spring Semester** Course	Credit Hours
MATH 2500 Multivariable Calculus	3	MATH 2700 Elem. Differential Equa.	3
CSEE 2220 Fund. of Logic Design	3	ENGR 2170 Electrical Circuits	3
MATH 3000 Intro. to Linear Algebra	3	ENGR 3140 Thermodynamics	2
PROGRAMMING FOR ENGINEERS	4	ENGR 3150 Heat Transfer	3
Social Science Elective	3	ECON 2105 Princ. of Macroeconomics	3
		Humanities and the Arts	3
Total Credit Hours	16	Total Credit Hours	17

Year Three:

Fall Semester Course	Credit Hours	**Spring Semester** Course	Credit Hours
ELECTROMAGNETICS	3	ENGR 4240 Intro. to Microcontrollers	3
ENGR 4210/6210 Linear Systems	3	ENGR 4270 Electronics II	3
ENGR 4230/6230 Sensors and Transduc.	3	ENGR 4220/6220 Feedback Cont. Sys.	3
ENGR 3210 Elect. Machines & Power	3	Design Laboratory	2
ENGR 3270 Electronics I	3	World Language & Culture	3
		ENGR 4250/6250 Adv. Microcontrollers	3
Total Credit Hours	15	Total Credit Hours	17

Year Four:

Fall Semester Course	Credit Hours	**Spring Semester** Course	Credit Hours
ELEC. ENGR. CAPSTONE DESIGN I	2	ELEC. ENGR. CAPSTONE DESIGN II	2
ELECTRICAL ENGR. ELECTIVE	3	ELECTRICAL ENGR. ELECTIVE	3
CSEE 4270 Design of Digital Systems	3	ELECTRICAL ENGR. ELECTIVE	3
ELECTRICAL ENGR. ELECTIVE	3	ELECTRICAL ENGR. ELECTIVE	3
ELECTRICAL ENGR. ELECTIVE	3	ECON 2106 Princ. Of Microeconomics	3
World Language & Culture	3		
Total Credit Hours	17	Total Credit Hours	14

6. INVENTORY OF FACULTY DIRECTLY INVOLVED

The University of Georgia offers ABET accredited undergraduate degrees. All required courses in arts and sciences are already available from the UGA Franklin College of Arts and Sciences. Nine engineering faculty members currently offer all core engineering science courses required for this degree program. The need for additional faculty is presented in Section 15.

The faculty who will be directly involved with the proposed degree program are listed below. Additional data on these faculty members is provided in Appendix B.

Dr. Suchi Bhandarkar, Faculty of Engineering, Computer Science Dept.
Dr. Takoi Hamrita, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Mark Haidekker, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Caner Kazanci, Faculty of Engineering, Math Dept.
Dr. Leidong Mao, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Don Potter, Faculty of Engineering, Computer Science Dept.
Dr. Andrew Sornborger, Faculty of Engineering, Math Dept.
Dr. Chi Thai, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Bingqian Xu, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Guigen Zhang, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Qing Zhang, Faculty of Engineering, Mathematics Dept.

7. OUTSTANDING PROGRAMS OF THIS NATURE IN OTHER INSTITUTIONS

List three outstanding programs of this nature in the country, giving location and name of official responsible for each program. Indicate features that make these programs stand out.

Institutions with ABET accredited Electrical Engineering Degree Programs:

1) Electrical and Computer Engineering Department

University of Wisconsin-Madison
2420 Engineering Hall
1415 Engineering Drive
Madison, WI 53706-1691
http://www.engr.wisc.edu/ece/current/

Parameswaran Ramanathan

Tel: 608/262-3840
Fax: 608/262-1267
E-mail: ecechair@engr.wisc.edu

2) Department of Electrical Engineering and Computer Science
Massachusetts Institute of Technology
Room 38-401
77 Massachusetts Avenue
Cambridge, MA 02139-4307

http://www.eecs.mit.edu/

Professor W. Eric L. Grimson; Room 38-403

(617) 253-4645
(617) 258-7354
welg@csail.mit.edu

3) Department of Electrical and Computer Engineering
University of Illinois at Urbana-Champaign
Everitt Laboratory, MC-702
1406 W. Green St.
Urbana, IL 61801-2918

http://www.ece.uiuc.edu/

Professor M. Tamer Basar
217-333-3607
Basar1@uiuc.edu

8. INVENTORY OF PERTINENT LIBRARY RESOURCES

Indicate in number of volumes and periodicals, available library resources (including basic reference, bibliographic, and monographic works as well as major journal and serial sets) which are pertinent to the proposed program. What additional library support must be added to support the program?

The University of Georgia Library has several campus units. It has a comprehensive collection in arts, sciences and professional subjects and has an archival section that holds special historical documents. The Library has been a member of the Association of Research Libraries, a nonprofit organization of 122 of the largest research libraries in the U. S. and Canada, since 1967. In 2006, UGA was ranked 32nd in the total number of volumes, 38th in the total library material and 9th in total number of government documents owned.

The UGA Library is the largest in the state with over 4.4 million volumes. On-line access to full text journals and serials is available both through a consortium of UGA, Emory, Georgia Tech, Georgia State and Medical College of Georgia, and directly to the University of Georgia libraries. In addition, UGA is a leader nationally in offering electronic access to a wide range of electronic resources, including journal articles in full text. The statewide GALILEO system provides electronic access to hundreds of databases, including Chemical Abstracts, Engineering Index, Bioengineering Abstracts, Current Contents, *etc.* The University subscribes electronically to over 1000 Elsevier titles and to all titles published by Academic Press, Marcel Dekker, Spring Verlag, and Wiley Interscience.

The University Libraries have excellent print and electronic resources, particularly in chemistry, biological sciences, physics, mathematics and computer sciences, ecology and environmental sciences, agricultural sciences and earth sciences. The University of Georgia Science Library would provide the primary resource and support for the

proposed program. Some relevant Science Library inventory and operational information is listed below.

a) Total volumes - 750,000 and its catalog is available over the Internet.
b) Volumes pertaining to engineering and technology – nearly 100,000 and materials accessible via the Internet.

Generally, basic texts and references are available; however, some expansion will be needed as described in the following section.

State of Faculty Instructional Support and Additional Support Needs

State of collections in engineering sciences for the proposed degree programs is as follows:

- Reference Collection — Adequate, but update will be required
- General Book Collection — Additional book on engineering will be needed
- Periodicals, current — Additional engineering periodical will be needed
- Serials — Adequate
- Documents — Adequate

Projection

The Science Library has made steady progress in upgrading technical holdings. With modest designated funding increases, the library should provide good support for the proposed program. Ongoing improvement in the sciences library holdings will complement the engineering resources.

Additional Information on Library Resources

The Science Library provides reference help, interlibrary loan, circulation and collection development. It has 26 full-time staff, including 7 librarians. It has about 750 seating capacity and is open 107.5 hours per week.

The Georgia Institute of Technology library would also be available to supplement the University's resources in engineering.

9. FACILITIES

Describe the facilities available for the program. What new facilities and equipment are required?

The University of Georgia has extensive facilities to support the proposed degree program in Electrical and Electronics Engineering.

a. Electrical/Electronics Lab

The Electrical/Electronics Teaching Laboratory (EETL) is equipped with twelve (12) workstations and one teacher workstation. This laboratory has specialized software and a computer projection system to permit sharing of any software application between teacher and students and among students (under the control of the teacher station). Each student can access their own PC for personal electronic hand-written note taking and also for laboratory exercises. Captured hypermedia files of

classroom notes and software demonstrations will be accessible to students for review on WebCT after class.

Courses Taught

ENGR 2170 Electrical Circuits
ENGR 3270 Electronics I & II
ENGR 4230 Sensors and Transducers
ENGR 4140 Introductory Systems Modeling
ENGR 4220 Feedback Control Systems
ENGR 4540 Applied Machine Vision

Hardware. The students' computers are Pentium D 2.8 GHz processor with 2048 MB RAM running Windows Vista Enterprise. The teacher workstation is a Pentium D 2.8 GHz with 4096 MB RAM running Windows Vista Enterprise with an 160 GB hard drive. This room has its own internal LAN running at 1 Gbps and is not connected to the World Wide Web. The teacher's workstation provides the necessary tools for a multimedia presentation. The desktop screen on the teacher's station is projected onto the front screen through a connection to a computer projection system. A document camera can also be used for small equipment demonstrations or hand-written notes. This camera output can also be sent to the ceiling mounted computer projector system. Pen tablets are available to the instructor and all students.

Software. The basic software for report writing ('Microsoft Office Suite') and data analysis ('Matlab', 'Scilab') are installed on each workstation. In addition to the customary software, each workstation in the Electrical/Electronic Teaching Lab has specialized software for electrical and system engineering:

'MultiSim 2001' (electrical/electronic simulation software)
'LabVIEW 8.5' (data acquisition and control)
'RSLinx', 'RSLogix500', 'RSLadder500' (programmable controller)
QuantIM (image processing)
Arena (modeling discrete systems)
Stella (modeling continuous systems)
RoboJDE (micro- controller software development environment)

b. The General Computing Undergraduate Laboratory (GCUL)

This lab is available for students taking engineering courses in order to complete their computer-based assignments. This lab has 20 workstations, they are P4 - 3.0 GHz processors with 512 MB or better RAM running Windows XP. All PCs in this lab are connected to a 100 Mbps LAN and are connected to the World Wide Web.

Software
Engineering software programs such as AutoCAD (engineering graphics), CodeWarrior (Java and C++ programming), BlueJ (Java programming), Matlab, Algor (finite element analysis) and SuperPro Designer (design of facilities for environmental industries) are installed on each of the PCs, along with standard office productivity software.

c. Machine Vision Lab
Although the laboratory is primarily used for research, two workstations are connected to a web server that allows students to conduct experiments in the laboratory from remote locations. Students have access to the solid-state cameras and frame grabbers for image acquisition as well as translation stages for aligning

specimens in the field of view. Microcontroller-based bots equipped with miniature cameras are also available for student projects.

Course Taught
ENGR 4540 Applied Machine Vision

Hardware
This lab is designed to be accessible from any student PC via the Web 24 hours/day, 7 days/week through the simple use of a Web browser and Microsoft NetMeeting. The complete laboratory computer cluster consists of 1 Web/FTP server and 2 PCs set up as machine vision workstations. Machine vision hardware for illumination, image capturing and processing are available along with 2 computer-controlled X-Y stages for sample presentation. VIS-NIR spectrometers are also accessible.

Software
Labview, QuantIM, RoboJDE, C++ Development Environments

d. Embedded Systems Lab
This is a state-of-the-art lab for teaching microcontroller-based design. The lab consists of 10 workstations, they are P4 - 3.0 Ghz processors with 512 MB or better RAM running Windows XP. All PCs in this lab are connected to a 100 Mbps LAN and are connected to the World Wide Web.

Courses Taught:
ENGR 4240 Intro. to Microcontrollers
ENGR 4250 Advanced Microcontrollers
ENGR 4210 Linear Systems
ENGR 4220 Feedback Control Systems

Hardware:
Each workstation consists of a Pentium IV PC, A Motorola 68HC11 EVB development board, a target board, digital scope, function generator, multimeter. The lab also consists of a logic analyzer, Chip programmers for "burning" programs on EPROM, and a variety of hardware components (small motors, sensors, ICs, etc.) for application design (Upgrade to the state-of-the-art components is needed; see below).

Software
Program compilers, chip simulators, MATLAB (for linear systems analysis).

e. Industrial Controls and Power Distribution Lab
This lab exposes students to various devices such as motor controllers and programmable logic controllers that are used in industrial control environments.

