Materials Engineering

Degrees Offered | MSME, Materials Engineering PhD
Website | https://www.uab.edu/engineering/mse/graduate
Program Director | Vinoy Thomas, PhD
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Phone | (205) 934-8450

Materials engineering involves the development, production, modification, and application of engineering materials to meet the specific needs of society. It is based on an understanding of the structures and forces that control the engineering properties of metals, ceramics, polymers, and composites. Through the development of this understanding, the student learns how to control the properties of materials through various industrial manufacturing processes, how to select the optimum material and predict its behavior under various environmental and service conditions, and how to alter this behavior through materials design, research, and development. Materials Engineers are employed in every major industry, including aerospace, chemical, automotive, metals casting, biomedical, and microelectronics.

Master of Science in Materials Engineering

Admission Requirements

In addition to the general Graduate School admission requirements, requirements for admission to the Master of Science in Materials Engineering (MSMtE) include the following:

- • 3.0 (A = 4.0) or better GPA on all undergraduate degree major courses attempted
- • Scores on the GRE General Test are not required (but are accepted) for applicants who receive a BS degree from a program accredited by the Engineering Accreditation Committee of ABET (http://www.abet.org), or from other programs with reciprocal agreement under the Washington Accord (http://www.ieagreements.org/accords/washington/). The GRE General Test is required for all other applicants.
- • A minimum score of 80 on the TOEFL, (minimum 18 on each subsection), or a 6.5 on the IELTS is required for international applicants whose native language is not English.

Early Acceptance

Early Acceptance Programs are designed for academically superior high-school students. Early Acceptance Programs allow high achieving students to be admitted to the Materials Engineering program at the same time they are admitted to an undergraduate program.

Eligible students are required to maintain a 3.5 undergraduate GPA and complete the following pre-requisite courses: EGR 265 or MA 227, MSE 280, MSE 281, MSE 380, MSE 381, MSE 382.

Requirement | Fulfilled By:
Deadline for Entry Term(s) | Fall: August 1; Spring: December 1; Summer: May 1

Program Requirements

The following minimum requirements for MSMtE apply to a student who has earned a baccalaureate degree from a program accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, in materials or metallurgical engineering or in a similarly named engineering program. A student with an undergraduate degree in another field of engineering or in the physical sciences may also be accepted into the MSMtE program. All students will be required to demonstrate competence in fields of study that emphasize the interrelationship among structure, processing, performance, and properties of materials. This can be accomplished by one of the methods described below.

Preparation Requirements

A student seeking a graduate degree in Materials Engineering must demonstrate competence at the undergraduate level in the areas of engineering materials, physical behavior of materials, thermodynamics, and mechanical behavior of materials. Students may be exempted from individual courses or examination if they demonstrate that they possess the knowledge from that course, usually with a grade of a “B” or better. However, the burden of proof is on the student. He/she may accomplish this by passing a prerequisite examination on the portion of the following course content depending on the student’s academic background. The courses that fulfill the preparatory requirements are:

- • MSE 280 Engineering Materials
- • MSE 281 Physical Materials I
- • MSE 380 Thermodynamics of Materials
- • MSE 381 Physical Materials II
- • MSE 382 Mechanical Behavior of Materials

Additional Academic Policies

Special Topics (590/690/790) courses and Independent Study (591/691/791) courses are reviewed for degree applicability for each program in the School of Engineering. No more than 6 combined hours of Special Topics and/or Independent Study courses will be applied to the MSMtE without appeal to and approval from the Program Director.

The School of Engineering offers similar courses at the 400/500 and 600/700 levels. While the higher numbered course has more advanced content, there is a significant overlap in topics. Therefore, students are not allowed to take a 500-level or 700-level course for credit if they have previously taken the related 400-level or 600-level course, respectively.

Plan I (Thesis Option)

The Plan I Master’s degree required completion of at least 35 semester hours of graduate work.

- • Up to 9 semester hours of Materials Science and Engineering courses (MSE) at the 500+ level
- • Up to 6 semester hours of approved mathematics, physical sciences, another engineering discipline or management courses (a maximum of 3 hours in a management course is allowed)
- • A full time graduate student is required to be registered for 1 credit hour of MSE 601 Materials Science and Engineering Seminar for fall and spring semester, up to 2 hours of seminar can be applied to the MSMtE degree
The remaining hours of coursework must be Materials Science and Engineering courses (MSE) at the 601+ level in consultation with the student’s thesis committee.

