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
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 ________________________

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 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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## APPENDICES

A. Undergraduate Course Descriptions

B. Scholarship, Publications and Professional Activities of the Faculty Directly Involved
1. PROGRAM ABSTRACT

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
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 biosciences, 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:

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 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.

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
Formal Proposal for B.S. in Electrical and Electronics Engineering

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

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: Foundation Courses (9 hours with a grade of C or better in each course)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2250</td>
<td>Calculus I for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 1101 (1)</td>
<td>English Composition I</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 1102 (1)</td>
<td>English Composition II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>10</td>
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II. Sciences (7-8 hours)

Physical Sciences (3-4 hrs.)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
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</thead>
<tbody>
<tr>
<td>PHYS 1211-1211L</td>
<td>Introductory Physics for Science and Engineering Students-Mechanics, Waves, Thermodynamics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>
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)
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
Formal Proposal for B.S. in Electrical and Electronics Engineering

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:

<table>
<thead>
<tr>
<th>Category</th>
<th>Hours</th>
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<tbody>
<tr>
<td>General Education Abilities</td>
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<tr>
<td>Foundation Courses</td>
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<tr>
<td>Physical Science</td>
<td>4</td>
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<tr>
<td>Life Science</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>4</td>
</tr>
<tr>
<td>World Language and Culture</td>
<td>9</td>
</tr>
<tr>
<td>Humanities and the Arts</td>
<td>3</td>
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<tr>
<td>Social Sciences</td>
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<tr>
<td>Courses Related to the Major</td>
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<tr>
<td>Requirements in the Major</td>
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<tr>
<td>Electrical Engineering Electives</td>
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</tr>
<tr>
<td>TOTAL FOR THE DEGREE</td>
<td>130</td>
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## B.S. in Electrical Engineering
### 130 Semester hours

### Year One:
#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>MATH 2250 Calculus I</td>
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<tr>
<td>ENGL 1101 English Comp. I</td>
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</tr>
<tr>
<td>BIOL 1104 Organismal Biology</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 1211-1211L Intro. Physics</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 1120 Engr. Graphics and Design</td>
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Total Credit Hours: 17

#### Spring

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MATH 2260 Calculus II</td>
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<tr>
<td>ENGL 1102 English Comp. II</td>
<td>3</td>
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<tr>
<td>World Languages and Culture</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 1212-1212L Intro. Physics</td>
<td>4</td>
</tr>
<tr>
<td>Social Science Elective</td>
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Total Credit Hours: 17

### Year Two:
#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>MATH 2500 Multivariable Calculus</td>
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<tr>
<td>CSEE 2220 Fund. of Logic Design</td>
<td>3</td>
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<tr>
<td>MATH 3000 Intro. to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>PROGRAMMING FOR ENGINEERS</td>
<td>4</td>
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<tr>
<td>Social Science Elective</td>
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Total Credit Hours: 16

#### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MATH 2700 Elem. Differential Equa.</td>
<td>3</td>
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<tr>
<td>ENGR 2170 Electrical Circuits</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 3140 Thermodynamics</td>
<td>2</td>
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<tr>
<td>ENGR 3150 Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ECON 2105 Princ. of Macroeconomics</td>
<td>3</td>
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<tr>
<td>Humanities and the Arts</td>
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Total Credit Hours: 17

### Year Three:
#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ELECTROMAGNETICS</td>
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</tr>
<tr>
<td>ENGR 4210/6210 Linear Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 4230/6230 Sensors and Transduc.</td>
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<tr>
<td>ENGR 3210 Elect. Machines &amp; Power</td>
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<tr>
<td>ENGR 3270 Electronics I</td>
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Total Credit Hours: 15

#### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENGR 4240 Intro. to Microcontrollers</td>
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</tr>
<tr>
<td>ENGR 4270 Electronics II</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 4220/6220 Feedback Cont. Sys.</td>
<td>3</td>
</tr>
<tr>
<td>Design Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>World Language &amp; Culture</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 4250/6250 Adv. Microcontrollers</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours: 17

### Year Four:
#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ELEC. ENGR. CAPSTONE DESIGN I</td>
<td>2</td>
</tr>
<tr>
<td>ELECTRICAL ENGR. ELECTIVE</td>
<td>3</td>
</tr>
<tr>
<td>CSEE 4270 Design of Digital Systems</td>
<td>3</td>
</tr>
<tr>
<td>ELECTRICAL ENGR. ELECTIVE</td>
<td>3</td>
</tr>
<tr>
<td>ELECTRICAL ENGR. ELECTIVE</td>
<td>3</td>
</tr>
<tr>
<td>World Language &amp; Culture</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours: 17

#### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEC. ENGR. CAPSTONE DESIGN II</td>
<td>2</td>
</tr>
<tr>
<td>ELECTRICAL ENGR. ELECTIVE</td>
<td>3</td>
</tr>
<tr>
<td>ELECTRICAL ENGR. ELECTIVE</td>
<td>3</td>
</tr>
<tr>
<td>ELECTRICAL ENGR. ELECTIVE</td>
<td>3</td>
</tr>
<tr>
<td>ECON 2106 Princ. Of Microeconomics</td>
<td>3</td>
</tr>
</tbody>
</table>

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/](http://www.engr.wisc.edu/ece/current/)

   **Parameswaran Ramanathan**

   Tel: 608/262-3840  
   Fax: 608/262-1267  
   E-mail: [ecechair@engr.wisc.edu](mailto: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
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 handwritten 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)
'RSLogix', '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.