Courses Taught:
ENGR 3210 Electrical Machines & Power Distribution

Hardware:
Each of the five stations is equipped with an Allen-Bradley MicroLogix 1500 Programmable Logic Controller (PLC). Options of each PLC include temperature and mV inputs as well as 6 channels of digital input/output. To assist in connection between devices, a control panel with various pushbuttons, indicators and relays is

installed. Single and three-phase power is available at each station. Program development for the PLCs is accomplished with the software suite from Rockwell Automation that is installed on the workstations in the Electrical/Electronics Lab described earlier.

f. The Collaborative Distance Education Laboratory (CDEL)

This instruction-only lab is used for all engineering students for in-class as well as remote content delivery using interactive and collaborative instructional techniques provided by the software package "NetSupport Manager." The Distance Education aspect is facilitated using IP/ISDN video-conferencing technologies so as to bring in off-campus guest lecturers for interactive and collaborative sessions with each student station. This laboratory has specialized software and a computer projection system to permit sharing of any software application between teacher and students and among students (under the control of the teacher station). Each student can access his or her own PC for personal electronic hand-written note taking and also for laboratory exercises. Captured hypermedia files of classroom notes and software demonstrations will be accessible to students for review on WebCT after class.

Hardware

The 35 student stations are configured as follows: 14 Intel Core Duo 2.6GHz and 1024 MB RAM; 14 Pentium D 2.8 GHz and 1024 MB RAM; 7 Pentium 4 3.0 GHz and 1024 MB running Windows XP Professional. The teacher station is a dual Xeon and 2048 MB RAM running Windows Vista Enterprise.

All PCs in this lab are connected to a 1.0 Gbps LAN and are connected to the World Wide Web. Pen tablets are available to the instructor and all students.

Software

Engineering software programs needed for instruction such as AutoCAD (engineering graphics), CodeWarrior (Java and C++ programming), Algor (finite element analysis) and SuperPro Designer (design of facilities for environmental industries) are installed on each of the PCs, along with standard office productivity software.

g. Visual and Parallel Computing Lab (VPCL)

Hardware and Software:

The VPCL facilities include a multiprocessor UNIX server, SUN and SGI workstations, and Pentium-IV PC's, all interconnected via a 100 Mbs Ethernet. In addition, VPCL has a variety of image/video acquisition equipment including high-resolution scanners, digital cameras, frame grabbers and video encoder/decoder hardware. VPCL has a variety of image processing, image analysis, and parallel computing software available including Khoros (Khoral Research Inc.), PVM (Oak Ridge National Laboratory) and MPI (Oak Ridge National Laboratory). In addition, VPCL has developed several image processing, image analysis, computational biology and parallel computing software in house. VPCL has access to departmental computing resources which include several servers, workstations, PC's and an 8-node cluster of SMPs where each SMP is a shared-memory multiprocessor comprised of four Pentium Xeon processors with 1 GB RAM and 60 GB disk storage.

New facilities and equipment that are needed are listed below.

Software Engineering Lab
The lab will be used for teaching undergraduate and graduate courses in the area of software methodologies for designing, modeling, testing and maintenance. It will provide an environment for team project development and management. This lab should build on state-of-the-art hardware, but is required to use the GNU/Linux operating system for several reasons:

Linux, as opposed to Windows, comes with a comprehensive package of development tools. This includes software development in most pertinent languages from C/C++ to Java to Python to Ruby, just to name a few examples. Linux comes with an enormous package of application programs, such as Open Office, the R project (SAS-like statistics), Octave (an Open Source Matlab replacement), circuit designers and simulators (e.g., the gEDA project, KTechlab), integrated circuit and VLSI design, linear and nonlinear systems simulators (e.g., Scilab/Scicos) and more. Most importantly, open source means that the student has the ability (actually, the *right*) to inspect, examine, learn about, and modify the software programs. This is fully in-line with our educational mission. Please consult http://www.gnu.org/philosophy/schools.html for an essay on why it is of crucial importance for our educational mission to offer access to Open Source software.

Embedded Systems Lab.
The existing lab will be expanded to meet increased student enrollment and add new equipment. The lab needs to be upgraded with state-of-the-art equipment to teach undergraduate and graduate students how to use microcontrollers and microprocessors for the design of embedded real-time systems. Students will learn embedded systems design using specialized system-level software techniques, along with hardware, interfacing and bus interconnect. The present lab builds on the 68H11 microcontroller. In future, modern chips, particularly the flash-programmable 8-bit PIC or Atmel microcontroller family should be used. For the extension into real-time digital signal processors, the 16- and 24-bit dsPIC family will be included. This requires addition of experimental boards, flash programmers, in-circuit debuggers, peripherals and necessary PC hardware, as well as programming language software (assembler, C-compiler, linker etc).

Computer Network Development Lab
The lab will provide facilities for studying network design, topology, protocols and performance.

VLSI Circuit Design Lab
The lab will provide facilities for learning techniques to create large and complex circuit designs and to map the designs onto a particular technology given such criteria as size, speed and power.

These facilities will also be used for undergraduate design and graduate research projects.

10. ADMINISTRATION

Describe how the proposed program will be administered within the structure of the institution.

The program will be based in the Institute of The Faculty of Engineering. The overall responsibility will reside with the Director of the Faculty of Engineering who will be the administrative officer of the program and who will be responsible for budgetary and related business matters. The Director will actively engage contributing UGA academic units in developing arrangements for appropriately sharing new resources provided for this degree program. The Undergraduate Coordinator of the Faculty of Engineering will coordinate this undergraduate degree program with regard to such matters as recruitment, admission, scheduling, advising students, curriculum revision and other matters insuring continued program enhancement.

11. ASSESSMENT

Indicate the measures that will be taken to assess the effectiveness of the program and the learning outcomes of students enrolled.

UGA currently offers two undergraduate engineering degree programs which are accredited by ABET. The EC-2000 assessment process has been adopted for these programs and the next ABET visit will be held during Fall 2009. This same process of continuous quality assessment will be applied to the Bachelor of Science in Electrical and Electronics Engineering. The educational objectives of the BSEE degree program are listed previously. The Program Outcomes of the BSEE are as follows:

a) an ability to apply knowledge of mathematics, chemistry, physics, computer science and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs
d) an ability to function on multi-disciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

The effectiveness of the proposed BSEE degree program will be assessed by the following five methods:

A. Graduates of the program

The performance of graduates of this degree program will be monitored by collecting information on:

i. Employment opportunities

Number of job offers received
Positions obtained
Unemployed
Underemployed
Type of industries and institutions offering jobs
Advancements in position and salary

ii. Additional Graduate Studies
Successful enrollment in subsequent graduate programs
Nature of graduate programs to which enrolled
Professional schools or other degrees

iii. Other
Graduates starting new companies
Consulting areas
Alumni surveys

B. Recruitment and Enrollment

The success of the B.S. in Electrical and Electronics Engineering will be assessed by the impact on recruitment and enrollment.

i. Number and quality of applicants
SAT scores
GPA
Number of applicants having already received undergraduate degrees
Incoming honors students

ii. Number and quality of applicants from underrepresented groups
Number of students from outside state
Number of transfer students and nature of program transferring from

C. Performance of Enrolled Students

Students enrolled in the B.S. in Electrical and Electronics Engineering program must perform at a high level in both science and engineering courses. Their performance will be assessed by comparing their grades with science and other engineering majors at UGA as well as their performance on the Fundamentals of Engineering Examination.

D. Impact of Enrolled Students

Students enrolled in the program should positively impact in developing Electrical and Electronics Engineering at the University of Georgia. Their impact will be assessed by:

i. New courses developed by faculty in engineering and developed jointly with Ecology, Environmental Design, Agricultural, Biological and Environmental Engineering
ii. Courses modified
iii. Participation in co-op work experience
iv. Unique undergraduate research experiences where creative exercises add to the learning process
v. Participation in study-abroad
vi. Number of honors students
vii. Recognition at University and College levels of scholarship and service
viii. Activities in professional societies and contributions in student clubs and/or professional societies

E. Regional and National Standing of the Program

The recognition of the B.S. in Electrical and Electronics Engineering program at the regional and national levels will be assessed by

i. Faculty in this program invited to consult with other universities

ii. Faculty in this program invited to lead or participate in workshops and debates
iii. Faculty in this program retained as consultants by civil engineering industries
iv. Demand for graduates both at regional and national levels
v. Publications in scholarly journals

Assessments will be performed to determine if the Program Outcomes important to the Program Educational Objectives and Missions of the Faculty of Engineering and the University of Georgia are being met. The selected Program Assessment Methods are as follows: alumni surveys, employer surveys, senior exit surveys, student portfolios, class exams and assignments, senior design experience, nationally normed exams such as the FE exam, and placement of graduates. A formalized assessment process will be established.

12. ACCREDITATION

Identify accrediting agencies and, where applicable, show how the program meets the criteria of these agencies.

The accrediting agency for undergraduate professional engineering degree programs in the U.S. is ABET (formerly the Accrediting Board for Engineering and Technology). UGA has two accredited undergraduate engineering programs: B.S. in Biological Engineering and B.S. in Agricultural Engineering. Accreditation for the B.S. in Electrical and Electronics Engineering will be pursued under the ABET Program Criteria for Electrical, Computer, and Similarly Named Engineering Programs. These program criteria apply to engineering programs that include electrical, electronic, computer, or similar modifiers in their titles. The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program. The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; and knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives.

13. AFFIRMATIVE ACTION IMPACT

Indicate what impact the implementation of the proposed program will have on the institution's desegregation and affirmative action programs.

The degree program will be open to all qualified persons and shall not discriminate on the basis of race, color, religion, national origin, sex, age, or physical disability. The engineering program at the University of Georgia has focused effort in recruiting

students and faculty from under-represented groups and is a charter member of the Southeastern Consortium for Minorities in Engineering (SECME). In addition to continued active participation in SECME, engineering recruiting activities include participation in identifying students in the under-represented populations through letters, personal contacts and visitations. The University has agreements with several historically Black Colleges and Universities, and the proposed engineering program in Electrical and Electronics Engineering is expected to enhance the effectiveness of these agreements, especially with institutions having established colleges of engineering.

It is anticipated that strong emphasis of the state on high-tech industry is creating new awareness and opportunities for the under-represented populations, and the Electrical and Electronics Engineering program will be appealing to students from a broad spectrum. It is expected that this program will enhance recruitment of minority and women engineers and will contribute to the University's goal of increasing enrollment from under-represented groups.

14. DEGREE INSCRIPTION

Indicate the degree inscription that will be placed on the student's diploma upon completion of this program of study.

Bachelor of Science in Electrical and Electronics Engineering

15. FISCAL AND ENROLLMENT IMPACT AND ESTIMATED BUDGET

On this form please indicate the expected EFT and headcount student enrollment, estimated expenditures, and projected revenues for the first three years of the program. Include both the reallocation of existing resources and anticipated or requested new resources. Second and third year estimates should be in constant-dollars – do not allow for inflationary adjustments or anticipated pay increases. Include a budget narrative that explains significant line items and discusses specific reallocations envisioned.