- 9 semester hours of MSE 699 Thesis Research, after admission to candidacy

A Graduate Thesis Committee consisting of at least three faculty members should be formed. A student is eligible for admission to candidacy after (1) a written thesis proposal following the NSF Proposal Preparation and Submission Guidelines and examination on topics related to the student’s research has been orally presented to the committee and approved and (2) completion of Responsible Conduct of Research (RCR) training (https://www.uab.edu/research/administration/resources/Pages/RCR-Training.aspx). Admission to candidacy must take place at least one semester before the student may graduate. A written thesis embodying the results of the student’s original research must then be publicly defended, approved by the committee, sent to a department-approved proofreader, and submitted to the Graduate School with edits incorporated.

**Plan II (Non-Thesis Option): Research/Design Emphasis**

The student must successfully complete at least 35 semester hours of (primarily) materials engineering graduate work including 32 semester hours of courses and 3 semester hours of MSE 698 Non-Thesis Research

- 3 to 6 semester hours will be approved courses in mathematics, physical sciences, another engineering discipline or management (a maximum of 3 hours are allowed in management)
- Up to 9 semester hours may be at the MSE 500 level
- A full time graduate student is required to be registered for 1 credit hour of MSE 601 Materials Science and Engineering Seminar for fall and spring semester, up to 2 hours of seminar can be applied to the MSMe degree
- The student must complete 3 semester hours of MSE 698 Non-Thesis Research, involving an on-site research project (usually taken after completion of all coursework)
- The remaining hours must be Materials Science and Engineering courses (MSE) at the 601+ level in consultation with the Program Director

**Plan II (Non-Thesis Option): Fast Track**

This plan is open to undergraduate students in materials engineering within 48 hours of graduation with at least 15 hours of coursework completed at UAB. The student must successfully complete at least 35 semester hours of (primarily) materials engineering graduate work. Students are expected to complete six semester hours of graduate level coursework prior to completing their bachelor degree.

- 15 to 21 hours are required within the MSE department at the graduate level
- 9 to 12 hours of business related courses – students may focus these courses in several areas: business administration, management, entrepreneurship, or engineering liability/law
- Up to 6 hours may be completed by participation in an internship opportunity. This is an option and not a requirement. If internships are conducted for credit, each discipline will have requirements associated with the internship.

- A full time graduate student is required to be registered for 1 credit hour of MSE 601 Materials Science and Engineering Seminar for fall and spring semester, up to 2 hours of seminar can be applied to the MSMe degree
- The remaining hours must be Materials Science and Engineering courses (MSE) at the 601+ level in consultation with the Program Director

**PhD Program**

The PhD program in Materials Engineering is offered jointly with the Department of Metallurgical and Materials Engineering at the University of Alabama (Tuscaloosa).

**Admission Requirements**

In addition to the general Graduate School admission requirements, requirements for admission to the Materials Engineering PhD program include the following:

- 3.0 (A = 4.0) or better GPA on all undergraduate degree major courses attempted
- The GRE general test is required for all applicants who do not have significant post baccalaureate experience. A score of 156 or higher on the on the quantitative section of the GRE is recommended for admission.
- Personal statement identifying research interest
- CV/Résumé
- 3 recommendations from academic or professional contacts
- Official transcripts from each institution where college credit was received to be mailed to:
  UAB Graduate School
  LHL G03; 1720 2
  Birmingham, AL 35294-0013

Institutions can also submit official transcripts electronically by choosing University of Alabama at Birmingham – Graduate Admissions or using the gradschool@uab.edu.

**Additional International Requirements**

- For applicants whose first language is not English, TOEFL score of 80 or higher (with a minimum score of 18 on each subsection) OR IETLS score of 6.5 or higher (Institution code – 1856. Applicable for the GRE and TOEFL only)
- Financial Affidavit of Support
- Immigration documentation if currently residing in the US

**Program Requirements**

A baccalaureate degree from a program accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, in materials or metallurgical engineering or in a similarly named engineering program. A student with an undergraduate degree in another field of engineering or in the physical sciences may also be accepted into the Materials
Engineering PhD program. All students will be required to demonstrate competence in fields of study that emphasize the interrelationship among structure, processing, performance, and properties of materials. This can be accomplished by one of the methods described below.

