The University of Georgia

Office of the President

February 27, 2009

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

Dear Chancellor Davis:

Attached for consideration by the Board of Regents is a proposal from the Institute of the Faculty of Engineering to offer a major in Mechanical Engineering under the Bachelor of Science in Mechanical Engineering degree (B.S.M.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_____________________________

Department ____

Name of Proposed Program ____B.S. in Mechanical Engineering___________________________

Degree___B.S. ____________Major __Mechanical Engineering__ CIP Code ______________

Starting Date __August, 2011_________________

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 Mechanical 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 related to energy systems, manufacturing, and biological and health systems.*

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 Mechanical 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? *N*o.

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 demand for engineers with expertise in the design, development of mechanical systems for occupational safety is projected to increase 13% nationally and 14% in Georgia between 2004 and 2014. The demand for engineers with expertise in the design of mechanical systems associated with alternative fuels is projected to increase 12% nationally in the next 10 years. This demand is associated with the growth of the biofuels market which increased nationally from $20 billion in 2006 to $81 billion in 2016. The report State Energy Strategy for Georgia indicates that alternative fuel production and "green-building" design are high priority industry areas for the State. Similar to most engineering fields, job vacancies are being filled by foreign engineers who are generally trained in a traditional way, the need for engineers who can innovate for the future can only be met when we graduate engineers who are educated under a new paradigm proposed in the National Academy of Engineering (NAE) report entitled "The Engineer of 2020." The proposed degree will ramp up engineering education in Georgia for meeting its own needs, and build the nation's capacity and provide incentives for graduating U.S. engineers in this critical area.

Give a brief justification for why your institution should offer the program.

The overall justification for graduates of an undergraduate Mechanical Engineering program is the need for engineers with the ability to deal with the increasingly complex dynamics between society's energy needs and its environment and the need to integrate emerging technologies into the State's industry base. At the University of Georgia, such a program is particularly justified in light of the University's rich liberal arts educational environment and the existing academic programs in nanotechnology, alternative energies as well as traditional energy systems, the biological sciences, resource management and law. The University of Georgia is committed to providing an education that is a unique synthesis of these diverse disciplines.

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 225,800 mechanical engineers were employed in 2006. Long-term occupational projections for Georgia reports 3,290 mechanical engineers employed in 2004 and projected a 14% increase between 2004 and 2014. The national growth projection is particularly true for mechanical engineers working in alternative energy industry and in worker safety. . The U.S. Bureau of Labor had a similar projection of an 11% increase in the national demand over the same period.*

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.*

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.*

<u>Facilities</u>
If additional facilities are needed, how they will be acquired. *None required.*

<u>Curriculum and delivery</u>
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 civil engineering very attractive, thus increasing the diversity of students within the University of Georgia.*

<u>Collaboration</u>
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 mechanical engineering at both their Atlanta and Savannah campuses. This program will enhance the needs of the mechanical engineering community in this state and will have unique programs in energy systems, nanotechnology, and health and safety.

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

<u>Other</u>
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? *No.*

University of Georgia

Proposal

for

Bachelor of Science in Mechanical Engineering

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

College/Unit: Faculty of Engineering

Name of the Proposed Program: Bachelor of Science in Mechanical Engineering

Degree: B.S.M.E. **Major:** Mechanical Engineering

Starting Date: Fall 2011

Prepared by the Faculty of Engineering:
Nadia Kellam, Faculty of Engineering; Dept. of Biological and Agricultural Engineering (Chair)
Timothy Foutz, Faculty of Engineering; Dept. of Biological and Agricultural Engineering

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APPENDICES

1. PROGRAM ABSTRACT

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

The objective of this proposal is to offer the Bachelor of Science degree in Mechanical Engineering (BSME) by the Faculty of Engineering at the University of Georgia (UGA) 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 objectives of the proposed degree are to graduate engineers that are capable of entering careers in the following areas:

1. The design and manufacture of systems for the generation, storage and use of traditional and alternative energy systems
2. The design, fabrication and testing of machinery components, equipment, and systems for manufacturing, worker safety, and the development of a sustainable economy
3. The application of mechanical engineering to biological and health systems, including cellular and nano-scale areas

The proposed mechanical engineering degree will graduate students ready for successful careers as practicing engineers as well as for graduate work in advanced research degrees, and it will increase Georgia's enrollment capacity to meet the needs of additional Georgia high school graduates seeking careers in engineering. Additionally, these students will have attributes aligned with those of the UGA Engineer, being socially conscious and innovative in addition to being technically excellent.

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 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 of Georgia are filled by graduates of out-of-state and foreign institutions. The Georgia Department of Labor projected a 14 percent increase for mechanical engineers between 2004 and 2014. The U.S. Bureau of Labor had a similar projection of an 11% increase in the national demand over the same period. The demand for engineers with expertise in the design, development of mechanical systems for occupational safety is projected to increase 13% nationally and 14% in Georgia between 2004 and 2014. The demand for engineers with expertise in the design of mechanical systems associated with alternative fuels is projected to increase 12% nationally in the next 10 years[1].

[1] Identifying and Addressing Workforce Challenges in America's Energy Industry. President's High Growth Job Training Initiative. The US Department of Labor: Employment and Training Administration. March 2007.

This demand is associated with the growth of the biofuels market which increased nationally from $20 billion in 2006 to $81 billion in 2016[2]. The report State Energy Strategy for Georgia[3] indicates that alternative fuel production and "green-building" design are high priority industry areas for the State. Similar to most engineering fields, job vacancies are being filled by foreign engineers who are generally trained in a traditional way. The need for engineers who can innovate for the future can only be met when we graduate engineers who are educated under a new paradigm proposed in the National Academy of Engineering (NAE) report entitled "The Engineer of 2020." The proposed degree will ramp up engineering education in Georgia for meeting its own needs, and build the nation's capacity and provide incentives for graduating U.S. engineers in this critical area.

The UGA Faculty of Engineering is uniquely prepared to develop a Mechanical 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 the only university among top ranked public research universities in the nation having the opportunity to design a brand new mechanical engineering degree program at the dawn of the 21st Century without having to restructure engineering departments or an existing college of engineering. The proposed Mechanical 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.

UGA already has all necessary academic units and 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, eight to ten new faculty and nineteen new courses in the targeted Mechanical Engineering areas will be needed. Especially important to this program are UGA's strong programs in bio-sciences and 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 mechanical 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 additional appropriate support staff. This new B.S. degree is projected to have 150 majors in its fourth year.

UGA 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 in the environmental area, which research has shown attracts more women and underrepresented minorities.

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[2] Clean Energy trends 2007
[3] State Energy Strategy for Georgia. Governor's Energy Policy Council. December 14, 2006.

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 Mechanical Engineering (BSME) by the University of Georgia's (UGA) 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 objectives of the proposed degree are to graduate engineers educated for careers in the following areas:

1. The design and manufacture of systems for the generation, storage and use of traditional and alternative energy systems
2. The design, fabrication and testing of machinery components, equipment and systems for manufacturing, worker safety, and the development of a sustainable economy
3. The application of mechanical engineering to biological and health systems, including cellular and nano-scale areas

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

UGA 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 of establishing a new unit and initiating academic studies in several use-inspired engineering areas. An important aspect of the Strategic Plan was the creation of a new engineering unit 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 engineering graduates should be able to address societal needs, and 2) the unit should be able to achieve success because of the desired excellence.

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 a Mechanical 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. All UGA students will have an enhanced undergraduate experience as they will understand and interact with students in other professions, students whom are likely to be a part of their life-long work environment.

USG Strategic Goal 2. The proposed BSME 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 BSME graduates will be prepared as practicing engineers who will create technology and solutions that contribute to economic development. Graduates will also be ready for advanced graduate work leading to research careers. The mechanical engineer's domain of application is ubiquitous and by focusing on the energy industry, nanotechnology, biosystems, manufacturing, sustainability, and worker safety, the graduates of this program will position Georgia to compete locally and globally.

USG Strategic Goal 4. By selecting the focus areas within mechanical engineering with the greatest current demand and with the greatest potential for demand, instead of 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 a mechanical engineer is $69,825, 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 outsourced because of a lack of qualified U.S. educated engineers. In his more recent publication, "Hot, Flat and Crowded," Mr. Friedman takes a look at the rapid changing of the world through climate change, population growth and globalization. In this 2008 book, he urges the U.S. to become a world leader in developing 'green' technologies needed for the coming era he calls the "Energy-Climate Era." Without becoming a leader in these technologies, he fears that the U.S. will be shunted aside by other nations.