	FY 09 First Year	FY 10 Second Year	FY11 Third Year
I. ENROLLMENT PROJECTIONS (indicate basis for projections in narrative)			
A. Student majors			
1. Shifted from other programs	10	10	5
2. New to institution	20	50	115
Total Majors	30	60	120
B. Course sections satisfying program requirements.			
1. Previously existing	63	63	63

2. New	8	17	33
Total Program Course Sections	71	80	96
C. Credit Hours generated by those courses			
1. Existing enrollments	10,154	10,154	10,154
2. New enrollments	810	1823	4,240
Total Credit Hours	10,964	11,977	14,394
D. Degrees awarded	0	5	15

II. COSTS	EFT	Dollars	EFT	Dollars	EFT	Dollars
A. Personnel–reassigned or existing positions						
1. Faculty	0.5	45,000	0.6	54,000	0.6	54,000
2. Part-time Fac.	0	0	0	0	0	0
3. Grad. Assist.	0	0	0	0	0	0
4. Administrators	0.05	2,500	0.05	2,500	0.05	2,500
5. Support staff	0.05	1,500	0.05	1,500	0.05	1,500
6. Fringe benefits		13,350		15,780		15,780
7. Other personnel costs		0		0		0
TOTAL EXISTING PERSONNEL COSTS		62,350		73,780		73,780
B. Personnel–new positions						
1. Faculty	2.0	196,000	3.0	294,000	5.0	500,000
2. Part-time Fac.	0	0	0	0	0	0
3. Grad. Assist.	0.5	8,500	1.0	19,000	2.0	36,000
4. Administrators	0	0	0	0	0	0
5. Support staff	0.5	15,000	0.8	25,000	2.0	60,000
6. Fringe benefits		58,595		89,080		157,800
7. Other personnel costs						
TOTAL NEW PERSONNEL COSTS		278,095		427,080		747,800

	FIRST YEAR	SECOND YEAR	THIRD YEAR
C. Start-up Costs (one-time expenses)			
1. Library/learning resources	4,000	6,000	8,000
2. Equipment	240,000	500,000	550,000
3. Other (New Faculty)	500,000	260,000	540,000
D. Physical Facilities: construction or major renovation	250,000	300,000	450,000
TOTAL ONE-TIME COSTS	994,000	1,066,000	1,548,000

E. Operating Cost (recurring costs–base budget)

1. Supplies/Expenses	5,000	10,000	20,000
2. Travel	2,000	4,000	6,000
3. Equipment	13,500	24,000	34,000
4. Library/learning resources	5,000	10,000	10,000
5. Other (_____)	0	0	0
TOTAL RECURRING COSTS	365,945	548,860	890,580
GRAND TOTAL COSTS	1,359,945	1,614,860	2,438,580

III. REVENUE SOURCES

A. Source of Funds			
1. Reallocation of existing funds	62,350	73,780	73,780
2. New student workload	xxxxxxxxxx	xxxxxxxxxxx	
3. New tuition	44,960	112,400	258,520
4. Federal funds	0	40,000	50,000
5. Other grants	0	0	0
6. Student fees	0	0	0
7. Other (_____)	0	0	0
Subtotal	107,310	226,180	382,300
New state allocation requested	1,263,875	1,399,920	2,057,280
GRAND TOTAL REVENUES	1,359,945	1,614,860	2,439,580
B. Nature of funds			
1. Base budget	365,945	548,860	891,580
2. One-time funds	994,000	1,066,000	1,548,000
GRAND TOTAL REVENUES	1,359,945	1,614,860	2,439,580

Budget Narrative

New faculty are required to teach the new courses for this degree program as well as some current courses to meet increased demand by the anticipated increase in enrollment. The new faculty will initiate research and outreach programs in high priority areas to meet the state's need and support graduate programs. Additional graduate assistants are needed to assist with the increased enrollments in core courses and with research and outreach projects. Incremental increases in current administrative and support staff are needed to manage the degree program. Start-up library costs are for reference works and recurring library costs are for periodicals appropriate to the major. Substantial start-up equipment is needed to develop the required instructional laboratories and the research laboratories for new faculty. The source of reallocated existing funds will be primarily from tuition of students shifting to this program from other current programs. Recurring funds for supplies, travel and equipment are needed to provide basic resources for program maintenance and equipment for upgrading teaching laboratories. Funds to upgrade teaching laboratories are essential to providing a quality learning environment. The educational objectives of the proposed degree program fit well with funding priorities of several federal and private (including industry) sources of grant funds.

Appendix A: BSEE Undergraduate Course Descriptions

New Courses

ELECTRICAL ENGINEERING - Programming for Engineers (2 semester hours of lecture and 2 semester hours of lab)

Course provides basic programming skills for engineers with particular consideration of practical applicability throughout the curriculum. The course covers programming constructs such as variables, data structures, control structures (conditional and loop blocks), subroutines, functions.

Teaching examples range from simple control tasks to algorithms using numerical methods such as solving polynomials, matrix manipulation, and the discrete Fourier transform. Apart from one conventional programming language (the C language), programming macros in Octave (Matlab) and LabView will be considered.

ELECTRICAL ENGINEERING - Electromagnetics (3 semester hours)

This course provides a fundamental understanding of electric and magnetic phenomena. Topics include potentials and fields, electrostatics (the electric field, potential, solution of electrostatic fields, dielectric materials), magnetostatics (magnetic fields of electric currents, magnetic materials, Biot-Savart Law, Ampere's Law, vector potentials), electromagnetic fields, and induction. This course provides the foundation for a class on electrical machines and power distribution.

ELECTRICAL ENGINEERING - Design Laboratory (2 semester hours)

The junior design laboratory is part of the expanded design experience in the EE curriculum. At the junior level, students will handle design problems and get exposed to elements of teamwork, project management, and effective communication methods. Students will solve a design problem of their choice offered by a faculty mentor. The design problem will integrate knowledge that the students have gained up to this point, including electrical circuits and programming.

ELECTRICAL ENGINEERING - Capstone Design (2 semesters with 2 semester hours each)

The two-semester capstone design sequence is the second part of the expanded design experience in the EE curriculum. Students will actively participate in a design team and make clear and defined contributions to the project goal and objectives. With this course, they will understand ethical and professional issues faced by engineers, learn how to prepare an engineering design proposal with clear statements of specifications, design criteria and deliverables, and deliver multiple oral presentations and written reports.

The projects are offered by faculty mentors or collaborating industry contacts. The goal of the first semester is a design study where students analyze the problem, provide possible solutions, and evaluate the solutions with respect to the design goals. During the second semester, the students will realize their projects and therefore gain hands-on experience and a feedback about the practical aspects of their projects.

Electrical Engineering Elective Courses

ELECTRICAL ENGINEERING ELECTIVE - Digital Signal Processing

Course introduces the fundamentals of digital signal processing and related applications. Topics will include linear system analysis, z-transform, discrete Fourier transform (DFT) and its applications, FFT algorithms, digital filter (FIR and IIR) design using windowing, frequency sampling, S-to-Z methods, frequency-transformation methods, optimization methods, 2-dimensional filter design.

ELECTRICAL ENGINEERING ELECTIVE - Wireless and RF Electronics

Course provides an introduction to the electronics and design of analog and digital wireless communication systems. Topics include transceiver architectures, passive and active component models, MOS and Bipolar LNAs, Mixers, VCOs, frequency synthesizers, PLLs and baseband circuits. Students will use CAD tools to realize a wireless communication system integrating various components such patch-antenna array, low noise amplifiers, voltage control oscillator, PLL, mixer, and microprocessors.

ELECTRICAL ENGINEERING ELECTIVE - Power and Energy Systems

Power systems and distribution with sustainable/renewable energy components.
An introduction to renewable energy systems and the design and application of electronic, mechanical and computer control for these systems. Topics include photovoltaics, solar thermal systems, green building, fuel-cells, hydrogen, wind power, waste heat, biofuels, wave power, tidal power and hydroelectric. Discussions of economic, environment, politics and social policy are integral components of the course.

ENGR 4260 - Introduction to Nanoelectronics

Recent advances in nanoelectronics, including the novel properties and device structures when classical transport is replaced by quantum transport as the device size is reduced down to nanometer scale. Introduction of new fabrication and characterization techniques developed for these nanoscale devices.

ENGR 4980 - Biomedical Imaging

Fundamental principles and applications of noninvasive imaging modalities in medicine (X-rays, tomography, magnetic resonance, ultrasound); computer methods and algorithms for image processing, enhancement and analysis. Prerequisites: POD

BCHE 4460 – Biorefinery Engineering

Various aspects of biomass conversion to energy, chemical, and bioproducts. The presentations are linked to introduce the student to opportunities in the emerging bio-economy. Topics include biomass types and characteristics, technologies, systems analysis, economics, and environmental aspects of biorefineries.

ELECTRICAL ENGINEERING ELECTIVE - Engineering Entrepreneurship I

The first of the two courses investigates key entrepreneurial areas of: (a) intellectual property, its protection and related strategies; (b) evaluating the market viability of new high-tech ideas; (c) shaping high-tech ideas into the right products or services for the right markets; (d) developing strategies for high-tech product positioning, marketing and operations; (e) acquiring the resources needed to start a new venture, e.g., people, financing, strategic partners, etc.; and (f) leadership roles for the founders of high-tech ventures.

ELECTRICAL ENGINEERING ELECTIVE - Engineering Entrepreneurship II

The second of the two courses investigates the key elements of planning an entrepreneurial high-tech venture including: (a) defining the venture's industry and market; (b) developing strategies for high-tech product positioning, marketing, distribution, sales, operations, management and development; and (c) preparing a financial plan. Effective written and verbal presentation skills are emphasized throughout the course.

Existing Courses

ENGR 1120 - Engr Graphics & Design

Standards and techniques for engineering drawings. Orthographic and isometric drawings through descriptive geometry. Engineering design will be reviewed and practiced through the use of a term project. The engineering discipline will be introduced through speakers and case studies.

ENGR 2170 - Electrical Circuits

Circuit element, circuit models, and techniques for circuit analysis.
The course emphasizes the application of Kirchhoff's laws in determining the transient and steady state response of circuits.

CSEE 4270 - Digital Systems Design

The basic building blocks and design methods to construct combinatorial and sequential circuits. Circuit implementation in Bipolar, TTL, or CMOS technologies. Standard logic (SSI, MSI) versus programmable logic (PLD, PGA). Finite state machine design. Digital computer building blocks as case studies. Introduction to computer aided design software.

ENGR 3270 – Electronics I

Diodes, transistors, and operational amplifiers.

ENGR 4210 – Linear Systems

Time and frequency domain analysis of linear systems, convolution, fourier series, and fourier transforms with applications.

ENGR 4230 – Sensors & Transducers

Fundamentals of the sensing process, transducers and their environments and the measurement problem. Transducer types and modeling.
Displacement, motion, pressure, fluid-flow, temperature measurements.

ENGR 3210 - Electr Machines & Pwr Distrib

DC and AC motors and generators. The design and analysis of electrical power distribution systems.

ENGR 4240 - Microcontrollers

Microcontrollers in engineering monitoring and control applications. The MC68HCII is used to demonstrate 1) the use of the MC as an integral part of modern electronic and electromechanical systems 2) design techniques for interfacing MC's to digital input/output devices and analog transducers 3) development tools 4) real-time control.

ENGR 4270 – Electronics II

Linear large-scale integrated circuits, power components, active filters and communication circuits.

ENGR 4220 – Feedback Controls

The analysis and design of continuous and discrete time, and linear feedback control systems.

ENGR 4250 – Adv. Microcontrollers

This course builds on the 68H11 microcontroller. Modern chips, particularly the flash-programmable 8-bit PIC or Atmel microcontroller family, and 16- and 24-bit dsPIC family will be discussed.

Appendix B: Faculty Data

1. Name, rank, academic discipline, institutions attended, degrees earned;

Bhandarkar, Suchendra M.
Professor, Computer Science

Ph.D., Computer Engineering, Syracuse University, Syracuse, New York, August 1989.
M.S., Computer Engineering, Syracuse University, Syracuse, New York, December 1985.
B.Tech., Electrical Engineering, Indian Institute of Technology, Bombay, India, May 1983.