<table>
<thead>
<tr>
<th></th>
<th>FY 09 First Year</th>
<th>FY 10 Second Year</th>
<th>FY 11 Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. ENROLLMENT PROJECTIONS (indicate basis for projections in narrative)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Student majors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Shifted from other programs</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>2. New to institution</td>
<td>20</td>
<td>50</td>
<td>115</td>
</tr>
<tr>
<td>Total Majors</td>
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<td>60</td>
<td>120</td>
</tr>
<tr>
<td>B. Course sections satisfying program requirements.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Previously existing</td>
<td>63</td>
<td>63</td>
<td>63</td>
</tr>
</tbody>
</table>
## Formal Proposal for B.S. in Electrical and Electronics Engineering

2. **New**

| Total Program Course Sections | 8 | 17 | 33 |

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

#### A. Personnel–reassigned or existing positions

<table>
<thead>
<tr>
<th>Role</th>
<th>EFT</th>
<th>Dollars</th>
<th>EFT</th>
<th>Dollars</th>
<th>EFT</th>
<th>Dollars</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.6</td>
<td>54,000</td>
<td>0.6</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>0</td>
<td>0</td>
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<tr>
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<td>2,500</td>
<td>0.05</td>
<td>2,500</td>
<td>0.05</td>
<td>2,500</td>
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<tr>
<td>Support staff</td>
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<td>0.05</td>
<td>1,500</td>
<td>0.05</td>
<td>1,500</td>
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<tr>
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<td>15,780</td>
<td>15,780</td>
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<tr>
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<td>0</td>
<td>0</td>
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**TOTAL EXISTING PERSONNEL COSTS**

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>62,350</td>
<td>73,780</td>
<td>73,780</td>
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</table>

#### B. Personnel–new positions

<table>
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<th>EFT</th>
<th>Dollars</th>
<th>EFT</th>
<th>Dollars</th>
<th>EFT</th>
<th>Dollars</th>
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<tr>
<td>Faculty</td>
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<td>Part-time Fac.</td>
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<td>0</td>
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<td>1.0</td>
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<td>36,000</td>
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<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>Support staff</td>
<td>0.5</td>
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<td>0.8</td>
<td>25,000</td>
<td>2.0</td>
<td>60,000</td>
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<tr>
<td>Fringe benefits</td>
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<td>157,800</td>
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<td></td>
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<tr>
<td>Other personnel costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL NEW PERSONNEL COSTS**

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>278,095</td>
<td>427,080</td>
<td>747,800</td>
</tr>
</tbody>
</table>

#### C. Start-up Costs (one-time expenses)

<table>
<thead>
<tr>
<th>Description</th>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library/learning resources</td>
<td>4,000</td>
<td>6,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Equipment</td>
<td>240,000</td>
<td>500,000</td>
<td>550,000</td>
</tr>
<tr>
<td>Other (New Faculty)</td>
<td>500,000</td>
<td>260,000</td>
<td>540,000</td>
</tr>
</tbody>
</table>

#### D. Physical Facilities: construction or major renovation

<table>
<thead>
<tr>
<th>Description</th>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>250,000</td>
<td>300,000</td>
<td>450,000</td>
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</table>

**TOTAL ONE-TIME COSTS**

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>994,000</td>
<td>1,066,000</td>
<td>1,548,000</td>
</tr>
</tbody>
</table>

#### E. Operating Cost (recurring costs–base budget)

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Formal Proposal for B.S. in Electrical and Electronics Engineering

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 xxxxxxxxxxx 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


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.

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
Journal Articles (peer-reviewed)
Y. Wei, S.M. Bhandarkar, and K. Li, Client-centered Multimedia Content Adaptation, ACM Trans. Multimedia Computing, Communications and Applications (ACM TOMCCAP), in 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.

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:


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.


Book reviews:


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;


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  

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.”  


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.
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 1999
Full 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)


4. Professional activity;


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

Master of Philosophy, Department of Electrical Engineering, September 2002 – September 2003
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;


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.


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;


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;


System for Integrated Forest Ecosystem Management”, in Computers and Electronics in

Integrating Multiple Components in a Decision Support System”, in Computers and

Algorithms, and Markov Chains”, in Applied Intelligence: The International Journal of
Artificial Intelligence, Neural Networks, and Complex Problem Solving Technologies, Vol. 20,

Inspired Heuristics in Aerial Spray Deposition Management”, in the Journal of Applied
Systems Studies (special issue on Real Life Applications of Nature Inspired Combinatorial

D. Nute, W.D. Potter, F. Maier, J. Wang, 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.
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
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,
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


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


**Book Chapters**


**Patents**

4. Professional activity; **Current research support**

**Course faculty**

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;


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


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


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
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;


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.
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.

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;


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.
   Guest Co-Editor, Automatica, Special Issue on Optimal Control Applications to Management Sciences, 2006.
   Member of Program Committees:

5. Expected responsibilities in this program;
Teaching courses and mentoring design/research projects