Erik Jonsson School of Engineering & Computer Science

Department of Materials Science and Engineering

Department Faculty

Professors: Orlando Auciello, Yves J. Chabal, Kyeongjae (KJ) Cho, Massimo V. Fischetti, Bruce E. Gnade, Julia W. P. Hsu, Jiyoung Kim, Moon J. Kim, Robert M. Wallace

Professor Emeritus: Don Shaw

Associate Professors: Lev D. Gelb, Manuel Quevedo-Lopez, Amy V. Walker

Assistant Professors: Christopher L. Hinkle, Walter E. Voit, Chadwin D. Young

UT Dallas Affiliated Faculty: Kenneth J. Balkus Jr., Ray H. Baughman, Julia Chan, Wonjae Choi, Ann (Catrina) Coleman, James J. Coleman, John P. Ferraris, Xin-Lin Gao, Matthew J. Goeckner, Fatemeh Hassanipour, Wenchuang (Walter) Hu, Gil S. Lee, Jeong-Bong Lee, Mark Lee, Hongbing Lu, Anton V. Malko, Kenneth K. O, Lawrence J. Overzet, Shalini Prasad, Dong Qian, Mario A. Rotea, Dennis W. Smith Jr., Mihaela C. Stefan, Anvar A. Zakhidov

Objectives

The objective of the Master of Science (MS) degree in materials science and engineering is to provide intensive preparation for the professional practice in modern materials science by those engineers and scientists who wish to continue their education. Courses are offered at times and locations convenient for the student who is employed on a full-time basis.

The objective of the Doctor of Philosophy (PhD) program in materials science and engineering is to prepare individuals to perform original, cutting-edge research in materials science, particularly in the areas of nano-structured materials, electronics, optical and magnetic materials, bio-mimetic materials, polymeric materials, MEMS materials and systems, organic electronics, and advanced processing of modern materials.

Scholarship Opportunities

The Erik Jonsson School of Engineering and Computer Science offers competitive scholarship awards for very well qualified students. Interested students should request application materials

by contacting the Department of Materials Science and Engineering.

Master of Science in Materials Science and Engineering

33 semester credit hours minimum

Admission Requirements

The university's general admission requirements are discussed on the Graduate Admission page (catalog.utdallas.edu/2014/graduate/admission).

A student lacking undergraduate prerequisites for graduate courses in Materials Science and Engineering (MSEN) must complete these prerequisites or receive approval from the graduate advisor and the course instructor. A diagnostic exam may be required. Specific admission requirements are as follows:

- Student has met standards equivalent to those currently required for admission to the PhD or master's degree programs in Materials Science, Electrical Engineering, Chemistry, Physics, or Biology.
- A grade point average (GPA) in undergraduate-level coursework of 3.5 or better on a 4.0 point scale.
- GRE revised scores which are recommended as 154 or above, 154 or above, and 4 for the verbal, quantitative, and analytical writing components, respectively, are advisable based on our experience with student success in the program.

Students, who fulfill only some of the above requirements, if admitted conditionally, will be required to take graduate level courses as needed to make up any deficiencies.

Degree Requirements

The university's general degree requirements are discussed on the Graduate Policies and Procedures page (catalog.utdallas.edu/2014/graduate/policies/policy).

The MSEN MS degree requires a minimum of 33 semester credit hours.

All students must have an academic advisor and an approved degree plan. These are based upon the student's choice of concentration. Courses taken without advisor approval will not count toward the 33 semester-hour requirement. Successful completion of the approved course of studies leads to the MS degree.

MS students undertaking the non-thesis option must complete at least 33 semester credit hours of coursework with a grade of B or better.

MS students undertaking the thesis option must carry out a research project under the direction of

a faculty or affiliated faculty in Materials Science and Engineering, and complete and defend a thesis on the research project, but they need only complete the four core courses and 9 semester credit hours of advanced coursework. A Supervisory Committee will be appointed once the faculty member accepts the student for a research project. The rules for the thesis defense are specified by the Office of the Dean of Graduate Studies.

Students must obtain a grade of B- or better in each of the following "core" classes and maintain an average core class GPA of at least 3.0 to remain in good standing and satisfy their degree requirements:

MSEN 5310 Thermodynamics of Materials

MSEN 5360 Materials Characterization

MSEN 6319 Quantum Mechanics for Materials Scientists

MSEN 6324 (EEMF 6324) Electronic, Optical and Magnetic Materials

Note: the presence of a course number in parentheses indicates that this course is cross-listed in another department.