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Three courses per academic year. Specific courses taught include:
CSCI 4720: Computer Organization and Architecture
CSCI 4810/6810: Computer Graphics
CSCI 6720: Computer Architecture
CSCI 8720: Advanced Computer Architecture
CSCI 8810: Image Processing
CSCI 8820: Computer Vision and Pattern Recognition
In addition to the above courses, could teach basic Electrical Engineering courses such as electrical circuit analysis, electronic circuit analysis, digital circuits, signal processing, control theory and electronic instrumentation.

3. Scholarship and publication record for past five years;

Book Chapters
J. Arnold, H.-B. Schuttler, D.A. Logan, D. Battogtokh, J. Griffith, B. Arpinar, S.M. Bhandarkar, S. Datta, K.J. Kochut, E. Kraemer, J. A. Miller, A. Sheth, G. Strobel, T. Taha, B. Aleman-Meza, J. Doss, L. Harris, and A. Nyong, Metabolomics, in Handbook of Industrial Mycology, Marcel-Dekker, New York, NY, 2008, in press.

S.M. Bhandarkar, J. Huang and J. Arnold, Information Theoretic Approaches to Genome Reconstruction, Chapter 11, in Handbook of Computational Molecular Biology, (S. Aluru and D. Bader, Eds.), CRC Press, Boca Raton, FL, 2006, pp. 11.1- 11.26.
Journal Articles (peer-reviewed)

S.M. Bhandarkar, X. Luo, R. Daniels and E.W. Tollner, Automated Planning and Optimization of Lumber Production Using Machine Vision and Computer Tomography, IEEE Trans. Automation Science and Engineering, in press.

Y. Wei, S.M. Bhandarkar, and K. Li, Client-centered Multimedia Content Adaptation, ACM Trans. Multimedia Computing, Communications and Applications (ACM TOMCCAP), in press.
S. Tewari, J. Arnold and S.M. Bhandarkar, Likelihood of a Particular Order of Genetic Markers and the Construction of Genetic Maps, Journal of Bioinformatics and Computational Biology, to appear.

S.M. Bhandarkar, A.S. Chowdhury, Y. Tang, J. Yu and E.W. Tollner, Computer Vision Guided Virtual Craniofacial Reconstruction, Jour. Computerized Medical Imaging and Graphics, Vol. 31, No. 6, Sept. 2007, pp. 418-427.

S. Tewari, S.M. Bhandarkar and J. Arnold, Design and Analysis of an Efficient Recursive Linking Algorithm for Constructing Likelihood-based Genetic Maps for a Large Number of Markers, Journal of Bioinformatics and Computational Biology, Vol. 5, No. 2(a), April 2007, pp. 201-250.

S. Chattopadhyay, S.M. Bhandarkar and K. Li, Model-based Power Aware Compression Algorithms for MPEG-4 Virtual Human Animation in Mobile Environments, IEEE Transactions on Multimedia, Vol. 9, No. 1, January 2007, pp. 1-8.

S. Chattopadhyay, S.M. Bhandarkar and K. Li, Human Motion Capture Data Compression by Model-based Indexing: A Power Aware Approach, IEEE Trans. Visualization and Computer Graphics, Vol. 13, No. 1, January/February 2007, pp. 5-14.

Y. Wei, S.M. Bhandarkar and S. Chandra, A Client-side Statistical Prediction Scheme for Energy Aware Multimedia Data Streaming, IEEE Trans. Multimedia, Vol. 8, No. 4, August, 2006, pp. 866-874.

S.M. Bhandarkar, X. Luo, R. Daniels and E.W. Tollner, A Novel Approach to Detection, Localization and 3-D Reconstruction of Internal Defects in Hardwood Logs Using Computer Tomography, Journal of Pattern Analysis and Applications, Vol. 9, Nos. 2/3, October 2006, pp. 155-175.

S.M. Bhandarkar, X. Luo, R. Daniels and E.W. Tollner, Detection of Cracks in Computer Tomography Images of Logs, Pattern Recognition Letters, Vol. 26, No. 14, Oct. 2005, pp. 2282-2294.

F. Chen and S.M. Bhandarkar, Similarity Analysis of Video Sequences Using an Artificial Neural Network, Intl. Journal of Applied Intelligence, Vol. 22, 2005, pp. 251-275.

S.M. Bhandarkar and S.R. Chandrasekaran, Parallel Parsing of MPEG Video on a Shared-Memory Symmetric Multiprocessor, Parallel Computing, Vol. 30, No. 11, Nov. 2004, pp. 1233-1276.

S.M. Bhandarkar, T. Jiang, N. Li and K. Verma, Automated Analysis of DNA Hybridization Images for High-Throughput Genomics, Journal of Machine Vision and Applications, Vol. 15, No. 3, July 2004, pp. 121-138.

J. Huang and S.M. Bhandarkar, A Comparison of Physical Mapping Algorithms Based on the Maximum Likelihood Model, Bioinformatics Journal, Vol. 19, No. 11, 2003, pp. 1303-1310.

Z. Xu, B. Lance, C. Vargas, B. Arpinar, S.M. Bhandarkar, E. Kraemer, K.J. Kochut, J.A. Miller, J.R. Wagner, M.J. Weise, J. K. Wunderlich, J. Stringer, G. Smulian, M.T. Cushion, and J. Arnold, Mapping by sequencing the Pneumocystis genome using the Ordering DNA Sequences V3 tool, Genetics, Vol. 163, April 2003, pp. 1299-1313.

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for

Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Professional Society Memberships
Association of Computing Machinery (ACM)
Institute of Electrical and Electronic Engineers (IEEE)
American Association of Artificial Intelligence (AAAI)
International Society of Photo-Optical and Instrumentation Engineering (SPIE)
Technical Committee on Robot Vision, IEEE Robotics and Automation Society
Technical Committee on Pattern Analysis and Machine Intelligence, IEEE Computer Society
Technical Committee on Multimedia Computing, IEEE Computer Society
Technical Committee on Cluster Computing, IEEE Computer Society

Editorships
Associate Editor, The Computer Journal.
Associate Editor, International Journal of Applied Intelligence.
Associate Editor, Journal of Machine Vision and Applications.

5. Expected responsibilities in this program;

Teaching basic Electrical Engineering courses such as electrical circuit analysis, electronic circuit analysis, digital circuits, signal processing, control theory and electronic instrumentation.
Supervising and mentoring honors student projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

Covington, Michael A.
Senior Research Scientist, Associate Director, Artificial Intelligence Center

Ph.D., Linguistics, Yale University, 1982
M.Phil., Linguistics, Cambridge University, 1978
B.A., Linguistics, University of Georgia, 1977

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Artificial Intelligence Programming Techniques,
Natural Language Processing Techniques,
Applied Natural Language Processing,
Advanced Microcontrollers

My normal teaching load is 3 courses every 2 years, but may be less depending on research funding. As I have no specific plans to teach EE courses, I do not expect this to be affected by the BSEE program.

My role in the BSEE program, as presently envisioned, will probably be limited to working with specific students. I manage an electronics lab for the Artificial Intelligence Center which will surely become a focus for collaborative work.

3. Scholarship and publication record for past five years;

Chapters in books:
Covington, Michael A. (2005) The technological relevance of natural language pragmatics.

Cognitive Systems: Human Cognitive Models in Systems Design, ed. by Michael L. Bernard and J. Chris Forsythe. Hillsdale, NJ: Erlbaum.

Covington, Michael A. (2000) Electronics. Invited contribution to Encyclopaedia Britannica Yearbook of Science and the Future. (Focusing on new developments in artificial intelligence and speech synthesis and recognition.)

Journal articles:
Covington, Michael A.; Riedel, Wim J.; Brown, Cati; He, Congzhou; Morris, Eric; Weinstein, Sara; Semple, James; Brown, John (2008) Ketamine and schizophrenic speech: more difference than originally reported. (Letter.) Journal of Psychopharmacology, in press.

Brown, Cati; Snodgrass, Tony; Kemper, Susan J.; Herman, Ruth; and Covington, Michael A. (2007) Automatic measurement of propositional idea density from part-of-speech tagging. Behavior Research Methods, in press.

Covington, Michael A.; Riedel, Wim J.; Brown, Cati; He, Congzhou; Morris, Eric; Weinstein, Sara; Semple, James; Brown, John (2007) Does ketamine mimic aspects of schizophrenic speech? Journal of Psychopharmacology 21:338-346.

Covington, Michael A.; Brown, Cati; He, Congzhou; Naçi, Lorina; Fjordbak, Bess Sirmon; Brown, John (2005) Schizophrenia and the structure of language: the linguist's view. Schizophrenia Research 77:85-98.

Covington, Michael A. (2004) The number of distinct alignments of two strings. Journal of Quantitative Linguistics 11:173–182.
Book reviews:

Covington, Michael A. (2007) Review of P. Nugues, An Introduction to Language Processing with Perl and Prolog. Computational Linguistics, December, 2007.

Covington, Michael A. (2005) Review of Schizophrenic Speech, by P. McKenna & T. Oh. Psychological Medicine 35:1535—1536.

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

HAIDEKKER, Mark A.
Associate Professor

University of California, San Diego	Postdoc	1999 -2000	Bioengineering
University of Bremen, Germany	Ph. D.	1994-1998	Computer Science
University of Hannover, Germany	M. Sc.	1983-1990	Electrical Engineering

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Teaching responsibilities: 15 hours / week
Research activities: 25 hours / week
Bureaucracy & Forms: 5 hours / week

3. Scholarship and publication record for past five years;

M.E. Nipper, S. Majd , M. Mayer, J. C.-M. Lee, E.A. Theodorakis, M.A. Haidekker*. Characterization of Changes in the Viscosity of Lipid Membranes with the Molecular Rotor FCVJ. Biochim Biophys Acta Biomembranes 2008, in press.

D. Zhu, M.A. Haidekker, J.S. Lee, Y.Y. Won, J-C.M. Lee. Application of molecular rotors to the determination of the molecular weight dependence of viscosity in polymer melts. Macromolecules 2007; 40: 7730-7732.

M.A. Haidekker*, E.A. Theodorakis. Molecular rotors--fluorescent biosensors for viscosity and flow (invited review). OBC 2007; 5: 1669-1678.

D. Fischer, E.A. Theodorakis, M.A. Haidekker. Synthesis and use of an in-solution ratiometric fluorescent viscosity sensor. Nature Protocols 2007; 2: 227-236.

M.A. Haidekker*, D. Lichlyter, M. Ben Johny, C.A. Grimes. Probing Polymerization Dynamics with Fluorescent Molecular Rotors and Magnetoelastic Sensors. Sensor Letters 2006; 4: 257-261.

M.A. Haidekker*, W.J. Akers, D. Fischer, E.A. Theodorakis. A Fiber Optic-Based Fluorescent Viscosity Sensor. Optics Letters 2006; 31: 2529-2531.

M.A. Haidekker*, T.P. Brady, D. Lichlyter, E.A. Theodorakis. A Ratiometric Fluorescent Viscosity Sensor. JACS 2006; 128: 398-399.

W.J. Akers, J.M. Cupps, M.A. Haidekker*. Interaction of fluorescent molecular rotors with blood plasma proteins. Biorheology 2005;42(5):335-44.

M.A. Haidekker*, T.P. Brady, D. Lichlyter, E.A. Theodorakis. Effects of solvent polarity and solvent viscosity on the fluorescent properties of molecular rotors and related probes. Bioorganic Chemistry 2005; 33; 415-425.

