Motivation

Societal challenges of the past have often required solutions that rely on technologies made possible by innovations in materials. Future challenges may similarly require solutions that advance technologies for which it will be necessary to create materials with multiple functionalities, prescribed forms, and properties customized for specific applications and performance requirements. The field of materials science and engineering is at the core of such scientific and technological innovations. Academic programs in materials science and engineering at universities across the world will need to focus research on all aspects of envisioning, predicting, designing, and developing materials for technologies needed to overcome tomorrow’s challenges. At the same time, education of materials scientists and engineers will need to be based on the foundation of our disciplinary paradigm (structure-process-structure-property-performance), combined with critical thinking, problem solving, entrepreneurial and other skills needed to succeed and lead in a multi-disciplinary and globally-competitive environment.

The School of Materials Science and Engineering (MSE) at Georgia Tech is recognized for its excellence in research, quality of education, and service to the profession. The breadth of materials research at Georgia Tech today, involves all classes and forms of materials for a multitude of functionalities and applications, including structural, electronic, opto-electronic, packaging, biological, and energy conversion and storage. Education of our students at the undergraduate and graduate levels includes options for specialization in materials-specific areas, while providing opportunities for research and internship experiences, and other skills. MSE at Georgia Tech, with its size and diversity of faculty research areas, is positioned to be a leader of our discipline, and has the responsibility for raising student interest and public awareness of the field. MSE at Georgia Tech also has the responsibility of being the campus-wide “hub” of inter- and intra-disciplinary materials-related research and educational activities in serving the needs of the institute, state, nation, and society as a whole.

As a field that is at the core of technological advances, and aligned with the Institute vision that “Georgia Tech will define the technological university of the 21st century,” MSE at Georgia Tech can be a model program that defines the future of our discipline. It will require a plan with multiple and parallel strategies that capitalize on the strengths and diversity of the research expertise of our faculty, and engagement with industry and national laboratory partners. It will require taking risks in exploring new research directions through collaborations and partnerships, developing a world-class shared-access research and innovation infrastructure, and implementing alternative methods of education and research training of students, backed by the strengths of our core expertise.

The goal for MSE at Georgia Tech is to be the “go-to-place” for materials solutions and education. We have developed a strategic plan that incorporates key objectives, specific strategies, and measures, recognizing future priorities, opportunities, challenges, and uncertainties. The strategic plan will serve as a guide for paths to maintain excellence and leadership, both on campus and across the globe.
VISION AND MISSION

Vision:
*MSE* at Georgia Tech will define the materials science and engineering program of the 21st century and be recognized globally as the preeminent leader in materials education, innovation, and research.

Mission:
To create leaders through education, innovation in materials research, and service to society.

STRATEGIC OBJECTIVES

The vision and mission of *MSE* at Georgia Tech will be realized through the following strategic objectives:

1. Enhance and sustain our world-class community of scholars.

2. Build a state-of-the-art materials innovation infrastructure for research and education.

3. Develop and promote collaborations within and outside of MSE through a suite of synergistic strategies.

4. Enhance excellence in materials education to create a new generation of scholars equipped to meet the challenges of the future.

5. Promote the visibility and impact of MSE as a School and discipline to both internal and external stakeholders.
**Objective 1.**

**Enhance and sustain our world-class community of scholars.** Our faculty, students, and staff, define the excellence of our School. It is critical that the School attracts, retains, promotes and trains our people to enhance and sustain our world-class recognition.

**Strategies**

- The School will attract and hire faculty in areas that reflect traditional materials science and engineering disciplines as well as emerging disciplines.
- Affirming that social diversity enhances the richness of our community, promotes outside-the-box thinking and an atmosphere of mutual understanding and respect, the School will hire faculty and staff, and recruit students with a variety of experiences, social backgrounds, and diverse perspectives.
- The School will actively support faculty efforts for promotion and tenure, entrepreneurship activities, fellowships, chaired professorships, and other awards and recognitions.
- The School will provide training and assistance to students interviewing for positions in industrial, national laboratory and academic settings.
- The School will support professional development activities for faculty and staff, including extended leaves at national and international institutions as well as industrial settings, classes for continuing education; and reverse sabbaticals for leading scientists from around the world working in new areas or research methods coming to MSE at Georgia Tech, to interact and work with our faculty and students.
- The School will provide its highest level of service by working collaboratively and communicating effectively with staff in a manner that is respectful and flexible, while also promoting them for awards and recognitions.

