

Materials Engineering

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| Degrees Offered | MSMtE, Materials Engineering PhD |
| Website | https://www.uab.edu/engineering/mme/graduate/phd-program |
| 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 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, energy, defense, 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:

1. A baccalaureate degree 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.
2. An undergraduate GPA of 3.0 or better on a 4.0 scale on all degree major courses attempted
3. GRE is not required
4. International applicants must submit English proficiency scores in accordance with UAB Graduate School requirement. [Click here for details](#)

UAB offers Accelerated Bachelor's / Master's and Early Acceptance. To learn more about these programs, including requirements and how to apply, visit the [Graduate School's ALO page](#).

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 UAB undergraduate GPA and complete the following per-requisite courses: EGR 265 or MA 227, MSE 280, MSE 281, MSE 380, MSE 381, MSE 382.

For more information about Early Acceptance opportunities, [click here](#).

Accelerated Bachelor's / Master's

students pursuing a BS degree in Materials Engineering at UAB. The following courses are approved for shared credit for students pursuing an ABM in MSE. A successful graduate of ABM will earn both a bachelor's degree and a master's degree in MSE from the University of Alabama at Birmingham in an accelerated timeframe compared to the independent completion of the two degrees.

Graduate courses allowed for credit sharing are: MSE 501, MSE 505, MSE 508, MSE 509 / MSE 509L, MSE 513, MSE 530 / MSE 530L, MSE 533, MSE 545, MSE 562, MSE 564 / MSE 564L, MSE 565 / MSE 565L, MSE 570 / MSE 570L, MSE 574

Preparation Requirements

All students will be required to demonstrate competence at the undergraduate level in engineering materials, physical behavior of materials, thermodynamics, and mechanical behavior of materials as well as in fields of study that emphasize the interrelationship among structure, processing, performance, and properties 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 or by one of the two options be.

This can be accomplished by one of the methods described below.

1. Successful completion (minimum grade of B) of MSE 280 Engineering Materials, MSE 281 Physical Materials I, MSE 380 Thermodynamics of Materials, MSE 381 Physical Materials II, and MSE 382 Mechanical Behavior of Materials;
2. Successful completion (minimum grade of B) of a prerequisite examination on the content of the courses listed above; or
3. Successful completion (minimum grade of B) of MSE 602 Intro to Thermodynamics and Mechanics of Materials and MSE 605 Introduction to Physical Materials

| Requirement | Fulfilled By: |
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| Deadline for Entry Term(s) | Fall: August 1; Spring: December 1; Summer: May 1 |
| Deadline for All Application Materials to be in the Graduate School Office | Seven business days before term begins |

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 MSMtE degree requires completion of at least 30 credit hours of graduate work as well as research integrity training according to the following guidelines:

- 12 credit hours of Materials Science and Engineering and no more than 9 credit hours of courses (MSE) at the 500 level. The remaining hours of coursework must be Materials Science and Engineering courses (MSE) at the 602+ level in consultation with the student's thesis committee.
- Up to 6 credit hours of approved mathematics, physical sciences, another engineering discipline or management courses (a maximum of 3 credit hours in a management course is allowed).
- 3 credit hours of MME 601 Mechanical and Materials Engineering Seminar
- Online modules covering the 9 topic areas of Responsible Conduct of Research (RCR) research integrity, which can be accessed online at <https://www.citipprogram.org>.
- 9 credit hours of after MSE 699 Thesis Research 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. 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 33 credit hours of (primarily) materials engineering graduate work including 30 credit hours of courses and 3 credit hours of MSE 698 Non-Thesis Research

- 18-21 credit hours of Materials Science and Engineering and no more than 9 credit hours of courses (MSE) at the 500 level. The remaining hours of coursework must be Materials Science and Engineering courses (MSE) at the 602+ level in consultation with the Program Director.
- 3-6 credit hours of approved mathematics, physical sciences, another engineering discipline or management courses (a maximum of 3 credit hours in a management course is allowed).
- 3 credit hours of MME 601 Mechanical and Materials Engineering Seminar
- Online modules covering the 9 topic areas of Responsible Conduct of Research (RCR) research integrity, which can be accessed online at <https://www.citipprogram.org>.
- 3 credit hours of MSE 698 Non-Thesis Research, involving an on-site research project (usually taken after completion of all coursework)

Plan II (Non-Thesis Option): Fast Track

This plan is open to undergraduate students in materials engineering within 48 credit hours of graduation with at least 15 credit hours of coursework completed at UAB. The student must successfully complete

at least 35 credit hours of (primarily) materials engineering graduate work. Students are expected to complete 6 credit hours of graduate level coursework prior to completing their bachelor degree.