K. Milich, W.A. Akers, M.A. Haidekker*. A ratiometric fluorophotometer for fluorescence-based viscosity measurement with molecular rotors. Sensor Letters 2005; 3: 237-243.

W. Akers, M.A. Haidekker*. Precision Assessment of Biofluid Viscosity Measurements Using Molecular Rotors. Journal of Biomechanical Engineering 2005; 127: 450-454.

M.A. Haidekker*, W. Akers, D. Lichlyter, T.P. Brady, E.A. Theodorakis. Sensing of Flow and Shear Stress Using Fluorescent Molecular Rotors. Sensor Letters 2005; 3: 42-48.

J.C. Gladish, G. Yao, N. L'Heureux, M.A. Haidekker*. Optical Transillumination Tomography for Imaging of Tissue-Engineered Blood Vessels. Annals of Biomedical Engineering 2005; 33(3): 323-327

M.A. Haidekker*. A Hands-on Model-computed Tomography Scanner for Teaching Biomedical Imaging Principles. Int J Engng Ed 2005; 21(2): 327-334

M.A. Haidekker*, T. Brady, W. Akers, D. Lichlyter, E. Theodorakis. Hydrophilic molecular rotors - synthesis and characterization. Bioorganic Chemistry 32: 531-536: 2004.

W. Akers, M.A. Haidekker*. A molecular rotor as viscosity sensor in aqueous colloid solutions. Journal of Biomechanical Engineering 126: 240-345, 2004.

M.A. Haidekker1 , C. White1 , H.Y. Stevens, J.A. Frangos. ERK1/2 activation and endothelin-1 production in human endothelial cells exposed to vibration. Journal of Physiology 2004; 555.2: 565-572.

M.A. Haidekker, H.Y. Stevens, J.A. Frangos. Cell membrane fluidity changes and membrane undulations observed using a laser scattering technique. Annals of Biomedical Engineering 2004; 32: 531-536.

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Since 2005 Member: IBE - The Institute of Biological Engineering
Since 2002 Member: BMES - Biomedical Engineering Society
Since 2005 Member: Sigma Xi, the Research Honor Society
Since 2005 Editorial Board member, Sensor Letters

5. Expected responsibilities in this program;

Curriculum development and maintenance
Teaching of classes

1. Name, rank, academic discipline, institutions attended, degrees earned;

Hamrita, Takoi
Associate Professor, Electrical Engineering

Ph.D. Electrical Engineering, Georgia Institute of Technology, 1993.
M.S. Electrical Engineering, Georgia Institute of Technology, 1990.
B. Sc. Electrical Engineering, Magma Cum Laude, Georgia Institute of Technology, 1989.

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

AESC 4920, Multidisciplinary International Service Learning-Tunisia, Summer
ENGR 4210/6210, Linear Systems (Undergraduate/Graduate), Fall
ENGR 4240/6240, Introduction to Microcontrollers, Spring
ENGR 4250/6250, Advanced Microcontrollers (Undergraduate/Graduate), Fall

3. Scholarship and publication record for past five years;

T.K. Hamrita "A Multidisciplinary International Linkage: An Engineering Faculty's Viewpoint." IIENetworker International Education Magazine, Institute of International Education. Pp. 46-47. 2007.

T. K. Hamrita, J. S. Durrence, G. Vellidis. Noise Reduction in a Load Cell Based Peanut Yield Monitor Using Digital Signal Processing Techniques. Transactions of the IEEE/IAS (in press).

T. K. Hamrita, E.C. Hoffacker. 2007. Dynamic Closed-Loop Climate Control in Tunnel Ventilated Poultry Housing Based on Real_Time Measurements of Poultry Deep Body Temperature. Transactions of the ASAE. (In Press).

T. K. Hamrita, Walter D. Potter and Benjamin Bishop. 2005. Robotics, Microcontroller and Embedded Systems Education Initiatives: An Interdisciplinary Approach. International Journal of Engineering Education. Vol. 21, No. 3, pp. 541-550

T. K. Hamrita, C. Hoffacker. 2005. Development of a "Smart" Wireless Soil Monitoring Sensor Prototype Using RFID Technology. Applied Engineering in Agriculture 21(1): 300-307.

T. K. Hamrita. "An International Partnership's Holistic Vision for Sustainable e-learning Capacity Building in Tunisia." Proceedings of the IEEE International Conference on Web-based Learning (ICWL). Edinburgh, UK. 15-17 August 2007.

T. K. Hamrita, Nivedita P. Kaluskar., Kurt Wolfe. "Advances in Smart Sensor Technology". Proceedings of the IEEE/IAS 2005. pp. IAS58p3. HongKong. Oct. 2-7, 2005.

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

2005 Chair, Industrial Automation and Control Committee, IEEE.

2005 Associate Editor, Industry Applications Society, IEEE.
2005 Session Chair, "Sensors, Measurements, Communication & Fault Analysis" IEEE/IAS Annual Meeting. Hong Kong, October 2005.
2004 Chair, Industrial Automation and Control Committee, IEEE.
2004 Associate Editor, Industry Applications Society, IEEE.
2003 Chair, Industrial Automation and Control Committee, IEEE.
2003 Associate Editor, Industry Applications Society, IEEE.

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

Kazanci, Caner
Assistant Professor

Ph.D. Carnegie Mellon University, Mathematical Sciences Department,
M.S. Carnegie Mellon University, Mathematical Sciences Department, December 2000.
B.S. Bilkent University, Ankara, Turkey, Department of Mathematics, May 1999Full scholarship awarded by the university for all undergraduate education.

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Current workload: Three courses a year.
Specific courses usually taught:
ENGR 8102, Computational Engineering: Elliptic Differential Equations
ENGR 8103, Computational Engineering: Parabolic Differential Equations
ENGG 8110, Mathematical Biology
MATH 4500/6500, Numerical Analysis I
MATH 4510/6510, Numerical Analysis II
MATH2700, Differential Equations
MATH 2200, Calculus I

Differential equations (MATH 2700) course will probably need two more sections.

3. Scholarship and publication record for past five years;

* Artificial biochemical Networks in Biological Pathway Analysis, C. Kazanc, S. Ta'asan. (in preparation)

* Cycling in ecosystems: An individual based approach, C. Kazanc, L. Matamba. (in preparation)

* Particle Tracking: An individual based approach for analyzing ecological networks, C. Kazanc, E.W. Tollner. (in preparation)

* Environ analysis of non-steady-state systems: A general computational approach, J. Shevtsov and C. Kazanc. (in preparation)

* Incorporating a temporal dimension to investigate stoichiometric control of nutrient cycling in stream ecosystems, G. Small, A. Helton, C. Kazanc. (in preparation)

* An Introduction of Reynolds Transport Theorem to Ecological Network Analysis – A Network Environ Analysis Energy Model, J.R. Schramski, B.C. Patten, C. Kazanc, D.K. Gattie, N.N. Kellam, 2008. (in preparation)

* EcoNet, A new software for ecological model simulation and network analysis, C. Kazanc, Ecol. Model. 208:3-8, 2007.

* Defining an ecological thermodynamics using discrete simulation approaches, E. W. Tollner and C. Kazanc, Ecol. Model. 208:68-79, 2007.

* An Evolving Course in Ecological Thermodynamics, E. W. Tollner and C. Kazanc, Proc. ASEE Annual Conf. pp 1345, 2007.

* A network model of distributed and centralized systems of students, N. Kellam, D. Gattie, C. Kazanc, Proc. FIE, 2007.

* Ecological Thermodynamics and the possibility of new thermodynamic indicators, E. W. Tollner and C. Kazanc, Proc. ASEE Annual Conf. pp 112, 2006.

* Chapter 17: Network Calculations and EcoNet, to appear on "Handbook of Ecological Modeling: Network and Informatics", Edited by Sven Jrgensen. WIT press, 2008. (in press)

4. Professional activity;

Organizer of the minisymposium titled ``Ecological Networks: Issues, advances and opportunities'', Society of mathematical biology annual meeting (SMB 2007), San Jose, CA. July, 2007. Invited speakers from the US, Spain and Hungary.

Advanced Course on ``Complexity of Biological Networks'', Epigenopmics project, Genopole, Evry, France. May, 2007.

National Evolutionary Synthesis Center (NESCENT), Genetic Networks Catalysis Meeting, Marathon, FL. January, 2006.

5. Expected responsibilities in this program;

Coursework and planning.

1. Name, rank, academic discipline, institutions attended, degrees earned;

Mao, Leidong
Assistant Professor

Ph. D. (May 2008), Department of Electrical Engineering, September 2003-present.
Master of Philosophy, Department of Electrical Engineering, September 2002 – September 2003
Master of Science, Department of Electrical Engineering, September 2001 – September 2002.
Bachelor of Science, Department of Materials Science, September 1997 – June 2001.

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

3. Scholarship and publication record for past five years;

Mao, L., Koser, H., "Overcoming the diffusion barrier: ultra-fast micro-scale mixing via ferrofluids," TRANSDUCERS & EUROSENSORS' 07, Proc. of 14th International Conference on Solid-State Sensors, Actuators and Microsystems, Lyon, France, June, 2007.

Mao, L., Koser, H., "Towards Ferrofluidics For μ-TAS And Lab On-A-Chip Applications," Nanotechnology, vol. 17, p. S34-S47, 2006.

Mao, L., Koser, H., "Ferrohydrodynamic Pumping In Spatially Traveling Sinusoidally Time-Varying Magnetic Fields," J. of Magnetism and Magnetic Materials, vol. 289, p. 199-202, 2005.

Fischer, B., Mao, L., Gungormus, M., Tamerler, C., Sarikaya, M., Koser, H., "Ferro-microfluidic device for pathogen detection," Proc. of 3rd Annual IEEE International Conference on Nano/Micro Engineered and Molecular Systems, Sanya, Hainan Island, China, January, 2008.

Fischer, B., Mao, L., Gungormus, M., Tamerler, C., Sarikaya, M., Koser, H., "Biomedical engineered ferrofluids," Proc. of 2007 Materials Research Society (MRS) Fall Meeting, Boston, MA, November, 2007.

Mao, L., Koser, H., "Modeling Ferrofluids in Spatially-Traveling Sinusoidally Time-Varying Magnetic Fields," Proc. 3rd International Conference on Computational Modeling and Simulation of Materials (CIMTEC), Sicily, Italy, June 2004.

Mao, L., Koser, H., "An Integrated, High Flow Rate MEMS Ferrofluid Pump," Proc. of 9th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS), Boston, Massachusetts, USA, October 2005.

Mao, L., Koser, H., "Ferrohydrodynamic Pumping In Spatially-Traveling Sinusoidally Time-Varying Magnetic Fields," Proc. of 10th International Conference on Magnetic Fluids, Sao Paulo, Brazil, August 2004.

Mao, L., Koser, H., "An Integrated MEMS Ferrofluid Pump Using Insulated Metal Substrate," Proc. of 31st Annual Conference of the IEEE Industrial Electronics Society (PCB MEMS Technology Special Session), Raleigh, North Carolina, USA, November 2005.

Mao, L., Koser, H., "Modeling an Integrated, High Flow Rate MEMS Ferrofluid Pump," 1st COMSOL Conference, Boston, Massechusset, November 2005.

Koser, H., Kaya, T., Mao, L., "A Microfluidic Assay Design for Real-Time Bacterial Chemotaxis Studies," 1st COMSOL Conference, Boston, Massechusset, November 2005.