A minimum of 9 semester credit hours of advanced coursework is required, from the following list:

MSEN 5340 (CHEM 5340) Advanced Polymer Science and Engineering

MSEN 5361 Fundamentals of Surface and Thin Film Analysis

MSEN 5370 Ceramics and Metals

MSEN 5375 Electronic Devices Based On Organic Solids

MSEN 5377 (PHYS 5377) Computational Physics of Nanomaterials

MSEN 6310 (MECH 6367) Mechanical Properties of Materials

MSEN 6320 (EEMF 6320) Fundamentals of Semiconductor Devices

MSEN 6327 (EEMF 6327) Semiconductor Device Characterization

MSEN 6330 Phase Transformations

MSEN 6339 Nanostructured Materials: Synthesis, Properties and Applications

MSEN 6340 Advanced Electron Microscopy

MSEN 6350 Imperfections in Solids

MSEN 6362 Diffraction Science

These courses are intended to provide greater depth and advanced training in areas broadly relevant to Materials Science and Engineering research.

The remaining semester credit hours may be taken from the following list of elective courses (or other electives which have been approved by the student's thesis advisor or the graduate director as appropriate.):

MSEN 5300 (PHYS 5376) Introduction to Materials Science

MSEN 5320 Materials Science for Sustainable Energy

MSEN 5331 (CHEM 5331) Advanced Organic Chemistry I

MSEN 5333 (CHEM 5333) Advanced Organic Chemistry II

MSEN 5341 (CHEM 5341) Advanced Inorganic Chemistry I

MSEN 5344 Thermal Analysis

MSEN 5353 Integrated Circuit Packaging

MSEN 5355 (CHEM 5355) Analytical Techniques I

MSEN 5356 (CHEM 5356) Analytical Techniques II

MSEN 5371 (PHYS 5371) Solid State Physics

MSEN 5383 (EEMF 5383, MECH 5383, and PHYS 5383) Plasma Technology

MSEN 5410 (BIOL 5410) Biochemistry

MSEN 5440 (BIOL 5440) Cell Biology

MSEN 6313 (EEOP 6313) Semiconductor Opto-Electronic Devices

MSEN 6321 (EEMF 6321) Active Semiconductor Devices

MSEN 6322 (EEMF 6322, MECH 6348) Semiconductor Processing Technology

MSEN 6341 Advanced Electron Microscopy Laboratory

MSEN 6348 (EEMF 6348, MECH 6341) Lithography and Nanofabrication

MSEN 6355 (BMEN 6355) Nanotechnology and Sensors

MSEN 6358 (BIOL 6358) Bionanotechnology

MSEN 6361 Deformation Mechanisms in Solid Materials

MSEN 6371 (PHYS 6371) Advanced Solid State Physics

MSEN 6374 (PHYS 6374) Optical Properties of Solids

MSEN 6377 (PHYS 6377) Physics of Nanostructures: Carbon Nanotubes, Fullerenes, Quantum Wells, Dots and Wires

MSEN 6382 (EEMF 6382, MECH 6347) Introduction to MEMS

MSEN 6V98 Thesis

MSEN 7320 (EEMF 7320) Advanced Semiconductor Device Theory

MSEN 7V80 Special Topics in Materials Science and Engineering

MSEN 8V40 Individual Instruction in Materials Science and Engineering

MSEN 8V70 Research In Materials Science and Engineering

Doctor of Philosophy in Materials Science and Engineering

75 semester credit hours minimum beyond the baccalaureate degree

Admission Requirements

The university's general admission requirements are discussed on the Graduate Admission page (catalog.utdallas.edu/2014/graduate/admission).

A student lacking undergraduate prerequisites for graduate courses in Materials Science and Engineering (MSEN) must complete these prerequisites or receive approval from the graduate advisor and the course instructor.

A diagnostic exam may be required. Specific admission requirements follow.

The student entering the MSEN program should meet the following guidelines:

- Student has met standards equivalent to those currently required for admission to the PhD or master's degree programs in Materials Science, Electrical Engineering, Chemistry, Physics, or Biology.
- A grade point average (GPA) in undergraduate-level coursework of 3.5 or better on a 4.0 point scale
- GRE revised scores which are recommended as 154 or above, 154 or above, and 4 for the verbal, quantitative, and analytical writing components, respectively, are advisable based on our

experience with student success in the program.

Students who fulfill some of the above requirements, if admitted conditionally, will be required to take graduate level courses as needed to make up any deficiencies.

Degree Requirements

The university's general degree requirements are discussed on the Graduate Policies and Procedures page (catalog.utdallas.edu/2014/graduate/policies/policy).

The MSEN PhD requires a minimum of 75 semester hours beyond the baccalaureate degree. These credits must include at least 30 semester hours of graduate-level coursework in MSEN.

All students must have an academic advisor and an approved degree plan. Courses taken without advisor approval will not count toward the 75 semester-hour requirement.

Each doctoral student must carry out original research in the area of Materials Science and Engineering, under the direction of a faculty or affiliated faculty of Materials Science and Engineering, and complete and defend a dissertation on the research project. A Supervisory Committee will be appointed once the faculty member accepts the student for a research project.

Students must be admitted to doctoral candidacy by passing a Qualifying Exam, which will be administered near the time that the students have completed their coursework. Upon passing the Qualifying Exam, students must present and defend a Research Proposal with their Supervisory Committee within approximately nine months or sooner after passing the Qualifying Exam. The rules for the dissertation research and defense are specified by the Office of the Dean of Graduate Studies.