- 15 to 21 credit hours are required within the MSE department at the graduate level
- Up to 9 credit hours of business related courses – students may focus these courses in several areas: business administration, management, entrepreneurship, or engineering liability/law
- Up to 3 credit 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.
- 3 credit hours may be in safety engineering (ASEM) courses
- 3 credit hours of MME 601 Mechanical and Materials Engineering Seminar
- The remaining hours must be Materials Science and Engineering courses (MSE) at the 602+ 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:

- A baccalaureate degree 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.
- An undergraduate GPA of 3.0 or better on a 4.0 scale on all degree major courses attempted or junior or senior students in good standing with a minimum GPA of 3.0 on a 4.0 scale in an engineering undergraduate degree program (undergraduate degree must be earned prior to matriculation)
- Personal statement identifying research interest
- CV/Résumé
- 3 recommendations from academic or professional contacts
- Original transcripts from all colleges and universities attended since high school must be sent directly to the UAB Graduate School (detailed instructions are included during the online application process)
- International applicants must submit English proficiency scores in accordance with UAB Graduate School requirement. [Click here for details](#)
- GRE is not required

Preparation Requirements

All students will be required to demonstrate competence at the undergraduate level in engineering materials, physical behavior of materials, thermodynamics, and mechanical behavior of materials as well as in fields of study that emphasize the interrelationship among structure, processing, performance, and properties 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 or by one of the two options be.

This can be accomplished by one of the methods described below.

1. Successful completion (minimum grade of B) of MSE 280 Engineering Materials, MSE 281 Physical Materials I, MSE 380 Thermodynamics of Materials, MSE 381 Physical Materials II, and MSE 382 Mechanical Behavior of Materials;
2. Successful completion (minimum grade of B) of a prerequisite examination on the content of the courses listed above; or
3. Successful completion (minimum grade of B) of MSE 602 Intro to Thermodynamics and Mechanics of Materials and MSE 605 Introduction to Physical Materials

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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

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

PhD students must complete 72 credit hours of (primarily) materials engineering graduate work as a requirement when entering with a BS degree according to the guidelines below:

- A minimum of 48 credit hours of approved graduate coursework in metallurgical engineering, materials engineering, or approved supportive fields. Of 48 credit hours
 - at least 15 credit hours may be at the 700-level MSE courses
 - 3 credit hours of GRD 717 Principles of Scientific Integrity
 - 6 credit hours but no more than 12 can be in supportive fields (a maximum of 6 credit hours can be in management)
 - 3 credit hours of MME 701 Mechanical and Materials Engineering Seminar
- A student may apply 6 credit hours of MSE 798 Non-Dissertation Research toward the coursework requirement
- Additional coursework from MSE may be required at the discretion of the dissertation committee; no more than 15 hours of 500-level courses will apply to the degree

- A minimum of 24 credit hours in MSE 799 Dissertation Research after admission to candidacy

Coursework for Students with an MS

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

- A minimum of 27 credit hours of approved graduate course work in metallurgical engineering, materials engineering, or fields supportive of these
 - at least 12 credit hours may be at the 700-level MSE courses
 - 3 credit hours of GRD 717 Principles of Scientific Integrity
 - 6 credit hours but no more than 12 can be in supportive fields (a maximum of 6 credit hours can be in management)
 - 3 credit hours of MME 701 Mechanical and Materials Engineering Seminar
 - A student may apply 3 credit hours of MSE 798 Non-Dissertation Research toward the coursework requirement
- A minimum of 24 credit hours in MSE 799 Dissertation Research after admission to candidacy

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). Admission to candidacy must take place at least two semesters before the student may graduate. A student is eligible for admission to candidacy after successfully completing the following:

1. A written examination on topics related to the student's research
2. An oral dissertation proposal
3. A written dissertation proposal (following the NSF Proposal Preparation and Submission Guidelines),
4. Completion of GRD 717 Principles of Scientific Integrity.

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.