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Travel Award from First International Bio-Nano-Informatics (BNI) Fusion Conference (2005).
Travel Award from 9th International Conference on Miniaturized Systems for Chemistry and Life Sciences (2005).
Best Poster Award from 11th International Conference on Magnetic Fluids (2007).

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

Potter, Walter D.
Professor, Department of Computer Science

Ph.D.	University of South Carolina Computer Science		1987
MS	University of South Carolina Computer Science		1981
BS	University of Tennessee	Business Administration	1974

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Data Structures, Knowledge-Based Systems, Database Management I and II, Advanced Data Modeling, Introduction to Computing, Discrete Mathematics, Computer Architecture, Genetic Algorithms, Artificial Intelligence, Program Project Design, Introduction to Robotics, Automata Theory, Computational Intelligence, Computer Networking, and Symbolic Programming.

FRES-1010 "Artificial Intelligence - It's For Real". Class focus on heuristic search with emphasis on Genetic Algorithms.

HONS-1990H "Artificial Intelligence". Class focus on rule-based production systems using Microsoft's Age of Empires II: Age of Kings artificial intelligence scripting.

FRES-1010 "Artificial Intelligence In Action,". Class focus on rule-based production systems using Microsoft's Age of Empires II: Age of Kings artificial intelligence scripting.

3. Scholarship and publication record for past five years;

N. Roy, W.D. Potter, D. Landau, "Polymer Property Prediction and Optimization Using Neural Networks", in IEEE Transactions on Neural Networks, Vol. 17, No. 4, pp. 1001-1014, July, 2006.

D. Casella and W.D. Potter, "Improving Genetic Algorithms Through Custom Hybridization", in Transactions on Information Science and Applications, Issue 1, Volume 3, pp. 48-55, 2005.
H. Fischer and W.D. Potter, "Mobile Decision Support for Purchase Decisions in Retail Environments", in Transactions on Information Science and Applications, Issue 1, Volume 3, pp. 119-126, 2005.

S. Radhakrishnan and W.D. Potter, "Basic Math via Character Recognition on the AIBO Robot Dog", in Transactions on Information Science and Applications, Issue 1, Volume 3, pp. 127-132, 2005.

T.K. Hamrita, W.D. Potter, and B. Bishop, "Robotics, Microcontroller, and Embedded Systems Education Initiatives at the University of Georgia: An Interdisciplinary Approach", in the International Journal of Engineering Education, vol. 21:4, pp. 730-738, 2005.

M. Twery, P.D. Knopp, S.A. Thomasma, H.M. Rauscher, D. Nute, W.D. Potter, F. Maier, J. Wang, M. Dass, H. Uchiyama, A. Glende, and R.E. Hoffman, "NED-2: A Decision Support System for Integrated Forest Ecosystem Management", in Computers and Electronics in Agriculture, Vol. 49, pp. 24-43, 2005.
D. Nute, W.D. Potter, Z. Cheng, M. Dass, A. Glende, F. Maier, C. Routh, H. Uchiyama, J. Wang, S. Witzig, M. Twery, P.D. Knopp, S.A. Thomasma, and H.M. Rauscher, "A Method for Integrating Multiple Components in a Decision Support System", in Computers and Electronics in Agriculture, vol. 49, pp. 44-59, 2005.

N. Roy, W.D. Potter, D. Landau, "Designing Polymer Blends Using Neural Networks, Genetic Algorithms, and Markov Chains", in Applied Intelligence: The International Journal of Artificial Intelligence, Neural Networks, and Complex Problem Solving Technologies, Vol. 20, pp. 215-229, 2004.

L. Wu, W.D. Potter, K. Rasheed, J. Ghent, D. Twardus, H. Thistle, and M. Teske, "Nature Inspired Heuristics in Aerial Spray Deposition Management", in the Journal of Applied Systems Studies (special issue on Real Life Applications of Nature Inspired Combinatorial Heuristics), Vol 4, No. 2, 2003.

D. Nute, W.D. Potter, F. Maier, J. Wang, M. Twery, H.M. Rauscher, P.D. Knopp, S.A. Thomasma, M. Dass, H. Uchiyama, and Astrid Glende, "NED-2: An Agent-Based Decision Support System for Forest Ecosystem Management," in Environmental Modelling and Software, Vol. 14, No. 5, 2003, Special Issue on Binding Environmental Sciences and Artificial Intelligence, (U. Cortes, M. Marre, Eds.).

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Regional Editor, International Journal of Hybrid Intelligent Systems, since 2003.
Associate Editor, Journal of Intelligent and Fuzzy Systems, since 2003.
Associate Editor, IEEE Transactions on Systems, Man, and Cybernetics, 2001-2003.
Program Committee Member, International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems, (IEA/AIE'2007), June, 2007; Japan.
Program Committee Member,4th Indian International Conference on Artificial Intelligence (IICAI'2007), June, 2007, India.
Program Committee Member, International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems, (IEA/AIE'2006), June, 2006; France.
Program Committee Member, International Multi-Conference on Systems, Cybernetics and Informatics (WMSCI'2006), Orlando, Florida, July 2006.
External dissertation reviewer: Swinburne University of Technology, Victoria, Australia, 2006.
Program Committee Member, International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems, (IEA/AIE'2005), June, 2005; Italy.
Program Committee Member, International Conference on Knowledge Based Computer Systems, 2004, India
Program Committee Member, International Conference on Informatics in Control, Automation, and Robotics, August, 2004, Portugal.

Program Committee Member, International Conference on Artificial Intelligence (IC-AI'2004), June, 2004, Las Vegas, Nevada.
Program Committee Member, 2nd Indian International Conference on Artificial Intelligence (IICAI'2005), December, 2005, India.
Program Committee Member, International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems, (IEA/AIE'2003), June, 2003; UK.
Program Committee Member and Robotics Competition Chairman, International Conference on Artificial Intelligence (IC-AI'2003), June, 2003, Las Vegas, Nevada.
Program Committee Member, Genetic and Evolutionary Computation Conference (GECCO-2003), July, 2003, Chicago, Illinois.
Program Committee Member, Southeastern Regional ACM Conference, (SEACM'2003), March, 2003, Savannah, Georgia.

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

Sornborger, Andrew T
Assistant Professor (soon Associate Professor)

Dartmouth College, AB Computational Linguistics
Brown University, MSc, PhD Theoretical Physics

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Average 1.5 Courses/Semester. Typically two mathematics courses, one engineering course.

3. Scholarship and publication record for past five years;

Peer-reviewed, refereed publications

Sornborger, A., Sailstad, C., Kaplan, E. and Sirovich, L. (2003). Spatio-temporal analysis of optical imaging data. NeuroImage 18, 610-621.

Sornborger, A., Sirovich, L. and Morley, G. (2003). Extraction of periodic multivariate signals: mapping of voltage dependent dye fluorescence in mouse heart. IEEE Trans. Med. Imaging 22, 1537-1549.

Sornborger, A., Cleland, A. and Geller, M. (2004). Superconducting phase qubit coupled to a nanomechanical resonator: beyond the rotating-wave approximation. Phys. Rev. A 70, 052315.

also selected for inclusion in: Virtual J. of Quant. Info. 4, 12 (2004, online)

Sornborger, A., Yokoo, T., Delorme, A., Sailstad, C. and Sirovich, L. (2005). Extraction of average and differential dynamical responses in stimulus-locked experimental data. J. Neurosci. Meth. 141, 223-229.

Wireman, J., Lowe, M., Spiro, A., Zhang, Y.Z., Sornborger, A. and Summers, A.O. (2006). Quantitative, longitudinal profiling of the primate fecal microbiota with flow cytometry microarrays. Environmental Microbiology 8, 490-503.

Adams, M. and Sornborger, A. (2007). Analysis of a certain class of replicator equations. J. Math. Biol. 54, 357-384.

Fan, X., Majumder, A., Reagin, S.S., Porter, E.L., Sornborger, A., Keith, C.H. and Lauderdale, J.D. (2007). New statistical methods enhance imaging of cameleon FRET in cultured zebrafish spinal neurons. J. Biomed. Opt. 12, 034017.

also selected for inclusion in: Virtual J. Biol. Phys. Res. 13, 11 (2007, online).

Sornborger, A. (2007). Higher-order operator splitting methods for deterministic parabolic equations. Int. J. Comp. Math. 84, 887-893.

Broder, J., Majumder, A., Porter, E., Srinivasamoorthy, G., Keith, C., Lauderdale, J. and Sornborger, A. (2007). Estimating weak ratiometric signals in imaging data I: dual-channel data. J. Opt. Soc. Am. A 24, 2921-2931.

Book Chapters

Pesaran, B., Sornborger, A., Nishimura, N., Kleinfeld, D. and Mitra, P.P. (2004). Spectral analysis for dynamical imaging data. In *Imaging in Neuroscience and Development: A Laboratory Manual* (R. Yuste and A. Konnerth, editors), Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.

Geller, M., Pritchett, E. and Sornborger, A. (2007). Quantum computing with superconductors I: architectures. In *Proceedings of the NATO-ASI Summer Workshop on Manipulating Quantum Coherence in Solid State Systems*. Springer Verlag, New York.

Sornborger, A. (2007). Optical imaging. Contributed to *Observed Brain Dynamics* by P.P. Mitra and H. Bokil, Springer Verlag,, New York.

Patents

Method for Detecting and Estimating Ratiometric Signals Provisional Patent Application, UGARF #PR07.078 – M&R 235.0091 0160

4. Professional activity;

Current research support

PI – Sornborger, A.; Intrinsic fluorimetric imaging at the system and cellular levels. NIH R21 EB005432 National Institute of Bioimaging and Bioengineering. July 2006 – June 2008. Direct costs $275,000.

Course faculty

Neuroinformatics course, Marine Biological Laboratories, Woods Hole, MA, August 2005-2007.

5. Expected responsibilities in this program;

Research, teaching.

1. Name, rank, academic discipline, institutions attended, degrees earned;

Thai, Chi Ngoc
Associate Professor in Biological & Agricultural Engineering

Ph.D. in Agricultural Engineering, University of California, Davis (1983)
MS in Aerospace Engineering, Northrop University (1979)
BS in Mechanical Engineering, Northrop University (1976)

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

3-4 courses a year:
ENGR 4540/6540: Applied Machine Vision
ENGR 4140/6140: Introductory Systems Modeling
ENGR 8930: Systems Optimization
ENGR 4920: Senior Design

3. Scholarship and publication record for past five years;
C. N. Thai, K. Morita and K. Iwasaki. 2007. Adapting Pervasive Learning Technologies to Mixed Local/Distance Engineering Education. The International Journal of Engineering Education. 23(4): 650-660

Chi N. Thai. 2007. A Dual-Mode Collaborative Teaching and Learning Classroom Environment. Presented at the International Conference on Engineering Education, Instructional Technology, Assessment, and E-learning, 2007 (Web Conference), Dec. 3-12, 2007. Peer-reviewed Proceedings to be published by Springer in summer 08.

K. C. Lawrence, B. Park, G. W. Heitschmidt W. R. Windham, and C. N. Thai. 2007. Evaluation of LED and Tungsten-Halogen Lighting for Fecal Contaminant Detection. Applied Engineering in Agriculture. 23(6): 811-818.

B. Park, M. Kise, K. C. Lawrence, W. R. Windham, D. P. Smith, C. N. Thai. 2007. Real-time Multispectral Imaging System for Online Poultry Fecal Inspection Using Unified Modeling Language. Sens. & Intrumen. Food Qual. V.1: 45-54.

Thai, C.N.. 2005. Development of a Symmetrical Extended-Classroom Facility. Computers in Education Journal, 15(4):79-86.