**Preparation Requirements**

A student seeking a graduate degree in Materials Engineering must demonstrate competence at the undergraduate level in the areas of engineering materials, physical behavior of materials, thermodynamics, and mechanical behavior of materials. Students may be exempted from individual courses or examination if they demonstrate that they possess the knowledge from that course, usually with a grade of a "B" or better. However, the burden of proof is on the student. He/she may accomplish this by passing a prerequisite examination on the portion of the following course content depending on the student's academic background. The courses that fulfill the preparatory requirements are:

- MSE 280 Engineering Materials
- MSE 281 Physical Materials I
- MSE 380 Thermodynamics of Materials
- MSE 381 Physical Materials II
- MSE 382 Mechanical Behavior of Materials

**Additional Academic Policies**

Special Topics (590/690/790) courses and Independent Study (591/691/791) courses are reviewed for degree applicability for each program in the School of Engineering. No more than 6 combined hours of Special Topics and/or Independent Study courses will be applied to the PhD without appeal to and approval from the Program Director.

The School of Engineering offers similar courses at the 400/500 and 600/700 levels. While the higher numbered course has more advanced content, there is a significant overlap in topics. Therefore, students are not allowed to take a 500-level or 700-level course for credit if they have previously taken the related 400-level or 600-level course, respectively.

**Coursework for Students with a BS**

For students entering the PhD program with a BS degree, it is expected that they will also earn a Plan II masters degree after completing the required coursework.

The requirements for a PhD student must complete 81 semester hours of (primarily) materials engineering graduate work as a requirement when entering with a BS degree:

- A minimum of 57 semester hours of approved graduate course work in metallurgical engineering, materials engineering, or fields supportive of these
  - 15 semester hours may be at the 500-level
  - At least 6 semester hours but no more than 12 must be in supportive fields, which must include GRD 717 Principles of Scientific Integrity (a maximum of 6 semester hours can be in management)
  - A full time graduate student is required to be registered for 1 semester hour of MSE 701 Materials Science and Engineering Seminar for fall and spring semester, up to 6 semester hours of seminar can be applied to the PhD
  - A student may apply 6 semester hours of MSE 798 Non-Dissertation Research toward the coursework requirement

- Additional coursework may be required at the discretion of the dissertation committee
- A minimum of 24 semester hours in MSE 799 Dissertation Research

**Coursework for Students with an MS**

The PhD student must complete 51 semester hours of materials engineering graduate work as a requirement when entering with a MS degree in Materials Engineering or a closely related field:

- A minimum of 27 semester hours of approved graduate course work in metallurgical engineering, materials engineering, or fields supportive of these
  - 6 semester hours may be at the 500-level
  - At least 3 semester hours but no more than 6 must be in supportive fields, which must include GRD 717 Principles of Scientific Integrity
  - A full time graduate student is required to be registered for 1 semester hour of MSE 701 Materials Science and Engineering Seminar for fall and spring semester, up to 4 semester hours of seminar can be applied to the PhD
  - A student may apply 6 semester hours of MSE 798 Non-Dissertation Research toward the coursework requirement
- A minimum of 24 semester hours in MSE 799 Dissertation Research

**Graduation Requirements**

In addition to completing coursework requirements (above), doctoral students must form a Graduate Dissertation Committee consisting of at least five faculty members, one of whom must be from the Department of Metallurgical and Materials Engineering at the University of Alabama (Tuscaloosa). A student is eligible for admission to candidacy after (1) a written dissertation proposal following the NSF Proposal Preparation and Submission Guidelines and examination on topics related to the student's research has been orally presented to the committee and approved and (2) completion of GRD 717 Principles of Scientific Integrity. Admission to candidacy must take place at least two semesters before the student may graduate. A written dissertation embodying the results of the student's original research must then be publicly defended, approved by the committee, sent to a department-approved proofreader, and submitted to the Graduate School with edits incorporated.