**Measures**

- Percentage of faculty, staff, and students from non-traditional and underrepresented groups.
- Number of MSE Ph.D. graduates in tenure track faculty positions at peer institutions.
- Promotion and tenure metrics (tenure rate, average time to tenure, promotion rate, average time for promotion).
- Number of faculty with endowed chairs, professorships, and fellowships.
- Number of staff and faculty training hours logged per year.
- Number of faculty taking professional development leaves
- Numbers of faculty coming to our School for their sabbatical.
- Staff and faculty attrition ratios.
- Number of companies started by our faculty and students.
**Objective 2.**

**Build a state-of-the-art materials innovation infrastructure for research and education.** The School will sustain and create new state-of-the-art equipment and research facilities for characterization, synthesis/processing, and computations, in addition to laboratories for undergraduate and graduate education.

**Strategies**

- **As the single most materials-intensive academic unit on campus,** MSE faculty will pursue leadership roles in materials-related institutes, such as the Institute for Materials (IMat), which provide the primary vehicles for acquisition and management of major shared-access research equipment. A variety of materials-related institutes (e.g., Institute for Materials (IMat), Institute for Electronics and Nanotechnology, Institute for Bioengineering and Bioscience, Strategic Energy Institute, Georgia Tech Manufacturing Institute, Institute of Paper Science and Technology) and centers (e.g., Center for Nanostructure Characterization and Fabrication, Mechanical Properties Research Laboratories) within Georgia Tech provide the primary vehicles for acquisition and management of major shared-access research equipment. Therefore, to ensure the effective operation of equipment for the needs of MSE, our faculty must actively seek out and take leadership roles in these organizations. In particular, IMat is a unique institute in that it is specifically designed to add value to extensive existing strengths in materials-related research within MSE and more broadly across Georgia Tech. The shared resources component of IMat will emphasize more effective identification, access, utilization, and support of distributed equipment for materials preparation, characterization and testing including web-based portals, user support models, and development of an interdisciplinary materials innovation complex.

- **An educational laboratory committee will be established to define equipment needs and implement an acquisition plan.** Ensuring appropriate laboratory equipment is critical for a high-quality undergraduate and graduate education in MSE. This requires focused and sustained planning, as well as regular interaction between the new undergraduate laboratory committee, the MSE educational lab supervisor, MSE faculty and the MSE School Chair. The committee will write a plan that defines needs for laboratory-based education, associated equipment needs and an implementation plan. The MSE educational laboratory supervisor will be responsible for implementing the plan, and the plan will be reviewed and revised on an annual basis.

**Measures**

- The number of major materials-related institutes with integral MSE faculty participation and leadership.
- A web-based portal to facilitate enhanced access and utilization of widely distributed materials-related experimental facilities is developed by IMat and on-line by Fall 2013.
- A user support model for access, authorization, scheduling, tracking and billing of shared facilities developed through IMat and active by Summer 2014.
- Plan for laboratory-based education, associated equipment needs, implementation and acquisition completed by Summer 2013.
Objective 3:

Develop and promote collaborations within and outside of MSE through a suite of synergistic strategies.

Strategies

- The School will increase the number of GT faculty presentations in the regular seminar series and add GT faculty seminars that promote research collaboration among the faculty. The primary objective of these seminars is for the speaker to highlight key areas in which she/he needs expertise from others in order to solve their research problems more effectively. Informal social hours will also be established to discuss research and educational collaborations.

- Implement a collaborative research seed grant program and develop a funding model for individual faculty research. The School will implement a Collaborative Research Seed Grant Program to enable faculty members to carry out exploratory research and lay the groundwork for major breakthroughs through outside funding. The funding will be in the range of $20-25K each for a maximum of two successful proposals each year; the submissions will require collaboration among a minimum of two faculty members and the funds will be allocated according to the budget submitted in the proposal. Recognizing that small investments at the faculty level often foster new, high-impact and interdisciplinary ideas, the School will explore models for returning a small amount of research funding to individual faculty.

- Implement a program to strengthen collaboration with external stakeholders. The School will establish a Research Partnerships Working Group to promote collaboration with external stakeholders, including national laboratories, industries and funding agencies. This working group will promote collaborative research by: (1) facilitating the mutual exchange of faculty members and external experts through industry residence programs, visiting professorships and reverse sabbaticals; (2) proactively identifying research opportunities and seeking research grants from funding agencies; and (3) exploring ways to removing the barriers to School-industry collaboration on research and technology transfer.

Measures

- The MSE faculty seminar program will be operational in the fall of 2013. The success of the program will be judged by the number of faculty members volunteering to discuss their work and the research collaborations that result from this activity.

- The details of the proposed seed grant program including the review criteria and proposal format will be finalized by the beginning of Fall 2013 and the call for proposals will be issued in mid-fall, leading up to the potential award of the first set of grants for work to begin in the summer of 2014. The success of the strategy will be judged by the number of resulting publications and research funding.

- The details of the role and operations of the Research Partnerships Working Group will be worked out during the fall of 2013. The success of the strategy will be judged by the establishment of the working group, the regularity of meetings and the number of opportunities successfully pursued by the fall of 2016 in terms of the exchange program, successful funding and joint research programs.

- A model for returning funding to faculty will be developed by Fall 2013.
Objective 4:

Enhance excellence in materials education as a path to improve our national and international reputation at both the undergraduate and graduate levels to create a new generation of scholars equipped to meet the challenges of the future. We will increase the undergraduate and graduate enrollments to create student/faculty ratios of higher than 10/1 and 6/1, respectively; train world-class scientists/engineers for the 21st century by nurturing a culture of innovation and by imparting breadth and depth in all classes of materials; develop life-long learning capabilities for continued educational experience; and develop on-line introductory courses to cover all classes of materials.

Strategies

• To increase graduate enrollment, promote *establishment of research centers* to make an impact in key 21st century grand challenge areas (health, energy, transportation, communication, environment, security, and water) where materials play a critical role. This will be done by establishing collaboration and exploiting expertise among research groups. Collaborations will be sought within MSE, broadly within Georgia Tech, with other universities, industry, government laboratories within U.S., as well as internationally.

• Strengthen links with industry and national laboratories within US, as well as with industries and laboratories in other parts of the world by arranging and offering *workshops and continuing education courses in emerging areas*.

• **Develop future teaching methods.** This will be done by taking advantage of the current and future electronic and Internet tools. Courses such as MSE 1111, MSE 2001, and MSE 3720 will be considered for on-line offerings.

• **Offer a MSE teaching practicum course** and actively seek and involve graduate students in this course. This should help to increase numbers of Ph.D. students going on to further academic positions (post-docs, faculty) and increase their effectiveness as teachers.

• **Increase opportunities for undergraduate students to participate in research and industry-based experiences.** Seek endowment and other sponsored research funds (e.g., NSF REU) specifically dedicated for undergraduate research. This should help to increase the numbers of UG students going on to graduate studies, including expansion of UG participation in the BS/MS program.

• **Establish MSE endowment for graduate student training/learning.** These endowed funds would be used for first year graduate students taking core classes before being attached to a permanent research group. In addition it could be offered on a competitive basis for students participating in national and international training activities.

• **Recruit faculty and continue undergraduate and graduate course offerings to maintain strength and breadth of MSE program that is at the forefront of materials developments.**

• **Increase participation in international educational activities, e.g., the GT International Plan.**

Measures

• Undergraduate and graduate student numbers, both in total and the rate of increase by year.