Thai, C.N.. 2005. Adapting Pervasive Learning Technologies to Machine Vision Course. Computers in Education Journal, 15(3):78-84.

Thai, C.N.. 2004. Development of a Collaborative Distance Education Classroom. Computers in Education Journal, 14(1):65-75.

Thai, C.N. and B.L. Upchurch. 2004. Tele-Experimentation for Machine Vision Course Using NetMeeting & LabView Software. Computers in Education Journal, 14(1):2-11.

Fang, C., M.S. Chinnan, and C.N. Thai. 2003. Finite Element Modeling of Heat and Mass Transfer During Steaming of Cowpea Seeds. Journal of Food Science, V. 68, No. 5 (pp. 1702-1712)

Morita, K., Y. Ogawa, C.N. Thai, and F. Tanaka. 2003. Soft X-ray Image Analysis to Detect Foreign Materials in Foods. Food Sci. Technol. Res., Vol. 9, No. 2, pp. 137-141

Morita, K., Y. Ogawa, C.N. Thai, F. Tanaka, and E. Ishiguro. 2003. Spectral Analysis of Reflected Soft X-ray for Detecting Foreign Materials in Foods. Food Sci. Technol. Res., Vol. 9, No. 3, pp. 231-236.

Schuerger, A.C., G.A. Capelle, J.A. Di Benedetto, C. Mao, C. N. Thai, and M. D. Evans. 2003. Comparison of two hyperspectral imaging and two laser induced fluorescence instruments for the detection of zinc stress and chlorophyll concentration. Remote Sensing of the Environment 84 (572-588)

Upchurch, B.L. and C.N. Thai. 2003. An Interactive Classroom for Collaborative Learning. Computers in Education Journal,V.13, No.2 (26 - 34)

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

ASABE Meeting Council Chair.
ASABE-AE50 Award Committees – (Member).
ASAE-P-515, Textbooks & Monographs (Representative from Education Division).
ASAE-IET-348, Committee for Electromagnetic Radiation and Spectroscopy (Member).
ASAE-IET-312, Committee for Machine Vision (Member).
Engineering Member of UGA Faculty of Engineering (since 2/28/2002).

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

Xu, Bingqian
Assistant Professor

BS, Physics, Northwestern University China
PhD, Materials Science and Engineering, Arizona State University

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

Research: run single molecular study in biosystems lab; Teaching: developing and teaching (routine) one graduate/graduate and undergraduate/undergraduate course in electronics, nanoelectronics, and nanobiotechnology. Often, sort courses are offered. The electronics course (ENGR 3270) can be assigned as a core course for BSEE.

3. Scholarship and publication record for past five years;

Xu,BQ. 2007. Modulating the Conductance of a Au-octanedithiol-Au Molecular Junction, Small 3(12) 2061-2065

Huang ZF, BQ Xu, YC Chen, M Di Ventra and NJ Tao. 2006. Measurement of Current-Induced Local Heating in a Single Molecule Junction, Nano Letters, 6 (6) 1240-1244

Li XL, BQ Xu, XY Xiao, XM Yang, L Zang and NJ Tao. 2006. Controlling Charge Transport in Single Molecules Using Electrochemical Gate, Faraday Discussions 131, 111-120, INVITED

Li XL, J He, Hihath J, BQ Xu, S.M Lindsay and NJ Tao. 2006. Conductance of Single Alkanedithiols: Conduction Mechanism and Effect of Molecule-Electrode Contacts, J AM CHEM SOC 128(6): 2135 -2141

Yan H and BQ Xu. 2006. Towards Rapid DNA Sequencing: Detecting Single-Stranded DNA with a Solid-State Nanopore, Small 2(3) 310-312, INVITED HIGHLIGHT

Hihath J, BQ Xu, PM Zhang and NJ Tao. 2005. Study of Single Nucleotide Polymorphisms via Electrical Conductance Measurements, Proc. Natl. Acad. Sci. USA 102, 16979-16983

Li XL, BQ Xu , XY Xiao, Hihath J and NJ Tao. 2005. Measurement of electron transport properties of single molecules, Japanese Journal of Applied physics,44 (7B): 5344-5347

Xu BQ, XL Li, XY Xiao, H Sakaguchi and NJ Tao. 2005. Electromechanical and Conductance Switching Properties of Single Oligothiophene Molecules, Nano Letters, 5(7) 1491-1495

Xu BQ, XY Xiao, XM Yang, L Zang and NJ Tao. 2005. Large Gate Modulation in Current of a Room Temperature Single Molecule Transistor, J AM CHEM SOC 127(8): 2386-2387

Tao NJ, BQ Xu and XY Xiao. 2004. Measurement of electron transport and mechanical properties of single molecules, IEEE 62nd DRC. Conference Digest, 1, 202-203

Xiao XY, BQ Xu and NJ Tao. 2004. Metal Ion Binding Induced Changes in Single Peptide Conductance, ANGEW.CHEM. 116(45) 6274-6278

Xiao XY, BQ Xu and NJ Tao. 2004. Conductance Titration of Single-Peptide Molecules, J AM CHEM SOC 126 (17): 5370-5371

Xiao XY, BQ Xu and NJ Tao. 2004. Measurement of Single Molecule Conductance: Benzenedithiol and Benzenedimethanethiol, Nano Letters 4(2) 267-271

Xu BQ, PM Zhang, XL Li and NJ Tao. 2004. Direct Conductance Measurement of Single DNA Molecules in Aqueous Solution, Nano Letters, 4(6) 1105-1108

Boussaad S, BQ Xu, LA Nagahara, I Amlani, W Schmickler, R Tsui, and NJ Tao. 2003. Discrete tunneling current fluctuations in metal-water-metal tunnel junctions, J CHEM PHYS 118 (19): 8891-8897

Li XL, HX He, BQ Xu, XY Xiao, LA Nagahara, I Amlani, R Tsui, T Ren and NJ Tao. 2003. Measurement of Electron Transport Properties of Electrochemically and Mechanically Molecular Junctions, SUR. SCI 573(1) 1-10

Xu BQ and NJ Tao. 2003. Measurement of single-molecule resistance by repeated formation of molecular junctions, SCIENCE 301 (5637): 1221-1223

Xu BQ, HX He, S Boussaad and NJ Tao. 2003. Electrochemical properties of atomic-scale metal wires, Electrochimica Acta 48 3085-3091

Xu BQ, XY Xiao and NJ Tao. 2003. of Electromechanical Properties of Single-Molecule Junctions, J AM CHEM SOC 125(52) 16164 - 16165

He HX, S Boussaad , BQ Xu, CZ Li and NJ Tao. 2002. Electrochemical Fabrication of Atomically Thin Metallic Wires and Molecular-Scale Gaps, J ELECTROANAL CHEM 522 (2): 167-172 invited review

Xu BQ, HX HX and NJ Tao. 2002. Controlling the Conductance of Atomically Thin Metal Wires with Electrochemical Potential, J AM CHEM SOC 124 (45): 13568-13575

Xu BQ, and NJ Tao. 2007. Measurement of Single-Molecule Conductance by Repeated Formation of Molecular Junctions, Single Molecule Electronics, Editor: Mark Reed , Publisher: Oxford University Press

Tao NJ, BQ Xu and XY Xiao. 2005. Measurement of electron transport in single redox molecules, ABSTR PAP AM CHEM S 229: U726-U726 497-COLL Part 1

Boussaad S, BQ Xu, NJ Tao. 2003. Telegraphic signals from metal-water-metal tunnel junctions, ABSTR PAP AM CHEM S 225: 81-COLL Part 1

He HX, S. Boussaad, BQ Xu and NJ Tao. 2003. Molecular and Ionic Adsorption onto Atomic-Scale Metal Wires, Nanowires and Nanobelts,Materials, Properties and Devices, Ed. Z.L. Wang, Kluwer Academic Press

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for

Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Chaired a session of Molecular and Molecular-Scale Electronics during the 231st ACS National Meeting, Atlanta, GA, March 26-30, 2006
Referee for Journals: Journal of the American Chemical Socienty, Nano Letters, Small, Journal of Physical Chemistry B, and Current Nanoscience
Serve as a panelist for the 2008 National Defense Science and Engineering Graduate (NDSEG) Fellowship evaluation meeting (Department of Defense (DoD) and the American Society for Engineering Education (ASEE)), February 16,2008
Developed the first systematic nanocourse, nanoelectronics in UGA
Advising: (Major Professor) 1 PostDoc, 2 graduate students now in the lab and 1 graduate student, 2 undergraduate students, and two high school students (past group members); (Thesis Committee) 8 students (3 Engineering and 5 Chemistry students).

5. Expected responsibilities in this program;

Develop and teaching EE course
Take EE undergraduate students to work in my lab/hands-on experiences

1. Name, rank, academic discipline, institutions attended, degrees earned;

Zhang, Guigen
Associate Professor

PhD, Clemson University

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

ENGR 4350, Finite Element Analysis, Fall
ENGR 4740, Biomaterials, Fall
ENGR 6350, Finite Element Analysis, Fall
ENGR 6740, Biomaterials, Fall
ENGR 6930, Experimental Methods for Engineers, Spring
ENGR 8980, Directed Study, All year

3. Scholarship and publication record for past five years;

Zhang G. 2007. Chapter 9: Nanotechnology Based Biosensors in Drug Delivery, Nanotechnology in Drug Delivery, Springer, In Press.

Zhang G. 2006. Chapter 5: Maxillofacial Bone Augmentation and Replacement, Polymers for Dental and Orthopedic Applications, SW Shalaby and U Salz, Eds., 169-183, CRC Press. 2007, ISBN:0849315301.

Zhang G, Gilbert JL. 2004. A New Method for Real-Time and In-Situ Characterization of the Mechanical and Material Properties of Biological Tissue Constructs, Tissue Engineered Medical Products (TEMPs), ASTM STP 1452, 120-133, E. Schutte, D.S. Kaplan and G.L. Picciolo Eds., ASTM International, West Conshohocken, PA

Lee SJ, Anandan V and Zhang G. 2008. Electrochemical fabrication and evaluation of highly sensitive nanorod-modified electrodes for a biotin/avidin system, Biosensors and Bioelectronics, 23, 1117-1124.

Anandan V, Yang X, Kim E, Rao YL and Zhang G. 2007. Role of Reaction Kinetics and Mass Transport in Glucose Sensing, Journal of Biological Engineering, doi:10.1186/1754-1611-1-5.

Peng Z, Hesketh PJ, Yang X, Zhang G. 2007. Interdigitated Array Electrodes with Magnetic Function as a Particle-Based Biosensor, IEEE Sensors, 1097-1100.

Yang X. and Zhang G. 2007. Effect of Electrical Double Layer on the Performance, IEEE Sensors, 367-370.

Haq F, Anandan V, Keith C, Zhang G. 2007. Neurite Development in PC12 Cells Cultured on Nanopillars and Nanopores, International Journal of Nanomedicine, 2 (1), 107-115.

Yang X and Zhang G. 2007. Simulating the Structure and Effect of the Electrical Double Layer at Nanometer Electrodes, Nanotechnology, 18, 335201, 1-9.

Yang X and Zhang G. 2007. The Voltammetric Performance of Interdigitated Electrodes with Different Electron-Transfer Rate Constants, Sensors and Actuators B, 126, 624-631.

Anandan V, Rao YL and Zhang G. 2006. Nanopillar Array Structures for Enhancing Biosensing Performance, International Journal of Nanomedicine. Vol.1, No.1, 73-79.

Haq F, Keith C, and Zhang G. 2006. Neurite Development in PC12 Cells on Flexible Micro-Textured Substrates Under Cyclic Stretch, Biotechnology Progress. Vol.22, No.1, 133-140.