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 educate 20,000 new engineers in order to address the shortage of engineers in 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 of Georgia are filled by graduates of out-of-state and foreign institutions. The Georgia Department of Labor projected a 14 percent increase for mechanical engineers between 2004 and 2014. The U.S. Bureau of Labor had a similar projection of an 11% increase in the national demand over the same period. The demand for engineers with expertise in the design, development of mechanical systems for occupational safety is projected to increase 13% nationally and 14% in Georgia between 2004 and 2014. The demand for engineers with expertise in the design of mechanical systems associated with alternative fuels is projected to increase 12% nationally in the next 10 years[4]. This demand is associated with the growth of the biofuels market which increased nationally from $20 billion in 2006 to $81 billion in 2016[5]. The report State Energy Strategy for Georgia[6] indicates that alternative fuel production and "green-building" design are high priority industry areas for the State. Similar to most engineering fields, job vacancies are being filled by foreign engineers who are generally trained in a traditional way. The need for engineers who can innovate for the future can only be met when we graduate engineers who are educated under a new paradigm proposed in the National Academy of Engineering (NAE) report entitled "The Engineer of 2020." The proposed degree will ramp up engineering education in Georgia for meeting its own needs, and build the nation's capacity and provide incentives for graduating U.S. engineers in this critical area.

The 1998 Board of Regents report on Engineering Education in Georgia identified that fewer than two-thirds of Georgia high school graduates with an SAT score of over 1100 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 opportunities 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 UGA for educating engineers. The proposed BSME 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

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[4] Identifying and Addressing Workforce Challenges in America's Energy Industry. President's High Growth Job Training Initiative. The US Department of Labor: Employment and Training Administration. March 2007.
[5] Clean Energy trends 2007
[6] State Energy Strategy for Georgia. Governor's Energy Policy Council. December 14, 2006.

individuals practicing engineering in Georgia's workforce in promising areas of health, energy and bio-based industries.

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

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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 immigration 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 a SAT score of over 1100 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 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 225,800 mechanical engineers were employed in 2006. Long-term occupational projections for Georgia reports 3,290 mechanical engineers employed in 2004 and projected a 14% increase between 2004 and 2014. While the national growth projection for all mechanical engineering positions is only 4% (or 9,372 jobs by 2016), the national growth projection for mechanical engineers working in food and worker safety is projected to grow by 14% and for mechanical engineers working in the alternative energy industry is projected to grow by 12%. A projected reduction in mechanical engineering positions occurs primarily in the durable goods manufacturing area (an 8% decrease in growth or 10,134 jobs nationally) and is attributed to the shifting of the manufacturing industry to other countries.

UGA's strengths as a comprehensive university and its extensive leadership in many areas 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 provides futuristic technological solutions.

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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 21^{st} century of UGA 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 interconnections among disparate systems and synthesize new ideas, and to adapt for the changing environment. UGA is the state's oldest, most comprehensive and most diversified institution of higher education. It has exceptional faculty with the 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 integrating engineering education in liberal arts environments.

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 mechanical engineering program can be given by the presence of a strong biofuels research program within the Faculty of Engineering, the Biological and Agricultural Engineering Department, the University's B3I[7] initiative and by the presence of two existing engineering degree programs (biochemical engineering and environmental engineering) which have foci on alternative energy applications and which will be linked with this proposed mechanical engineering program. These existing and state of the art resources, and the linking of three major engineering disciplines will provide undergraduates with an in-depth and broad understanding of the technical issues associated with alternative energy, sustainability, renewable energy sources, biosystems, and power distribution. These graduates will be able and ready to provide leadership in a team environment and to communicate and function across the disciplines of mechanical engineering, biosystems, nanotechnology, and other applied science fields. Thus, the graduates can serve Georgia's energy and manufacturing industries, therefore satisfying an immediate need.

Clearly, the addition of the B.S. in Mechanical Engineering degree program will make UGA a more effective public university. The mechanical engineering students and faculty will be able to contribute to programs in mathematics and the sciences in areas such as energy, biosystems, sustainability and manufacturing, and the research work of these areas will be more readily transformed for use in the development of the state.

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

Georgia needs more engineers. While Georgia's growth and its stature among states rose in the decade of the 90's in some important categories (for example, 4th in population growth, 8th in venture capital investment, and 8th in start-up companies), it ranked 40th in the nation in percentage of engineers and scientists in its workforce

[7] UGA's Biofuels, Biopower, and Biomaterials Initiative (B3I) unites the University's legacies in agriculture, forestry, environmental science and engineering with its strengths in carbohydrate science, genetics and microbiology to provide a scientific and practical foundation to support an economic and sustainable bioenergy future.

[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 immigration 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 (USG)-commissioned report on engineering education needs that was published in 1998 presented data showing that fewer than two-thirds of the qualified Georgia high school graduates (SAT scores of 1100 to 1600) with an expressed interest in majoring in engineering were enrolled in engineering in USG institutions of higher education. The 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."

UGA 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: bio-based 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 UGA's existing programs, increase the quest for use-inspired research and reduce the time between knowledge discovery and use.

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

Georgia Institute of Technology currently offers a Bachelor of Science in Mechanical Engineering from the George W. Woodruff School of Mechanical Engineering. This degree can be obtained through their Atlanta and Savannah campuses. They awarded 334 BSME degrees in 2006. There are no other public or private institutions in the State of Georgia offering a B.S. in Mechanical Engineering. The Mechanical Engineering program at Georgia Tech provides educational and research opportunities for students to minor in eight areas: aerospace engineering, biology, biomedical engineering, computing science, earth and atmospheric sciences, materials science and engineering, mathematics and nuclear and radiological engineering. In contrast, the UGA Mechanical Engineering degree program offers opportunities for students to focus on energy systems, biosystems, nanotechnology, sustainability, and worker safety. Courses offered in the UGA Mechanical Engineering program build around the needs of these focus areas.

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 UGA 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 immigration 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 mechanical engineering at UGA was recognized in 2008 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 Mechanical Engineering.

A Mechanical Engineering Degree Program Proposal Committee comprised of persons with a diversity of 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 faculty in UGA engineering and related UGA Colleges/Schools. The proposal was then submitted for approval following the established procedures of UGA 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.

Many of the 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 will support these programs and 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 Mechanical Engineering (BSME)

Proposed Program Requirements

BSME CORE CURRICULUM REQUIREMENTS

I: Foundation Courses (10 hours with a grade of "C" or better in each course)		
MATH 2250 ENGL 1101 (1) ENGL 1102 (1)	Calculus I for Science and Engineering English Composition I English Composition II	4 3 3
II. Sciences (7-8 hours)		
Physical Sciences (3-4 hrs.) PHYS 1211-1211L	Introductory Physics for Science and Engineering Students-Mechanics, Waves, Thermodynamics	4
Life Sciences (3-4 hrs.)	Select one from the following BIOL 1103 or PBIO 1210	3
III. Quantitative Reasoning (3-4 hours)		
ENGG 2000	Solving Technical Problems Using Engineering Decision Making	3
IV. World Languages and Culture (WL&C), Humanities and the Arts (12 hours)		
Foreign Language course from the approved list		3
World Language and Culture courses from the approved list		6
Humanities and Arts courses from the approved list		3
V. Social Sciences (9hrs)	Social Science from the approved list	9
VI. Courses Related to the Major (18 hours)		
CHEM 1211 & CHEM 1211L MATH 2260 MATH 2500 PHYS 3900 PHYS 1212-1212L	Freshman Chemistry I Calculus II for Science and Engineering Multivariable Calculus Mathematical Methods in Physics Introductory Physics for Science and Engineering Students-Electricity and Magnetism, Optics, Modern Physics	4 4 3 3 4
VII. Requirements in the Major (41 hours)		
ENGM 110X	CAD and Engr. Fabrication	2
ENGM 102X	Engineering Studio I	1
ENGM 202X	Engineering Studio II	2
ENGM 302X	Engineering Studio III	2
ENGM 402X	Engineering Studio IV	3
ENGM 303X	Engineering Management	2
ENGG 201X	Energy and the Environment	2
ENGM 301X	Engineering Experimentation	3
ENGR 2120	Engineering Statics	3
ENGR 2130	Dynamics	3
ENGR 2140	Strength of Materials	3
ENGR 2170	Electrical Circuits	3
ENGR 3150	Heat Transfer	3
ENGR 3160	Fluid Mechanics	3
ENVE 3210	Energy Analysis I	3
ENVE 3510	Modeling, Statistical Analysis, and Uncertainty	3

VIII. Engineering Electives (24 hours)		
ENGR 3210	Electrical Machines and Power Distribution	3
ENGR 324X	Industrial Controls	3
ENGR 3300	Mechanisms and Machine Kinematics	3
ENGR 3540	Physical Unit Operations	3
ENGR 4300	Mechanical Systems	3
ENGR 4350/6350	Introduction to Finite Element Analysis	3
ENGR 4360/6360	Advanced Topics in CAD/CAM	3
ENGR 4340	Machine Hydraulics	3
ENGR 4490/6490	Renewable Energy Engineering	3
ENGR(LAND) 4660/6660-4660L/6660L	Sustainable Building Design	3
ENGR 411X	Momentum Heat Transport Processes	3
ENGM 304X	Nanostructured Materials	3
ENGM 311X	Modeling and Simulation of Microsystems	3
ENGM 321X	Nanomechanics of Materials and Biomaterials	3
ENGM 322X	Microscale Fluid Mechanics	3
ENGM 403X	Energy Systems Laboratory	3
ENGM 404X	Power Generation	3
ENGM 401X	Nanoelectronics	3
ENGM 411X	Nanomaterials Characterization	3
ENGM 421X	Soft Materials and Nanobiotechnology	3
ENGM 422X	Mechatronics	3
IX. Technical Elective (6 hours)		
Suggested Technical Electives		
AAEC 2060	Economic Perspectives on the Environment and Natural Resources	3
EHSC 4100/6100-4100L/6100L	Industrial Hygiene	3
ETES 5060/7060	Energy Systems	3
FDST 3000	Introduction to Food Science and Technology	3
FDST 4010/6010-4010L/6010L	Principles and Methods of Food Processing	3
FDST 4060/6060-4060L/6060L	Food Engineering Fundamentals	3
FDST(EHSC)(MIBO) 4320/6320-4320L/6320L	Hazard Analysis Critical Control Point in the Food Industry	3
HPRB 4450/6450	Occupational Safety	3
Or Technical Elective can be any other University course approved by the Engineering Academic Office Advisor		

Special Requirements
A maximum of three courses with grades of "D" may be used to satisfy graduation requirements.

Graduation Requirement
Overall GPA 2.5.

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

General Education Abilities		41 hours
• Foundation Courses	10 hours	
• Physical Science	4 hours	
• Life Science	3 hours	
• Quantitative Reasoning	3 hours	
• World Language and Culture	9 hours	
• Humanities and the Arts	3 hours	
• Social Sciences	9 hours	
Courses Related to the Major		18 hours
Requirements in the Major		41 hours
Mechanical Engineering Electives		30 hours
Engineering Electives		
Technical Electives		
TOTAL FOR THE DEGREE		130 hours

Example Programs of Study

B.S. in Mechanical Engineering
Energy Systems Track
130 Semester Hours

Fall Semester		**Spring Semester**	
Year 1:			
ENGM 110X - CAD & Engr. Fabrication	2	PHYS 1211-1211L – Introductory Physics for Science and Engineering Students-Mechanics, Waves, Thermodymanics	4
Foreign - Language Elective	3	ENGM 102X - Engr Studio I	1
ENGL 1101 - English Composition I	3	ENGL 1102 – English Composition II	3
MATH 2250 – Calculus I for Science and Engineering	4	Social Science Elective	3
ENGG 2000 – Solving Technical Problems Using Engineering Decision Making	3	MATH 2260 - Calculus II for Science and Engineering	4
		ENGG 201X - Energy & Environment	2
Total Credit Hours	*15*	*Total Credit Hours*	*17*
Year 2:			
World Languages & Culture Elective	3	ENGR 2130 - Dynamics	3
ENGR 2120 – Engineering Statics	3	ENGR 2140 – Strength of Materials	3
CHEM 1211 & CHEM 1211L – Freshman Chemistry I	4	ENGR 3160 - Fluid Mechanics	3
PHYS 1212-1212L – Introductory Physics for Science and Engineering Students-Electricity and Magnetism, Optics, Modern Physics	4	ENGR 2170 - Electrical Circuits	3
MATH 2500 – Multivariable Calculus	3	ENGM 202X - Engr. Studio II	2
		PHYS 3900 - Mathematical Methods in Physics	3
Total Credit Hours	17	*Total Credit Hours*	17
Year 3:			
ENVE 3210 - Energy Analysis I	3	ENGM 301X - Engr. Experimentation	3
ENGR 3150 - Heat Transfer	3	ENGM 302X - Engr. Studio III	2
ENGR 324X- Industrial Controls	3	ENGR 4490 - Renewable Energy Engineering	3
ENGR 3300 - Mechanisms and Machine Kinematics	3	ETES 5060/7060 - Energy Systems	3
ENVE 3510 - Modeling, Statistical Analysis, and Uncertainty	3	Social Science Elective	3
ENGM 303X - Engr. Management	2	AAEC 2060 - Economic Perspectives on the Environ. & Natural Resources	3
Total Credit Hours	17	*Total Credit Hours*	17

Year 4:

ENGR 3210 – Electrical Machines and Power Distribution	3	ENGM 402X - Engr. Studio IV	3
ENGR 411X - Momentum and Heat Transport Processes	3	ENGM 403X - Energy Systems Laboratory	3
ENGR(LAND) 4660/6660-4660L/6660L - Sustainable Building Design	3	ENGM 404X - Power Generation	3
Life Science Elective	3	World Languages & Culture Elective	3
General Education (Humanities)	3	Social Science Elective	3
Total Credit Hours	15	*Total Credit Hours*	*15*

B.S. in Mechanical Engineering

Nanotechnology Mechanical Engineering Track
130 Semester Hours

Fall Semester		**Spring Semester**	
Year 1:			
ENGM 110X-CAD & Engr. Fabrication	2	PHYS 1211-1211 L – Introductory Physics for Science and Engineering Students-Mechanics, Waves, Thermodynamics	4
Foreign Language Elective	3	ENGM 102X - Engineering Studio I	1
ENGL 1101 - English Composition I	3	ENGL 1102 – English Composition II	3
MATH 2250 – Calculus I for Science and Engineering	4	Social Science Elective	3
ENGG 2000 – Solving Technical Problems Using Engineering Decision Making	3	MATH 2260 - Calculus II	4
		ENGG201X - Energy & Environment	2
Total Credit Hours	*15*	*Total Credit Hours*	*17*
Year 2:			
World Languages & Culture Elective	3	ENGR 2130 - Dynamics	3
ENGR 2120 – Engineering Statics	3	ENGR 2140 - Strength of Materials	3
CHEM 1211 & CHEM 1211L – Freshman Chemistry I	4	ENGR 3160 - Fluid Mechanics	3
PHYS 1212-1212L – Introductory Physics for Science and Engineering Students-Electricity and Magnetism, Optics, Modern Physics	4	ENGR 2170 - Electrical Circuits	3
MATH 2500 – Multivariable Calculus	3	ENGM 202X - Engr. Studio II	2
		PHYS 3900 - Mathematical Methods in Physics	3
Total Credit Hours	17	*Total Credit Hours*	17
Year 3:			
ENVE 3210 - Energy Analysis I	3	ENGM 301X - Engr. Experimentation	3
ENGR 3150 - Heat Transfer	3	ENGM 302X - Engr. Studio III	2
ENGR 304X - Nanostructured Materials	3	ENGM 321X – Nanomechanics …	3
ENGM 311X - Modeling and simulation	3	ENGM 401X – Nanoelectronics	3

ENGM 303X Engr. Management	2	ENGM 411X – Nanomaterials Characterization	3
ENVE 3510 Modeling, Statistical Analysis, and Uncertainty	3	Social Science Elective	3
Total Credit Hours	*17*	*Total Credit Hours*	*17*

Year 4:

ENGM 421X – Soft Materials and Nanobiotechnology	3	ENGM 402X - Engr. Studio IV	3
ENGM 422X – Mechatronics	3	World Languages & Culture Elective	3
FDST 3000 Introduction to Food Science and Technology	3	ENGM 322X - Microscale Fluid Mechanics	3
Life Science	3	EHSC 4100/6100-4100L/6100L - Industrial Hygiene	3
Humanities Elective	3	Social Science Elective	3
Total Credit Hours	*15*	*Total Credit Hours*	*15*

6. INVENTORY OF FACULTY DIRECTLY INVOLVED

UGA 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. Mark Haidekker, Faculty of Engineering
Dr. Caner Kazanci, Faculty of Engineering, Math Dept.
Dr. Nadia Kellam, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Tom Lawrence, Faculty of Engineering, Biol & Agri. Engineering Dept.
Dr. Sudhagar Mani, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Leidong Mao, Faculty of Engineering
Dr. John Schramski, Faculty of Engineering
Dr. Andrew Sornborger, Faculty of Engineering, Department of Mathematics
Dr. William Tollner, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Chi Thai, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Sidney Thompson, Faculty of Engineering, Biol. & Agri. Engineering Dept.
Dr. Bingqian Xu, Faculty of Engineering, Biol. & Agri. Engineering 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 Mechanical Engineering Degree Programs:

Department of Mechanical and Aerospace Engineering
North Carolina State University
Broughton Hall
2601 Stinson Drive
Raleigh, NC 27695l
http://www.mae.ncsu.edu

Richard D. Gould
Tel: 919-515-3241
Fax: 919-515-7968
E-mail: fpmedlin@ncsu.edu

Department of Mechanical and Aerospace Engineering
University of Florida
231 MAE-A Building
Gainesville, FL 32611

S. Bala Balachandar
Tel: 352-392-0961

FAX: 352-392-7303
Bala1S@ufl.edu

Department of Mechanical Science and Engineering
University of Illinois
1206 West Green Street
Urbana, IL 61801

James Phillips
152 Mechanical Engineering Building
120-6 West Green Street
Urbana, IL 61801
Tel: 217-333-4388
FAX: 217-244-6534

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 UGA 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 UGA 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 and particularly in chemistry, biological sciences, physics, mathematics and computer sciences, ecology and environmental sciences, agricultural sciences and earth sciences. The UGA 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?

UGA has extensive facilities to support the proposed degree program in Mechanical Engineering.

a. <u>Electrical/Electronics Lab</u>

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 Supported

ENGR 2170 Electrical Circuits
ENGR 3210 Electrical Machines and Power Distribution
ENGM 404X Power Generation
ENGM 324X Industrial Controls

Hardware. The students' computers are Pentium D 2.8 GHz processor with 2048 MB RAM running Windows Vista Enterprise. The teacher workstation is a Pentium D 2.8 GHz with 4096 MB RAM running Windows Vista Enterprise with an 160 GB hard drive. This room has its own internal LAN running at 1 Gbps and is not connected to the

World Wide Web. The teacher's workstation provides the necessary tools for a multimedia presentation. The desktop screen on the teacher's station is projected onto the front screen through a connection to a computer projection system. A document camera can also be used for small equipment demonstrations or hand-written notes. This camera output can also be sent to the ceiling mounted computer projector system. Pen tablets are available to the instructor and all students.

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

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

b. Electrical Machines and Electronics Laboratory

This laboratory is located in Room 312 Driftmier Engineering Center and is primarily used to support several of the undergraduate courses taught in electrical engineering. The laboratory is extremely well equipped for teaching electric circuits and machines. Students have the opportunity to work with equipment typically found within energy generation industries. Some of the equipment is older, but in some cases this is an advantage in that the components are larger, more open and are more easily examined and studied by the student. If the size of the student body increases significantly, additional work stations will need to be added or additional laboratory sessions will need to be scheduled.

Courses Supported

ENGR 2170 Electrical Circuits
ENGR 3210 Electrical Machines and Power Distribution
ENGM 301X Engineering Experimentation

c. Fluid Mechanics Laboratory

This laboratory is approximately 1670 sq. ft, located in room 215 Driftmier Engineering Center and is well equipped with devices for demonstrating basic engineering principles of fluid mechanics for water and air flow. The major equipment housed in this laboratory include the following: Portable Hydraulic Open Channel, Pipe Flow Apparatus, Hydraulic Demonstration Channel, Pipe Friction Apparatus, Pump Efficiency Apparatus, Air Flow Tunnel Elutriating Chamber, Pipe Flow Energy Apparatus and H-Flume & Recorder. This laboratory is well equipped with devices for demonstrating basic engineering principles of fluid mechanics for water and air flow. The primary need for this laboratory is the maintenance and, in certain cases, updating of the existing equipment. Additionally, the laboratory needs equipment to measure air flow, liquid viscosity and fluid flow in channels.

Courses Supported

ENGR 3160 Fluid Mechanics

d. Materials Testing Laboratory

The laboratory occupies approximately 1200 sq. ft. of room 211 and approximately 800 sq. ft of room 329 both in the Driftmier Engineering Center and has been designed to familiarize students with the basic principles of Strength of Materials. This laboratory is equipped to perform: 1) testing of engineering materials and biological materials, 2) properties of soils and granular materials, 3) load cell testing and calibration and 4) photoelastic testing. The laboratory is available for graduate and faculty research activities. Overall, this laboratory is well equipped with equipment for measuring static and dynamic stresses and strains. Laboratory exercises are used to expose students to this set of equipment and teaches them the application advantages and limitations of such equipment. A long term goal is to acquire equipment for creep testing and fatigue testing and gradually replace the Universal Test machine with a more up-to-date model.

Courses Supported
ENGR 2140 Strengths of Materials
ENGM 403X Engineering Systems Laboratory
ENGM 301X Engineering Experimentation

e. Energy Systems/BioProcessing Laboratory

This laboratory is located in the Driftmier Engineering Center and is a multi-purpose facility focused on process and material properties measurements and physical and biological process studies for optimizing energy and pollution abatement. Primary impacts are in the areas of value-added processing of biological products, alternative energy, and process problem-solving for Georgia companies. This lab provides instructional support for courses designed to provide instruction on systems for handling liquids or gases including pump or fan driven systems, physical separation of solids in liquid or gas medium and the use of psychometrics for process environment control. Overall, the instructional support is related to hands-on learning of engineering principles.

Courses Supported
ENGR 3540 Physical Unit Operations
ENGR 4490 Renewable Energy Engineering
ENGM 403X Energy Systems Laboratory

f. 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.

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 Supported:
ENGR 3210 Electrical Machines & Power Distribution

ENGM 324X Industrial Controls
ENGM 404X Power Generation

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 XP Professional.

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.

a. **Mechanical Systems Laboratory**

The engineering academic program needs improvements in its laboratory support for the Mechanical Engineering degree program; thus a new Mechanical Systems Laboratory will need to be developed. This Laboratory will need to have the capabilities of housing large equipment, automotive machines such as engines and hydraulic simulators, dynameters, engine lifts, and supporting supplies such as gears, mechanical parts and tools. The laboratory will be used for the study of engine combustion, alternate fuels and other engine phenomena. The laboratory will also need to house heavy duty diesel engines for biodiesel studies where both physical and biological characteristics of the fuel can be examined.

Courses Supported:
ENGM 404X Power Generation
ENGM 403X Engineering Systems Laboratory
ENGM 324X Industrial Controls
ENGR 3300 Mechanisms and Kinetics
ENGR 4300 Mechanical Systems
ENGR 4340 Machine Hydraulics

b. **Fabrication Laboratory**

This laboratory will be available for students wishing to fabricate and test projects developed for courses throughout the Mechanical Engineering Program. This facility will house CNC machinery, welding stations, metal and wood working equipment. Students will need to complete ENGM 11XX-CAD and Engineering Fabrication prior to working in this laboratory independently. This laboratory will be run as a semi-independent laboratory where students are expected to utilize the facility without the need to associate their work to a specific faculty member or course but all work must be course related. The lab will house computers with software for simulation and modeling such as Algor, FEM, engineering graphics such as AutoCad and Pro-E and fabrication software for rapid prototyping and CNC machining. The lab will need to host software designated by faculty who assign design projects and need software support. The intent of this laboratory is to support design, fabrication and general instructional needs of the Mechanical Engineering program as well as other engineering programs.

c. **Engineering Studio**

The synthesis and design studio space will be used for teaching the undergraduate, freshmen through senior-level, synthesis and design studios. These studios will require a space with computers (preferably laptops) for modeling, design, project management, and project deliverables. They will also require studio space so that students can design and develop physical models. This space will include round tables to encourage collaboration among students and faculty. All students (freshmen through seniors) enrolled in the synthesis and design studios will meet together in the lab space twice a week to encourage mentoring and collaboration. The studio will be designed to integrate freshmen, sophomore, junior and senior mechanical engineering students into the design process and to incorporate undergraduates from what are often considered disparate disciplines, such as the humanities and social sciences, such that the undergraduate can experience holistic problem solving. State of the art equipment, for example a prototyping machine, will help students prototype their mechanical engineering design projects. These facilities can also be used for the environmental engineering synthesis and design studios and senior design projects within the biological and agricultural engineering department.

Courses Supported:
ENGM 102X Engineering Studio I
ENGM 202X Engineering Studio II
ENGM 302X Engineering Studio III
ENGM 402X Engineering Studio IV

d. **Nanoeducation Laboratory**

Concepts, ideas, and enabling tools of nanoengineering taught through lab modules and imaging tools, which include microfluidics, microthermal systems, MEMS, nanomaterials, SEM, TEM, and AFM. Provides practical knowledge and experience via building, observing and manipulating micro- and nanoscale structures. Teaches students how to apply engineering knowledge to practical fluid, thermal, and dynamic systems at small scales. Students taking the graduate version complete additional assignments.

Courses Supported:
ENGM 304X –Nanostructured Materials
ENGM 311X – Modeling and Simulation of Microsystems
ENGM 321X – Nanomechanics of Materials and Biomaterials
ENGM 322X – Microscale Fluid Mechanics
ENGM 401X – Nanoelectronics
ENGM 411X – Nanomaterials Characterization
ENGM 421X – Soft Materials and Nanobiotechnology
ENGM 422X – Mechatronics

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 Mechanical Engineering. The educational objectives of the BSME degree program are listed previously. The Program Outcomes of the BSME are as follows:

a) an ability to apply knowledge of mathematics, life and natural sciences, 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 BSME 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 Mechanical 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 Mechanical 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 Mechanical Engineering at UGA. 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 Mechanical 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 UGA 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 Mechanical Engineering will be pursued under the ABET Program Criteria for Mechanical and Similarly Named Engineering Programs.

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 the ability to: apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) to model, analyze, design, and realize physical systems, components or processes; and work professionally in both thermal and mechanical systems areas.

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 UGA 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 Mechanical 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 Mechanical 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 Mechanical Engineering

15. FISCAL AND ENROLLMENT IMPACT AND ESTIMATED BUDGET

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

	FY 11 First Year	FY 12 Second Year	FY13 Third Year
I. ENROLLMENT PROJECTIONS (indicate basis for projections in narrative)			
A. Student majors			
1. Shifted from other programs	10	10	5
2. New to institution	10	30	70
Total Majors	20	40	75
B. Course sections satisfying program requirements.			
1. Previously existing	60	60	60
2. New	6	13	22
Total Program Course Sections	66	73	82
C. Credit Hours generated by those courses			
1. Existing enrollments	9,280	9,280	9,280
2. New enrollments	608	1,394	2,827
Total Credit Hours	9,888	10,674	12,107
D. Degrees awarded	0	3	12

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

	FIRST YEAR	SECOND YEAR	THIRD YEAR
TOTAL NEW PERSONNEL COSTS	278,095	427,080	747,800
C. Start-up Costs (one-time expenses)			
1. Library/learning resources	4,000	6,000	8,000
2. Equipment	240,000	500,000	550,000
3. Other (New Faculty)	500,000	260,000	540,000
D. Physical Facilities: construction or major renovation	250,000	300,000	450,000
TOTAL ONE-TIME COSTS	994,000	1,066,000	1,548,000
E. Operating Cost (recurring costs–base budget)			
1. Supplies/Expenses	5,000	10,000	20,000
2. Travel	2,000	4,000	6,000
3. Equipment	13,500	24,000	34,000
4. Library/learning resources	5,000	10,000	10,000
5. Other (__________)	0	0	0
TOTAL RECURRING COSTS	365,945	548,860	890,580
GRAND TOTAL COSTS	1,359,945	1,614,860	2,438,580
III. REVENUE SOURCES			
A. Source of Funds			
1. Reallocation of existing funds	62,350	73,780	73,780
2. New student workload	xxxxxxxxxxx	xxxxxxxxxxxx	___________
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: BSME Undergraduate Course Descriptions

New Courses

ENGM 110X –CAD and Engineering Fabrication
This course will teach fundamentals of Computer Animated Design (CAD) and will apply CAD designs to fabrication projects involving Computer Numerical Controlled (CNC) machines.

ENGM 102X –Synthesis & Design Studio I
First in a sequence of four interdisciplinary courses focused on observation and modeling, topics relevant to mechanical engineering and today's society. Students will be introduced to broad issues that comprise the field of mechanical engineering through an experiential design project and students will learn to observe and model simple and complex mechanical phenomena that are most germane to the mechanical engineering practice.

ENGG 201X – Energy and the Environment
This course focuses on environmental and sustainability issues, including global warming, from an energy perspective with a focus on the role of mechanical engineering in these issues. Students will be exposed to concepts of wind, solar, and other renewable resources; conservation, increased efficiency and new technologies; combustion technologies and reactants/products treatment associated with fossil-fuel and renewable resource consumption.

ENGM 202X –Synthesis & Design Studio II
The main objective of the sophomore level design studio is for students to develop an understanding of framing problems within a complex, global landscape. Students will build upon their observation and modeling projects from the prior semester and frame problems within this context. They will use the model to determine the preferred problem to focus on given their current constraints (e.g. time, personnel, money). They will then develop a solution to the specified problem.

ENGM 301X –Engineering Experimentation
This course is designed to develop analytical and experimental skills in modern engineering measurement methods, based on instrumentation and computer-based data acquisition systems. The lectures are concerned with theoretical engineering analysis and design as well as the principles of instrumentation, whereas the laboratory periods afford the student an opportunity to use modern devices in actual experiments.

ENGM 302X –Synthesis & Design Studio III
The main objective of the junior level Synthesis and Design Studio is for students to develop a deep understanding of the larger systems in which mechanical engineering is situated within. Students will develop an understanding of the interrelationships between engineering, social sciences, and humanities areas. In addition they will learn strategies for managing interdisciplinary teams that are working on large-scale, complex issues. This will include learning to develop a business plan that will include a project management plan and team formulation, and will develop each students' marketing, finance, and entrepreneurial business skills through a combination of experiential group projects and modules.

ENGM 303X –Engineering Management
The objective of this course is for students to develop a deep understanding of cost estimation and risk assessment methods. Students will develop a project management skills and business skills (including team formulation, marketing, finance & entrepreneurial skills). Students will be required to integrate technical knowledge and skills with professional skills to design and document a commercially viable product or system.

ENGM 304X –Nanostructured Materials
A variety of technologically important nanomaterials, including quantum dots, carbon nanotubes and semiconductor nanowires, will be introduced. The rational synthesis, structural characterization, novel properties and potential applications will be covered.

ENGM 311X – Modeling and Simulation of Microsystems
Miniature pressure sensors, accelerometer chips, rate gyroscopes, tiny fluidic systems for medical applications and drug delivery, stamp-sized opto-mechanical assemblies and displays, and tiny portable power generators are examples of Microystems, i.e., microelectromechanical devices (MEMS). Designing and building this class of sensors and actuators require an interdisciplinary knowledge ranging from microfabrication to mechanics to electromagnetism. This class presents an introduction to the broad field of MEMS, using examples and design projects drawn from real-world MEMS applications. Student teams will design a complete microsystem along their interests to meet a set of specifications based on realistic microfabrication processes. Modeling and simulation in the design process is emphasized.

ENGM 321X – Nanomechanics of Materials and Biomaterials
This course focuses on the latest scientific developments and discoveries in the field of nanomechanics, the study of forces and motion on the nanoscale in synthetic and biological materials and structures. At this level, mechanical properties are intimately related to chemistry, physics, and quantum mechanics. Most lectures will consist of a theoretical component that will then be compared to recent experimental data from the literature. The course begins with a series of introductory lectures that describes the normal and lateral forces acting at the atomic scale. The following discussions include experimental techniques in high resolution force spectroscopy, atomistic aspects of adhesion, nanoindentation, molecular details of fracture, chemical force microscopy.

ENGM 322X – Microscale Fluid Mechanics
The interface between engineering and miniaturization is among the most intriguing and active areas of inquiry in modern technology. This course aims to explore microscale fluid mechanics as an interdisciplinary research area, with an emphasis on emerging microfluidics disciplines, including novel materials synthesis, bio-microtechnology and nanotechnology. The course will begin by highlighting important fundamental aspects of fluid mechanics, scaling laws and flow transport at small length scales. Discuss will then be given to capillary-driven, pressure-driven, and electro-kinetic based microfluidics. We will also cover materials such as multi-phase flow, droplet-based microfluidics and complex fluids flow in microfluidics.

ENGM 324X –Industrial Controls
This course provides a hands-on synthesis of control systems, electrical engineering, and mechanical engineering. Specifically, students will develop a deep understanding of the following: principles and practice of power systems, steady state analysis of AC and DC motors, electrical motor selection, motor performance & prediction, electro-hydraulic systems, pneumatic systems, simulation and modelling, mechanical power transmission, physics of sensing & sensor design, and sensor specification and dynamics

ENGM 401X – Nanoelectronics (existing course is Nanoelectronics ENGR 4200/6XXX)
This course introduces recent advances in nanoelectronics. It deals with the novel properties and device structures of nanoscale materials and devices when classical transport is replaced by quantum transport and new fabrication and characterization techniques developed for these nanoscale devices.

ENGM 402X –Synthesis & Design Studio IV
The main objective of the senior level Synthesis and Design Studio is for students to develop an understanding of design through an in-depth, team group project. The students will practice management skills through hiring underclassmen as consultants for their projects.

ENGM 403X –Energy Systems Laboratory
This course will further reinforce students' understanding of fuel technology and processing. In particular students will develop an understanding of the following alternative energy systems through experiential projects: hydroelectric, solar, wind, nuclear, magneto-hydrodynamics, thermo-electrics, thermionics, photo-voltaics, and fuel cells.

ENGM 404X –Power Generation
This course will introduce students to the fundamentals of one-dimensional gas dynamics. This will include isentropic and non-isentropic flows, applications of dynamical similarity to shock waves, oblique shocks, supersonic nozzles, and flows with friction or heat transfer. Students will also be introduced to computational fluid dynamics (CFD).

ENGM 411X – Nanomaterials Characterization (existing course similar is materials characterization, special topics, BAE)
This course is to teach the students the fundamental and practical operation of an array of advanced characterization tools that are needed for (nano)materials characterization and analysis. These tools include transmission electron microscope, scanning electron microscope, X-ray diffractometer, energy-dispersive spectrometer, atomic force microscope, x-ray fluorescence spectrometer, and spectrofluorometer.

ENGM 421X – Soft Materials and Nanobiotechnology
This class will serve as an introduction to polymeric materials. We will cover elastic and plastic deformation, creep, and fracture of soft materials including synthetic and biopolymers. We will focus on the design and processing of materials from the atomic to the macroscale to achieve desired mechanical behavior. Topics of interest will include nanotribology, elasticity of single macromolecular chains, intermolecular interactions in polymers, dynamic force spectroscopy, molecular motors, and bond strength measurements in biopolymers.

ENGM 422X – Mechatronics
Mechatronics is an interdisciplinary field that integrates Mechanical, Electronics, Control and Computer Engineering in the design of systems and products. The course deals with basic kinematics, sensors, actuators, measurements, electronics, microprocessors, programmable logic controllers, feedback control, robotics and intelligent manufacturing.

Existing Courses

ENGR 2120. Engineering Statics - Two and three dimensional force systems, equilibrium, rigid structures, centroids, friction, and area moments of inertia.

ENGR 2130. Dynamics - Particles and rigid bodies that are moving with respect to a reference system. Kinematics deals with motion in terms of displacement, velocity, and acceleration. Kinetics includes the effect of forces on particles and bodies.

ENGR 2140 Strength of Materials - Elements of stress analysis, resistance, and design as applied to engineering materials and structures.

ENGR 2170. Electrical 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.

ENGR 3150. Heat Transfer - Theory of heat transmission by conduction, convection, and radiation. The solution of steady and unsteady state engineering problems involving heat transfer.

ENGR 3210. Electrical Machines and Power Distribution - DC and AC motors and generators. The design and analysis of electrical power distribution systems.

ENGR 3300. Mechanisms and Machine Kinematics - Basic mechanical parts, kinematic analysis of mechanisms, application of static and fatigue failure theories, dimensioning and tolerancing, material selection, basic manufacturing processes.

ENGR 3540. Physical Unit Operations - Physical unit operations for processing plants. Systems for handling liquids or gases include pump or fan driven systems. Physical separation of solids in liquid or gas medium. Psychometrics for process environment control. Water or solvent transport from materials.

ENGR 4300. Mechanical Systems - The application of mechanisms and hydraulic systems in the design of machines.

ENGR 4340. Machine Hydraulics - Fundamental understanding of power hydraulic components and hydraulic system design.

ENGR 4350 Introduction to Finite Element - Fundamental finite element theory for the solution of engineering problems. Geometrical modelling techniques, element selection, and tests for accuracy. Emphasis on problems in structural mechanics and elasticity.

ENGR 4360 Advanced Topics in CAD/CAM - The use of computer aided design/computer aided manufacturing. Computer modeling of solid objects, advanced mechanism modeling, rapid prototyping and virtual reality.

ENGR 4490 Renewable Energy Engineering- Basic principles and technical details of various renewable energy technologies (solar, biomass, wind, hydroelectric, geothermal, tidal, and wave energy) for the sustainable future. Process design, energy analysis, engineering economics, and environmental assessment of renewable energy systems.

ENGR 4660 Sustainable Building Design - The design features and technologies contained in sustainable (green) building design, and the design process to create a green building. Building types covered include both commercial and residential construction. Topics covered include energy and water, construction materials, site work, and indoor environmental quality.

ENVE 3210. Energy Analysis I - Introduction to energy principles and analysis based on the fundamentals of thermodynamics and heat transfer. The first law of thermodynamics will be introduced and examined in-depth with respect to its applications at multiple scales.

ENVE 3510. Modeling, Statistical Analysis, and Uncertainty - Modeling and analysis of engineering problems under uncertainty with applications of probability and statistical concepts and methods. Data collection, measurements, simulation, model development, misinformation, validation, and analysis with environmental applications.

Appendix B: Faculty Data

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

HAIDEKKER, Mark A.
Associate Professor

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

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

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

3. Scholarship and publication record for past five years;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Expected responsibilities in this program;

Curriculum development and maintenance
Teaching of classes

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

Kazanci, Caner
Assistant Professor

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

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

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

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

3. Scholarship and publication record for past five years;

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

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

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

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

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

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

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

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

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

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

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

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

4. Professional activity;

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

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

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

5. Expected responsibilities in this program;

Mathematics and Computational Coursework and planning.

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

Kellam, Nadia
Assistant Professor

Ph.D. University of South Carolina, Mechanical Engineering, May 2006.
M.E. University of South Carolina, Mechanical Engineering, December 2004.
B.S. University of South Carolina, Mechanical Engineering, May 2002.
B.S. College of Charleston, Physics, May 2002.

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 1140, Computational Engineering Methods
ENGR 2130, Dynamics
ENGR 4920, Engineering Design Project
ENVE 4980, Synthesis and Design Studio

With the addition of the proposed program my teaching workload will not be changed; however the specific courses I teach may be altered. For example, I may become more focused on teaching the Synthesis and Design Studio course sequence in the Environmental Engineering and Mechanical Engineering programs.

3. Scholarship and sample publication record for past five years;

Kellam N. N., Maher M. A., Peters W. H. (2008). The State Of Complex Systems in American and Australian Mechanical Engineering Programmes: The Faculty Perspective, European Journal of Engineering Education, 33(1), 45-57.
Kellam N. N., Maher M. A., Russell J. A., Addison V., Peters W. H. (2007). Benchmarking the Integration of Complex Systems Study in American Mechanical Engineering Programs. International Journal for Mechanical Engineering Education, 35(3), 256-270.
Kellam (Craig), Nadia, Nancy Thompson, and Lori Donath (2005). Incorporating Complexity into Undergraduate Engineering Development through the Research Communications Studio, Proceedings of the ASEE Annual Conference and Exposition, Portland, OR.
Donath, Lori, Roxanne Spray, Nancy Thompson, Elizabeth Alford, Nadia Kellam (Craig), and Michael Matthews, (2005). Characterizing Discourse among Undergraduate Researchers in an Inquiry-Based Community of Practice, Journal of Engineering Education, 94(4), 403-417.
Kellam, N. N., Gattie, D. K., & Kazanci, C. (2007). A Network Model of Distributed and Centralized Systems of Students. 37th ASEE/IEEE Frontiers in Education Conference Proceedings, Milwaukee, WI.
Kellam, N. N., & Gattie, D. K. (2008). Developing a Systems Understanding of Education through Ecological Concepts. Complexity Science and Educational Research Conference Proceedings, Athens, GA.
Kellam, N. N., Gattie, D. K., & Peters, W. H. (2007). Niche Construction as an Ecological Analog for Improving Educational Systems. Complexity Science and Educational Research Conference Proceedings, Vancouver, BC.
Gattie, D. K., & Kellam, N. N. (2008). Engineering Education as a Complex System. Complexity Science and Educational Research Conference Proceedings, Athens, GA.

Gattie, D. K., Kellam, N. N., & Turk, H. J. (2007). Informing Ecological Engineering through Ecological Network Analysis, Ecological Modelling, and Concepts of Systems and Engineering Ecology. Ecological Modelling, 208(1), 25-40.
Kellam, N.N., Gattie, D.K., & Babcock, A. (2008). The Engineering Learning Environment: A Proposed Model, Proceedings of the ASEE Annual Conference and Exposition, Pittsburgh, PA.

4. Professional activity;

Conference organizer of Complexity Science and Educational Research conference, Athens, GA 2008.

Editor of the Complexity Science and Educational Research Conference Proceedings, Athens, GA 2008.

Member of the American Society for Engineering Education, Pi Tau Sigma (mechanical engineering honor society), and Tau Beta Pi (engineering honor society)

Chaired sessions at Frontiers in Education and American Society for Engineering Education conferences

Reviewed papers for the International Journal for Mechanical Engineering Education and International Journal of Engineering Eucation

5. Expected responsibilities in this program;

Coursework (Engineering Synthesis and Design Studio Design and Implementation) and planning.

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

Tom Lawrence
Public Service Associate
Mechanical Engineer
Purdue University (B.S., Ph.D.), Oregon State University (M.S.),
Washington University (M.S.)

2. Current workload for typical semester, including specific courses actually taught.

Position is ½ teaching and ½ engineering outreach
Fall Semester teaching

ENGR 4630	Design of Residential Structures	(3 credit hours)
ENGR 4660	Sustainable Building Design	(3 credit hours)
ENGR 3150	Heat Transfer	(3 credit hours)

Spring Semester teaching

ENGR 4650	Management of Structural Environments	(3 credit hours)
ENGR 4920	Senior Design (faculty mentor)	(4 credit hours)

3. Scholarship and publication record for past five years.

RECENT JOURNAL PUBLICATIONS:

Lawrence, T.M., 2009, "Selecting CO_2 Criteria for Space Monitoring", accepted for publication, *ASHRAE Journal*.

Hilten, R.N., T.M. Lawrence and E.W. Tollner. 2008, "Modeling Stormwater Runoff from Green Roofs with HYDRUS-1D", accepted for publication, *Journal of Hydrology*.

Lawrence, T.M. and J.E. Braun. 2007, "Calibrated Simulation for Retrofit Evaluation of Demand-Controlled Ventilation in Small Commercial Buildings", *ASHRAE Transactions* 113(2):227-240.

García-Núñez, J.A., K.C. Das, T.M. Lawrence. 200X, Physical and Thermal Models of Pyrolysis of Oil Palm Shell in a Tubular Bench Scale Reactor, submitted to *Biomass and Energy.*

Lawrence, T.M. and J.E. Braun. 2007. "Determination of Occupant CO_2 Source Generation Rates from Measured Field Data at Smaller Commercial Buildings", *Buildings and Environment* 42(2):623-639.

Lawrence, T.M. and J.E. Braun. 2006. "Modeling of CO_2 Concentrations in Small Commercial Buildings", *Buildings and Environment* 41(2):184-194.

Lawrence, T.M., J.D. Mullen, D.S. Noonan, and H.J. Enck. 2005. "Moving Beyond the First Cost Mentality", *Solar Today* 19(6):34-37.

Lawrence, T.M., J.D. Mullen, D.S. Noonan, and H.J. Enck. 2005. "Overcoming Barriers to Efficiency", *ASHRAE Journal* 47(9):S40-S44.

Lawrence, T.M. 2004. "Demand-Controlled Ventilation and Sustainability", *ASHRAE Journal* 46(12):117-121.

CONFERENCE PRESENTATIONS:

Lawrence, T.M. 2007. "What's New with the ASRHAE Green Guide, 2nd Edition?", ASHRAE Summer Meeting, Long Beach California, June 2007.

Hilten, R.N, and T.M. Lawrence. 2007. "Using Green Roofs and Other Technologies for Reducing the Need for Stormwater Retention Capacity Requirements", Low Impact Development Conference, Wilmington, NC, March 2007.
Swift, J., and T.M. Lawrence. 2007. "The ASHRAE GreenGuide: One Means of Establishing a Link between Sustainable Design Practitioners", CLIMA 2007 Congress, Helsinki, Finland.
Swift, J., B. Millard, E. Avis, and T.M. Lawrence. 2007. "Air Distribution Strategy Impact on Operating Room Infection Control", CLIMA 2007 Congress, Helsinki, Finland.
Lawrence, T.M. 2006. "Using Case Studies to Bring Real World Situations into the Engineering Course Learning Environment", Amer. Soc. of Engineering Education Southeastern Conference, Tuscaloosa, AL, April 2006.
Hilten, R. N., T. M. Lawrence, E. W. Tollner, and D. Gattie. 2006. Predicting building energy use and stormwater runoff associated with greenroofs. American Ecological Engineering Society.
Lawrence, T.M. and J.E. Braun. 2003. "Ventilation Effectiveness and Indoor Air Quality at Modular Schoolrooms", CIBSE/ASHRAE Green Buildings Conference, Edinburgh, Scotland Sept. 2003

d. Professional Activity

Chair of ASHAE Technical Committee 2.8, *Building Impact on the Environment and Sustainability*
ASHRAE Distinguished Lecturer staring in 2007. Various invited presentations given on *Sustainable Design and Green Buildings* throughout the U.S., Canada and the rest of the world, including Dubai (United Arab Emirates), India, China, Singapore and Taiwan.

CONFERENCE SESSIONS CHAIRED:
"HVAC Related Building Systems Interaction with the Local Environment". ASHRAE 2006 Winter Meeting, Chicago, IL
"California Energy Update: Energy Efficiency Using Innovative Approaches". ASHRAE 2004 Winter Meeting, Anaheim, CA
BOOKS AND BOOK CHAPTERS:

Senior editor for the second edition of the *ASHRAE GreenGuide*, published by the American Society of Heating, Refrigeration and Air Conditioning Engineers, released in 2006. Author of a new chapter titled "Building HVAC Interaction with the Local Environment"

"Automobile Assembly Plant Paint Shop Oven Heat Transfer", 2006. Chapter 14 of *Heat Transfer Calculations* edited by Myer Kurtz, McGraw-Hill, New York, New York.

Subject Matter Expert for an on-line learning course for ASHRAE and Elsevier titled *Fundamentals of Sustainable Buildings and High Performance Systems Design* based on the ASHRAE GreenGuide.

e. Expected responsibilities in this program.

Teaching of courses (existing and perhaps new) that are part of the proposed new curriculum.
Curriculum development and program planning

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

Sudhagar Mani
Assistant Professor
Biological and Agricultural Engineering &
Faculty of Engineering
Driftmier Engineering Center
University of Georgia, Athens, GA 30602-4435
Ph: (706)542-2358; Fax: (706)542-8806
Email: smani@engr.uga.edu

Ph. D. - Chemical Engineering, University of British Columbia, Canada – 2005
M. Tech. - Dairy and Food Engineering, Indian Institute of Technology, India – 2000
B. E. - Agricultural Engineering, Tamil Nadu Agricultural University, India – 1998

2. Current workload for typical semester, including specific courses actually taught

I teach Engineering Thermodynamics, Physical Unit Operations, Biomass Feedstock Engineering courses, Bio-based Economy seminar and develop two new senior level undergraduate/graduate courses on Renewable Energy Engineering and Engineering Life Cycle Analysis at the University of Georgia.

3. Professional activity

Selected honors, awards, recognitions:

- Lowry H. Gillespie, Jr., Engineering Curriculum Enhancement Award winner, UGA- 2007
- Best poster prize, University of British Columbia – 2006
- Travel Award, University of British Columbia – 2004
- Best paper presentation award, Canadian Society of Bioengineering – 2003

Research interests:
My research interests are in the area of biomass feedstock supply logistics, preprocessing of biomass including mechanical densification, granulation, biomass drying, size reduction, thermo-chemical pretreatment (torrefaction) and conversion (pyrolysis and gasification) of biomass into fuels and chemicals, techno-economic assessment and life cycle assessment of bioenergy systems. Other specific research topics include process simulation and modeling and solvent and supercritical CO_2 extraction of chemicals and oils from biomass and micro-algae. Through my research, I have authored or coauthored 25 referred journal articles, 1 book chapter, 3 technical reports and 45 conference papers and presentations.

4. Expected responsibilities in this program

Teach undergraduate and graduate level courses with an emphasis on chemical and food processes in the proposed Mechanical Engineering curriculum.

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

Mao, Leidong
Assistant Professor

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

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

3. Scholarship and publication record for past five years;

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

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

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

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

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

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

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

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

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

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

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

4. Professional activity;

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

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

5. Expected responsibilities in this program;

Teaching courses in materials science and mentoring design/research projects

5. Name, rank, academic discipline, institutions attended, degrees earned

John Schramski
Assistant Professor
Environmental Engineering
Faculty of Engineering

Ph.D.	2006	University of Georgia	Ecology
M.S.	1993	University of Cincinnati	Mechanical Engineering
B.S.	1989	University of Florida	Mechanical Engineering

6. Current workload for typical semester, including specific courses actually taught

ENGR 4300	Mechanism Design II	(3 credit hours)
ENGR 3160	Fluid Mechanics and Laboratory	(1 credit hour)

7. Scholarship and publication record for past five years

Schramski JR, Gattie DK, Patten BC, Bata SA, Whipple SJ, Borrett SR, Fath BD. 2007. Indirect effects and distributed control in ecosystems: Distributed control in the environ networks of a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA — Time series analysis. *Ecological Modelling, 206(1-2):18-30*.

Gattie DK, Schramski JR, Bata SA. 2006. Analysis of microdynamic environ flows in an ecological network. *Ecological Engineering, 28(3):187-204.*

Schramski JR, Gattie DK, Patten BC, Borrett SR, Fath BD, Thomas CR, Whipple SJ. 2006. Indirect effects and distributed control in ecosystems: Distributed control in the environ networks of a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA — Steady-state analysis. *Ecological Modelling, 194(1-3):189-201*.

Gattie, DK, Schramski JR, Borrett SR, Patten BC, Bata SA, Whipple SJ. 2006. Indirect effects and distributed control in ecosystems: Network environ analysis of a seven-compartment model of nitrogen flow in the Neuse River Estuary, USA — Steady-state analysis. *Ecological Modelling, 194(1-3):162-177*.

8. Professional activity

Conference Organizing Committee, Session Moderator, and Participant, Ecological Network Analysis workshop–Systems and Engineering Ecology. University of Georgia, Athens, GA. March 1-3, 2005.

Invited Discussant, International Workshop – Ecosystem Complexity. Bled, Slovenia. Sept. 25-26, 2004.

Organizer and Chair, Ecological Network Analysis (ENA) Conference Organizing Committee, University of Georgia's Faculty of Engineering, April 23, 24, and 25, 2008 — Fall 2007 planning is complete with 28 world scholars invited to participate as discussants. Registration is now underway.

Reviewer for Ecological Modelling.

9. Expected responsibilities in this program

Teach the large number of undergraduate and graduate level courses common to both Civil and Environmental Engineering.

Sit on graduate committees and serve as major professor for M.S. and Ph.D. students working with civil and environmental related research.

Advise undergraduate and graduate students.

Lead research programs in the environmental sciences that directly involve or impact the Civil Engineering related areas of research including but not limited to geotechnical, hydrological, infrastructure, and structural concerns.

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;

<u>Peer-reviewed, refereed publications</u>

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

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

Sornborger, A., Cleland, A. and Geller, M. (2004). Superconducting phase qubit coupled to a nanomechanical resonator: beyond the rotating-wave approximation. Phys. Rev. A 70, 052315.
also selected for inclusion in: Virtual J. of Quant. Info. 4, 12 (2004, online)

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

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

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

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

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

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

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

Book Chapters

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

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

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

Patents

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

4. Professional activity;

Current research support

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

Course faculty

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

5. Expected responsibilities in this program;

Research, teaching courses in mathematics and computational sciences

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

Tollner, Ernest, W
Professor in Biological & Agricultural Engineering

Ph.D. in Agricultural Engineering, Auburn University (1981)
MS in Agricultural Engineering University of Kentucky (1974)
BS in Agricultural Engineering, University of Kentucky (1972)

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;
Books
Tollner, E.W., 2003. Osmotic Pressure. IN Encyclopedia of Agricultural, Food and Biological Engineering, Ed by D. Heldman. 712 - 716. (invited).

Tollner, E.W. 2003. Soil dynamics. IN Encyclopedia of Agricultural, Food and Biological Engineering, Ed by D. Heldman. 906 - 910. (invited).

Tollner, E.W., R.L. Schafer and T.K. Hamrita. 2002. Sensors and controllers for primary drivers and soil engaging implements. Advances in Soil Dynamics II: 179 – 224, 244 – 253. Am. Soc. Agr. Engrs., St. Joseph, MI.

Tollner, E.W. and M.H. Shahin. 2000. X-ray imaging for classifying food products based on internal defects. IN Nondestructive food evaluation. Ed by S. Gunasekaran. Marcel Decker, New York.

4. Professional activity;
Current membership in American Society of Agricultural Engineers, American Society for Engineering Education, National Society of Professional Engineers, Ecological Engineering Society

2007	Incoming Director, ASABE Publications
2007	ASABE representative, EPE committee
2007	Organizing Committee for ASABE International Water Conference
2005-07	Member of the Aquacultural CRSP Technical coordinating committee
2006	Ga Section ASABE past Chair
2005	Ga Section ASABE Chair
2005-06	P-412 (Ethics Committee) chair and session organizer
2005	IBE Thermodynamics Session Organizer
2005	Program Chair, ASEE-BAE division
2005	Incoming Chair, ASEE-BAE division
2004-Pr	NCEES FE exam committee – Biological coordinator

5. Expected responsibilities in this program;

Teaching courses in mechanical systems, modeling and mentoring design/research projects

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

Thai, Chi Ngoc
Associate Professor in Biological & Agricultural Engineering

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Expected responsibilities in this program;

Teaching courses and mentoring design/research projects

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

Sidney Alan Thompson
U. H. Davenport Professor, Biological and Agricultural Engineering

Ph. D.	Agricultural Engineering	University of Kentucky
MS	Civil Engineering	Purdue University
BS	Civil Engineering	Kansas State University

2. Current workload for typical semester, including specific courses actually Taught

Fall Semester:
ENGR2140 Strength of Materials (3 credit hours)
ENGR3610 Structural Design (3 credit hours)
ENGR4630 Residential Design (3 credit hours)
ENGR4630 is Team Taught – I teach approximately ¼ of the lectures
Spring Semester:
ENGR2140 Strength of Materials (3 credit hours)
ENGR2920 Design Fundamentals (2 credit hours)
ENGR2920 is Team Taught
ENGR4610 Steel Design (3 credit hours)
ENGR4920 Senior Design (4 credit hours)
Faculty teaching ENGR4920 do so on demand based on project and class needs.
Currently: Undergraduate Coordinator for the Biological and Agricultural Engineering Department

3. Scholarship and publication record for past five years

Das, K. C., J. D. Governo and S. A. Thompson. 2002. Computer tool for composting process design and cost estimation. Applied Engineering in Agriculture.Vol. 17(5):711-718.

Molenda, M. J. Horabik, S. A. Thompson and I. J. Ross. 2002 Bin loads induced by eccentric filling and discharge of grain. Transactions of the ASAE. 45(3):781-785.

McNeill, S.G., S. A. Thompson and M. D., Montross. 2004. Effect of moisture content and broken kernels on the bulk density and packing of corn. Applied Engineering in Agriculture. 20(4):475-480.

Molenda, M., M. D. Montross, J. Horabik and S. A. Thompson. 2004. Vertical wall loads in a model grain bin with non-axial internal inserts. Transactions of the ASAE, 47(5):1681-88.

Molenda, M., Horabik, J., Thompson, S. A. and Ross. I. J. 2004. Effects of grain properties on loads in model silo. Journal of International Agro-physics. Vol. 18, No. 4. pp 329-332.

Webster, A. B., S. A. Thompson, N. C. Hinkle and W. C. Merka. 2006. In-house composting of layer manure in a high-rise tunnel ventilated commercial layer

house during an egg production cycle. Journal of Applied Poultry Science. 15(3):447-456.

Molenda, M., Montross, M. D., Thompson, S. A. and J. Horabik. 2006. Vertical loads from wheat on obstructions located on the floor of a model bin. Transactions of the ASAE 49(6):1855-1865.

Visser, M. C., B. Fairchild, M. Czarick, M. Lacy, J. Worley, S. A. Thompson, J. Kastner, C. Ritz and L. P Naeher. 2006. Fine particle measurements inside and outside of tunnel ventilated broiler houses. Journal of Applied Poultry Research 15(3):394-405.

Burmeister, J, Foutz, T. L. and S. A. Thompson. 2007. Sophomore Engineering Design: Back to the Future. International Journal of Engineering Education. 23(5):894-901.

Books, Book Chapters and Proceedings Chapters:

Bucklin, R.A., S. A. Thompson, M. Montross and A. Abded-Hadi. 2007. Grain Storage Systems Design. In: Handbook of Farm, Dairy and Food Machinery Handbook. M. Kutz, ed. William Andrew Publishing, Norwich, NY.

4. Professional Activity

Professional Societies:

ASAE - American Society of Agricultural Engineers
ASCE - American Society of Civil Engineers
ASEE - American Society of Engineering Education

5. Expected contributions to this degree program

Teach mechanics of materials sections
Teach current undergraduate courses related to the structural engineering.
Serve on graduate committees with research topics associated with structural engineering.

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

Xu, Bingqian
Assistant Professor

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

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

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

3. Scholarship and publication record for past five years;

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

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

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

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

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

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

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

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

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

Chaired a session of Molecular and Molecular-Scale Electronics during the 231st ACS National Meeting, Atlanta, GA, March 26-30, 2006
Referee for Journals: Journal of the American Chemical Socienty, Nano Letters, Small, Journal of Physical Chemistry B, and Current Nanoscience
Serve as a panelist for the 2008 National Defense Science and Engineering Graduate (NDSEG) Fellowship evaluation meeting (Department of Defense (DoD) and the American Society for Engineering Education (ASEE)), February 16,2008
Developed the first systematic nanocourse, nanoelectronics in UGA
Advising: (Major Professor) 1 PostDoc, 2 garduate students now in the lab and 1 graduate student, 2 undergradute 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 ME courses related to my emphasis areas.
Take ME undergraduate students to work in my lab/hands-on experiences.