• Track average scores of entering classes: SAT/ACT and High School GPA’s of Undergraduate students, and GRE and B.S. GPA’s of Graduate students.

• Track alumni and stakeholders (industry) – questionnaires, surveys and EAB inputs.

• Track various measures of national and international reputation.

• Track number of undergraduate students’ participation in research and number of undergraduate students going on to graduate studies.

• Track number of graduate students participating in teaching practicum course and number of graduating students going on to take faculty positions.

• Track number of people taking MSE-offered-on-line courses.
**Objective 5:**

Promote the visibility and impact of MSE as a School and discipline to both internal and external stakeholders.

**Strategies**

- **Re-design all web and collateral materials to attract appropriate audience.** The School will provide information on its website in a clear and direct style; website will be search engine-friendly, with enhanced SEO results using keyword research and content development. PageRank will be optimized and provide key content in HTML text format. A template will be provided for faculty to develop their own individual websites that will be linked directly to the School faculty page. Ready and easy access to the rich expertise and experience of the faculty is critical for faculty members and external stakeholders seeking a specific expertise, instrument, or laboratory facility for identifying collaborators and, in turn, potential opportunities for research and funding. The School will create an on-line, printable, listing of faculty research expertise and research topics. Topics will be specific enough to identify different areas of research, yet be sufficiently non-technical in diction to maintain broad appeal. The School’s Director of Development will be the main contact provided with additional links to each faculty member’s research page. The School will also develop videos showcasing students, alumni, and faculty using YouTube-style video formats to introduce prospective students to MSE, explain the benefits of MSE as a major and future career choice, and showcase interviews with current student, recent alumni, and faculty who show a passion for their field and career. The School will design and distribute collateral materials to target particular constituent groups.

- **Maximize the use of social and printed media.** The School will enhance social media linked to the School website to focus on School announcements and news events, and widely publicize the School to industry, alumni, and government. The most recent news will appear first while still allowing older news items to remain accessible AND will allow for individuals to interact to each posting. The School will develop a blog and contribute to the GT Amplifier blog. The use of printed media will be maximized by aggressively pitching to current GT media and to select industry and trade publications. Annual surveys to alumni, industry and other external stakeholders will be created and sent for the purpose of providing the School with direct feedback to be used to best engage each stakeholder.

- **Host Biennial MSE symposium at GT.** The School will host a symposium every two years to foster participation and input by both industry and alumni. Theme and focus of the symposium will vary. Alongside the symposium, select students will showcase their research in a poster session. Pre- and post-publicity will appear in all MSE publicity venues. Follow-up surveys will be sent to all participants to provide the School with feedback for improvement and future symposium topics.

- **Promote public awareness of our discipline.** The School will organize meetings and participate in community events that increase public awareness of our discipline. This requires that faculty participate as mentors for high school teachers in the GT-led GIFT program, seek funding through the NSF-RET program, as well as collaborate with local professional society chapters in organizing materials camps for teachers and students.

**Measures**

- Initial implementation of revised webpages will occur by Fall 2013, with regularly occurring revisions to continue in order to maintain a website highlighting current School activities. The success of the web redesign will be judged by increasing numbers of contacts via online publicity, and number of MSE items pulled during search queries. Collateral materials are currently in process, with key items to be produced by Fall 2013. The success of these materials will be judged by increased interest expressed in connecting with the School, by the number of requests to receive different collateral materials, and by any increases in the number of student admissions applications.

- A news-tracking service company will be hired to track all media, including information on successful MSE graduates pursuing advanced degrees at other institutions.
Objective 5: continued

Measures continued

Postings on School online media outlets will be tracked, as will requests for information from potential students and the number of student applicants.

- The School will follow-up with participants of the MSE symposium to gauge their satisfaction with the symposium and provide suggestions for future, related meetings of MSE-industry interactions. Feedback on all surveys and social media, as well as both verbal and written correspondence will be tracked.
- The success of the faculty expertise and research listing will be judged by the number of calls received by Director of Development and/or the specific faculty member.
- Number of community events and organized activities involving MSE faculty and students.