Radke H, Aron DN, Applewhite A, Zhang G. 2006. Biomechanical analysis of unilateral IMEX SK and IMEX KE external skeletal fixators combined with IM-pin using finite element method, Veterinary Surgery. Vol.35, 15-23.

Rao LR, Zhang G. 2006. Enhancing the Sensitivity of SAW Sensors with Nanostructures, Current Nanoscience. Vol.2, No.4, 311-318.

Tang XJ, Zhang G, Zhao YP. 2006. Electrochemical characterization of silver nanorod electrodes prepared by oblique angle deposition, Nanotechnology, 17, 4439-4444.

Zhang G, Haq F, Venkatramani A. 2006. Neurite Development in PC12 Cells on Nanostructured Substrates, Advances in Science and Technology. Vol.53, 85-90.

Haq F, Rao YL, Keith C, Zhao Y, and Zhang G. 2005. Nano and Micro Structured Substrates for Neuronal Cell Development, Journal of Biomedical Nanotechnology, Vol.1, No.3, 313-319.

Rao YL, Anandan V, Zhang G. 2005. FFT Analysis of Pore Pattern in Anodized Alumina Formed at Various Conditions, Journal of Nanoscience and Nanotechnology, Vol. 2, No. 12, 2070-2075.

Yu JC, Borke J, Zhang G. 2005. A Brief Synopsis on Cranial Sutures: Optimization by Adaptation, Seminars in Pediatric Neurology, (Special issue) Craniosynostosis: Concepts and Recent Advances - Edited by Harold L. Rekate, Vol 11/4, 249-255.

Zhang G. 2005. Evaluating the Viscoelastic Properties of Biological Tissues in a New Way, Journal of Musculoskeletal and Neuronal Interactions. 5 (1), 85-90.

Fan JG, Dyer D, Zhang G, Zhao YP. 2004. Pattern Formation During Wetting of Vertically Aligned Nanorod Arrays, Nano Letters. Vol.4, No.11, 2133-2138.

Zhang G. 2004. Geometric and Material Nonlinearity in Tensioned Wires of an External Fixator, Clinical Biomechanics. Vol.19, 513-518.

Zhang G. 2004. Avoiding the Material Nonlinearity in an External Fixation Device, Clinical Biomechanics. Vol. 19, 746-750.

Zhang G, Zhao Y-P. 2004. Mechanical Characteristics of Nano-Scale Springs, Journal of Applied Physics. 95, 267-271.

Zhang G. 2003. An Integrated Method for Evaluating the Mechanical Integrity of Biomaterials In-Situ, Materials Science Forum. Vols. 426-432, 3225-3230.

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Society for Biomaterials
Institute of Biological Engineering
American Society for Composites
The International Society for Optical Engineering
Tissue Engineering Society International
American Society for Testing and Materials International

Founding Member of the Editorial Board, Journal of Biological Engineering
Editorial Board, Journal of Biological Engineering,
Scientific Advisory Board, Engineering Board, and Nanotechnology Board, Lifeboat Foundation
Education Editor, Biomaterials Forum, The Society For Biomaterials

Chair, committee on Distinguished Lecture in Engineering – host to Dr. William Wulf, the past president of the National Academy of Engineering, for the inaugural lecture, Sept. 2007.
Member of the UGA Engineering Think Tank – Developed the roadmap for a comprehensive engineering at the University of Georgia, 2006.
Chair, symposium on Multidisciplinary Research on Biorheology during the 12th International Congress of Biorheology, Chongqing, China, June 1-4, 2005.
Chair, Tissue Engineering/Cell Matrix Interaction, the 30th Annual Meeting of the Society For Biomaterials, Memphis, Tennessee, April 27-30, 2005.
Organizing Committee for the 2005 Society for Biomaterials Meeting.
Chair, Bio-Nanotechnology, Nanoscience and Nanotechnology Conference at Georgia Tech, Atlanta, November 11-12, 2004.
Member of the USDA planning committee on Nanoscale Science and Engineering for Agricultural and Food Systems, November 2002, Washington DC.

Invited speaker on Nanotechnology, the Georgia Agri-Leader Forum, Athens, Georgia, 2007.
Invited speaker, "Imitating Nature for Developing Wet Adhesives by Nanostructures,"
Ethicon Inc, Johnson & Johnson, Somerville, NJ. August 14, 2006.
Featured lecturer, "Nanoscale Modeling of Electrochemical Processes Using COMSOL,"
COMSOL workshop. Atlanta, GA, June 22, 2006.

Panel members
National Institutes of Health: Nanotechnology,
National Science Foundation: Biotechnology, Chip Based Sensors, Sensors and Detectors for Environmental Monitoring, Nanoscale Drug Delivery, and MEMS and NEMS Devices

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

1. Name, rank, academic discipline, institutions attended, degrees earned;

Zhang, Qing
Professor, applied mathematics,

Brown University, Ph.D

2. Current workload for typical semester, including specific courses usually taught; explain how workload will be impacted with the addition of proposed program;

7 for two years (3+4), probability, stochastic processes, stochastic analysis

3. Scholarship and publication record for past five years;

G. Badowski, G. Yin and Q. Zhang, Nearly optimal controls of discrete-time dynamic systems driven by singularly perturbed Markov chains, Journal of Optimization Theory and Applications, Vol. 116, No. 1, pp. 131-166, (2003).

G. Yin, Q. Zhang, and K. Yin, Constrained stochastic estimation algorithms for a class of hybrid stock market models, Journal of Optimization Theory and Applications, Vol. 118, No. 1, pp. 157-182, (2003).

G. Yin and Q. Zhang, and G. Badowski, Discrete-time singularly perturbed Markov chains: Aggregation, occupation measures, and switching diffusion limit, Advances in Applied Probability, Vol. 35 , pp. 449-476, (2003).

H. Yang, G. Yin, K. Yin, and Q. Zhang, Control of singularly perturbed Markov chains: A numerical study, Australian New Zealand Industrial and Applied Mathematics, (ANZIAM) Journal, (formerly known as Journal of the Australian Mathematical Society, Series B: Applied Mathematics), Vol. 45, pp. 49-74, (2003).

G. Yin and Q. Zhang, Stability of Markov modulated discrete-time dynamic systems, Automatica, Vol. 39, pp. 1339-1351, (2003).

Q. Zhang and G. Yin, Exponential bounds for discrete-time singularly perturbed Markov chains, Journal of Mathematical Analysis and Applications, Vol. 293, pp. 645-662, (2004).

Q. Zhang and G. Yin, Nearly optimal asset allocation in hybrid stock-investment models, Journal of Optimization Theory and Applications, Vol. 121, pp. 419-444, (2004).

G. Yin, Q. Zhang, and Y.J. Liu, Discrete-time approximation of Wonham filters, Journal of Control Theory and Applications, Vol. 2, pp. 1-10, (2004).

X. Guo and Q. Zhang, Closed-form solution for perpetual American put with regime switching, SIAM Journal on Applied Mathematics, Vol. 64, pp. 2034-2049, (2004).

Q. Zhang, G. Yin, and R.H. Liu, A near-optimal selling rule for a two-time-scale market model, Multiscale Modeling and Simulation: A SIAM Interdisciplinary Journal, Vol. 4, pp. 172-193, (2005).

X. Guo and Q. Zhang, Optimal selling rules in a regime switching model, IEEE Transactions on Automatic Control, Vol. 50, pp. 1450-1455, (2005).

Y.J. Liu, G. Yin, and Q. Zhang, Computational methods for pricing American put options, Journal of Optimization Theory and Applications, Vol. 127, pp. 389-410, (2005).

G. Yin, Q. Zhang, J.B. Moore, Y.J. Liu, Continuous-time tracking algorithms involving two-time-scale Markov chains, IEEE Transactions on Signal Processing, Vol. 53, pp. 4442-4452, (2005).

G. Yin, Q. Zhang, F. Liu, R.H. Liu, Y. Cheng, Stock liquidation decision making using stochastic approximation methods: A numerical study, Mathematical Finance, Vol. 16, pp. 217-236, (2006).

Y. Hou, S.P. Sethi, H. Zhang, and Q. Zhang, Asymptotically optimal production policies in dynamic stochastic jobshops with limited buffers, Journal of Mathematical Analysis and Applications. Vol. 317, pp. 398-428, (2006).

J.W. Wang, Q. Zhang, and G. Yin, Two-time-scale hybrid filters: Near optimality, SIAM Journal on Control and Optimization, Vol. 45, pp. 298-319, (2006).

M. Pemy and Q. Zhang, Optimal stock liquidation in a regime switching model with finite time horizon, Journal of Mathematical Analysis and Applications, Vol. 321, pp. 537-552, (2006).

G. Yin, J. Wang, Q. Zhang, and Y.J. Liu, Stochastic approximation algorithms for pricing American put options, Journal of Optimization Theory and Applications, Vol. 131, pp. 37-52, (2006).

M. Pemy, G. Yin, and Q. Zhang, Liquidation of a large block of stock, Journal of Banking and Finance, Vol 31, pp. 1295-1305, (2007).

Q. Zhang, G. Yin, and J.B. Moore, Two-time scale approximation for Wonham filters, IEEE Transactions on Information Theory, Vol. 53, pp. 1706-1715, (2007).

M. Pemy, G. Yin, and Q. Zhang, Selling a large stock position: A stochastic control approach with state constraints, Communications in Information and Systems, Special Issue Dedicated to the 65th Birthday of Tyrone Duncan: Part III, Edited by A. Bensoussan, S. Mitter, and B. Pasik-Duncan, Vol. 7, pp. 93-110, (2007).

J. Bao, A. Belu, Y. Gershon, Y.J. Liu, G. Yin, and Q. Zhang, Using stochastic optimization methods for stock selling decision making and option pricing: Numerics and bias and variance dependent convergence rates, Communications in Information and Systems, Special Issue Dedicated to the 65th Birthday of Tyrone Duncan: Part III, Edited by A. Bensoussan, S. Mitter, and B. Pasik-Duncan, Vol. 7, pp. 111-132, (2007).

Y.J. Liu, J.B. Moore, G. Yin, Q. Zhang, Balanced realization of regime-switching linear systems,
Mathematics of Control, Signals, and Systems, Vol. 19, pp. 207-234, (2007).

G. Yin, Q. Zhang, and C. Zhuang, A stochastic approximation algorithm for parameter estimation in option pricing with regime switching, Stochastic Analysis and Applications, Vol. 25, pp. 1243-1261, (2007).

R. Liu, G. Yin, and Q. Zhang, Option pricing in a regime switching model using the fast Fourier transform, Applied Mathematics and Stochastic Analysis, (accepted for publication).

M. Pemy, G. Yin, and Q. Zhang, Liquidation of a large block of stock with regime switching, Mathematical Finance, (accepted for publication).

H. Zhang and Q. Zhang, Trading a mean reverting asset: Buy low and sell high, Automatica, (accepted for publication).

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, Institute of Electrical and Electronics Engineers, Sigma Xi, Sigma Gamma Tau, Tau Beta Pi, Order of the Engineer.

Corresponding Editor, SIAM Journal on Control and Optimization, 2007--2009.
Associate Editor, SIAM Journal on Control and Optimization, 2000--2005.
IEEE Transactions on Automatic Control, 1998--2001.
Guest Co-Editor, Automatica, Special Issue on Optimal Control
Applications to Management Sciences, 2006.
Member of Program Committees:
IEEE Conference on Decision and Control Conference, 2007.
IEEE Conference on Decision and Control--European Control Conference, 2005.

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects