

WHAT IS MSE?

MSE focuses on the development of new materials for the next generation of engineering applications. It views biomaterials, nanomaterials, ceramics, metals, polymers, electronic materials and composites from a fundamental point of view, emphasizing the relationships between the atomic- and micro-structure as well as the properties, processing and performance of the material.

Current materials research projects in the School of MSE...

- ◆ synthesis of nanomaterials for the construction of nanoscale machines aimed at applications ranging from renewable energy to cancer detection and treatment;
- ◆ use of the genetic patterns found in nature to harness the ribosome to manufacture biosensors and photonic circuits;
- ◆ development of conductive polymers for a new generation of MEMS devices as well as PEMS fuel cells;
- ◆ development of a new generation of form fitting light-weight armor that can stop ballistic projectiles;
- ◆ development of hydrogen burning solid oxide fuel cells to power a future generation of automobiles;
- ◆ computer modeling the microstructure of the human brain;
- ◆ self-cleaning surfaces via nanotexturing;
- ◆ development of a self deploying shape memory polymer neuronal probe;
- ◆ computer design of the next generation of ceramics and alloys; and much more.

Research in MSE at Georgia Tech is at the leading edge of defining tomorrow's world!

- ◆ MSE undergraduate program ranked 9th and graduate program ranked 8th by U.S. News and World Report
- ◆ MSE students are among the best in the nation and have virtually the highest SAT scores at Georgia Tech!
- ◆ More than 40 fellowships and scholarships awarded to MSE students annually
- ◆ Starting salaries of 2007 MSE graduates
 - B.S. > \$58K**
 - M.S. > \$66K**
 - Ph.D. > \$86K**

ACADEMIC HIGHLIGHTS



STRATEGIC DIRECTIONS

Nanomaterials and Nanoengineering

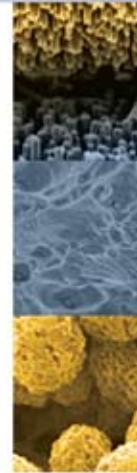
- ◆ Building components and devices of molecular dimensions such as synthesis of nanowires, nanobelts, and nanocoils for the assembly of nanomachines.

Bio-Enabled Materials

- ◆ A new paradigm for manufacturing and harnessing the living cell to manufacture nanomachines for drug delivery to specific body sites for cancer treatment; in situ diagnosis, chemical and bio-sensing; production of paper fiber, catalysts, photonic circuits and scaffolds for the self assembly of large scale devices.

Computational Materials Design

- ◆ The use of advanced intensively parallel computers to design new materials with properties never before seen.



Degree Programs

BS: Materials Science & Engineering
BS/MS: Materials Science & Engineering (5 Year)
MS: Bioengineering*
MS: Materials Science & Engineering
MS: Paper Science & Engineering*
MS: Polymers*
MS: with a Major in Materials Science & Engineering
PhD: with a Major in Bioengineering*
PhD: with a Major in Materials Science & Engineering
PhD: with a Major in Paper Science & Engineering*

*denotes interdisciplinary programs

Student Profile	Bachelor's 141	2008 statistics
	Master's 23	
	Doctoral 274	

THE GEORGIA TECH MATERIALS COUNCIL...

Chaired by Regents' Professor David McDowell, addresses co-operative education and research program development across campus through regular meetings, workshops, and seminars. Approximately 160 faculty members from the Colleges of Engineering, Science, Architecture, Computing and the Georgia Tech Research Institute contribute to materials-related research and education on campus. Over 70 undergraduate and 80 graduate courses are regularly offered in materials-related topics across campus. The Institute Materials Seminar Series, organized by the Council, is a forum for exchange with external distinguished researchers. For more information visit www.matecouncil.gatech.edu.

FACULTY HIGHLIGHTS

- ◆ **Faisal Alamgir** was elected to be representative in the Users Executive Committee of the National Synchrotron Light Source.
- ◆ **Mo Li** was promoted to Full Professor.
- ◆ **Meilin Liu** was promoted to Regents' Professor.
- ◆ **David McDowell** received the Khan International medal at the 14th International symposium on Plasticity for his twenty-year contributions to the field of plasticity.
- ◆ **Valeria Milam** received the CETL/BP Junior Faculty Teaching Excellence Award.
- ◆ **Preet Singh** was named a Fellow of the National Association of Corrosion Engineering International. **Professor Singh** along with **Dong Yang** and **Richard Neu** received the "Stow Best Paper Award" at the TAPPI Engineering Conference.
- ◆ **Naresh Thadhani** was elected Fellow of the American Physical Society.
- ◆ **Z. L. Wang** was selected as a Principal Investigator and Satellite Co-Director for the National Institute for Materials Science (NIMS), International Center for Materials Nanoarchitectonics (MANA).
- ◆ **Z. L. Wang** and **Xudong Wang** shared the Sigma Xi Best Paper Award.
- ◆ **C. P. Wong** received the 2008 Total Excellence in Electronics Manufacturing (TEEM) Award by the Society of Manufacturing Engineers.
- ◆ **Gleb Yushin** received the Roland B. Snow Award from the American Ceramic Society.

The National Institute of Materials Science ranks Georgia Tech second in the world for citations per paper during the period of 2003-2007!

FISCAL YEAR DATA

	03	04	05	06	07	08
Faculty	21	29	38	38	40	43
BS Degrees	9	11	15	17	23	37
MS Degrees	17	10	22	15	8	12
PhD Degrees	6	5	4	22	34	27
External Funding (\$M)	8	20	16	21	21	26
Journal Papers	208	458	628	624	628	796
Presentations	215	355	315	353	417	637
Patents	25	25	43	38	81	67
U.S.N&WR Rankings						
Undergraduate	10	9	7	7	9	9
Graduate	11	10	12	11	9	8

PRINCIPAL RESEARCH AREAS

Biologically Enabled and Genetically Engineered Materials

- Bio-inspired Manufacturing
- Near Net Shape Processing
- Advanced Reaction Processing and Low Temperature Chemical Syntheses
- Biological Responses to Materials
- Conducting, Semiconducting and Nanostructured Soft Materials

Nanotechnology

- Self-assembled Nanostructures and Nanocomposite
- Nanocomposite Magnetic Materials
- Super-hydrophobic Self-Cleaning Materials
- One-dimensional Nanostructures for Nanoelectronics, Actuating and Sensing
- Functionally Graded and "Smart" Materials
- Nanomaterials in Cancer Research

Materials Design and Computational Predicted Materials

- Modeling Hierarchical Microstructures (casting alloys, Ni-base superalloys)

Photonic and Phononic Materials

Electronic, Magnetic, Semiconducting and Superconducting Materials

Photonic and Opto-electronic and LED Materials

Advanced Structural Materials

- Corrosion and Stress Corrosion, Fracture Mechanics, Fatigue and Durability

Light Weight High Strength Cellular Alloys

Multifunctional Structural Energetic Materials

Advanced Materials Characterization

Sustainable Energy Research – Fuel Cells and Beyond

Application Areas

Advanced Metals, Ceramic, Polymers and Composites for

- Fuel Cells
- Next Generation Space Shuttle
- Rocket Nozzle and Hypersonic Materials
- Sustainable Energy
- LED Lighting
- Electronic Packaging
- Photonic Circuits and Photovoltaics
- Nanomaterials and Nanomachines
- Integrated Circuits, LEDs, Packaging, Latency
- Form Fitting B4C Body Armor
- Advanced Security Systems
- Biomedical Applications
- Drug Delivery
- Artificial Bone Scaffolds
- Cancer Detection and Treatment



INTERDISCIPLINARY CENTERS

CENTER OF EXCELLENCE FOR PHOSPHOR TECHNOLOGY C. J. Summers (MSE), Director

CENTER FOR NANOSCIENCE AND NANOTECHNOLOGY Z. L. Wang (MSE), Director

CENTER FOR NANOSTRUCTURE CHARACTERIZATION & FABRICATION Z. L. Wang (MSE), Director

CENTER FOR ORGANIC PHOTONICS AND ELECTRONICS S. Marder (CHEM/MSE), Director

COMPOSITES EDUCATION AND RESEARCH CENTER W. S. Johnson (MSE/ME), Director

CENTER FOR BIOLOGICALLY ENABLED ADVANCED MANUFACTURING K. Sandhage (MSE), Director

MECHANICAL PROPERTIES RESEARCH LABORATORY D. L. McDowell (ME/MSE), Director

MICROELECTRONICS RESEARCH CENTER J. Meindl (ECE), Director

MURI ON GENETICALLY ENGINEERED MATERIALS AND MICRO/NANODEVICES K. Sandhage (MSE), Director

MURI ON INTELLIGENT LUMINESCENCE FOR COMMUNICATION, DISPLAY AND IDENTIFICATION C. J. Summers (MSE), Director

PACKAGING RESEARCH CENTER R. Tummala (ECE/MSE), Director

USCAR ON STRUCTURAL CAST MAGNESIUM DEVELOPMENT PROJECT A. M. Gokhale (MSE), Director

FOR ADDITIONAL INFORMATION, CONTACT

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MSE Highlights 2009

Georgia Institute of Technology
School of Materials Science and Engineering
College of Engineering