Students must obtain a grade of B- or better in each of the following "core" classes and maintain an average core class GPA of at least 3.0 to remain in good standing and satisfy their degree requirements:

MSEN 5310 Thermodynamics of Materials

MSEN 5360 Materials Characterization

MSEN 6319 Quantum Mechanics for Materials Scientists

MSEN 6324 (EEMF 6324) Electronic, Optical and Magnetic Materials

Note: the presence of a course number in parentheses indicates that this course is cross-listed in another department.

A student may petition for waiver of core courses based on prior coursework of equivalent scope and level, and if the Department finds that the student has already mastered the course material, the student may replace that core course with elective courses for up to a total of twelve semester

credit hours.

A minimum of 9 semester credit hours of advanced coursework is required, from the following list:

MSEN 5340 (CHEM 5340) Advanced Polymer Science and Engineering

MSEN 5361 Fundamentals of Surface and Thin Film Analysis

MSEN 5370 Ceramics and Metals

MSEN 5375 Electronic Devices Based On Organic Solids

MSEN 5377 (PHYS 5377) Computational Physics of Nanomaterials

MSEN 6310 (MECH 6367) Mechanical Properties of Materials

MSEN 6320 (EEMF 6320) Fundamentals of Semiconductor Devices

MSEN 6327 (EEMF 6327) Semiconductor Device Characterization

MSEN 6330 Phase Transformations

MSEN 6339 Nanostructured Materials: Synthesis, Properties and Applications

MSEN 6340 Advanced Electron Microscopy

MSEN 6350 Imperfections in Solids

MSEN 6362 Diffraction Science

These courses are intended to provide greater depth and advanced training in areas broadly relevant to Materials Science and Engineering research.

Any remaining semester credit hours of coursework may be taken from the following list of elective courses (or other electives which have been approved by the student's thesis advisor):

MSEN 5300 (PHYS 5376) Introduction to Materials Science

MSEN 5320 Materials Science for Sustainable Energy

MSEN 5331 (CHEM 5331) Advanced Organic Chemistry I

MSEN 5333 (CHEM 5333) Advanced Organic Chemistry II

MSEN 5341 (CHEM 5341) Advanced Inorganic Chemistry I

MSEN 5344 Thermal Analysis

MSEN 5353 Integrated Circuit Packaging

MSEN 5355 (CHEM 5355) Analytical Techniques I

MSEN 5356 (CHEM 5356) Analytical Techniques II

MSEN 5371 (PHYS 5371) Solid State Physics

MSEN 5383 (EEMF 5383, MECH 5383, and PHYS 5383) Plasma Technology

MSEN 5410 (BIOL 5410) Biochemistry

MSEN 5440 (BIOL 5440) Cell Biology

MSEN 6313 (EEOP 6313) Semiconductor Opto-Electronic Devices

MSEN 6321 (EEMF 6321) Active Semiconductor Devices

MSEN 6322 (EEMF 6322, MECH 6348) Semiconductor Processing Technology

MSEN 6341 Advanced Electron Microscopy Laboratory

MSEN 6348 (EEMF 6348, MECH 6341) Lithography and Nanofabrication

MSEN 6355 (BMEN 6355) Nanotechnology and Sensors

MSEN 6358 (BIOL 6358) Bionanotechnology

MSEN 6361 Deformation Mechanisms in Solid Materials

MSEN 6371 (PHYS 6371) Advanced Solid State Physics

MSEN 6374 (PHYS 6374) Optical Properties of Solids

MSEN 6377 (PHYS 6377 Physics of Nanostructures: Carbon Nanotubes, Fullerenes, Quantum Wells, Dots and Wires

MSEN 6382 (EEMF 6382, MECH 6347) Introduction to MEMS

MSEN 7320 (EEMF 7320) Advanced Semiconductor Device Theory

MSEN 7V80 Special Topics in Materials Science and Engineering

MSEN 8V40 Individual Instruction in Materials Science and Engineering

Research effort towards the degree should be completed under:

MSEN 8V70 Research In Materials Science and Engineering

Description of Facilities Available for Conducting Research

An extensive array of the materials characterization, synthesis, and processing tools exist in the department for student use in research. Characterization capabilities include advanced high-resolution electron microscopy, x-ray diffraction, a large variety of surface analysis methods, and electrical characterization. Thin film deposition methods include atomic layer deposition, sputter deposition, thermal deposition, molecular beam epitaxy, chemical vapor deposition, pulsed laser deposition, and gas phase adsorption. Fabrication methods can be accomplished in the Cleanroom Research Laboratory as well (www.utdallas.edu/research/cleanroom). Computational modeling activities include studies from the atomistic to the macroscopic level. Details of the capabilities and faculty research can be obtained at: mse.utdallas.edu.

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