

# Materials Science and Engineering - Graduate Programs

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## Objective

The graduate program in materials science and engineering is designed to provide students with a fundamental understanding of phenomena occurring in materials and their associated chemical, electrical, mechanical, and physical properties. The master's program prepares students for professional careers in materials science and engineering or for additional studies at the doctoral level.

Candidates for a master's or doctoral degree may elect programs emphasizing metals, polymers, ceramics, composite materials, or electronic materials, as well as a number of other areas. Although the program is administered through the College of Engineering, it is broadly interdisciplinary, actively involving faculty in both the College of Science and the College of Engineering. In addition to materials science and engineering courses, applicable courses are in the disciplines of aerospace engineering, biomedical engineering, chemistry, civil engineering, computer science engineering, electrical engineering, mechanical engineering, and physics.

## Continuation

The Materials Science and Engineering Graduate Program, in fulfillment of its responsibility to graduate highly qualified professional engineers and scientists, has established certain policies and procedures. In addition to the requirements of the Graduate School listed elsewhere in this catalog, to continue in the program each materials science and engineering graduate student must:

- a. Maintain at least a B (3.0) overall GPA in all coursework, and
- b. Demonstrate suitability for professional practice.

At such time as questions are raised by materials science and engineering graduate faculty regarding either of the above, the student will be notified and will be given the opportunity to respond to the Committee on Graduate Studies for Materials Science and Engineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

## Admission Requirements

Applicants for the master's degree must have either a baccalaureate or master's degree in engineering or science. Applicants who have completed a bachelor's degree and wish to pursue a doctoral degree without completing a master's degree may apply for admission into the B.S. to Ph.D. Track (p. 3). All applicants must meet the general requirements of the University as stated in the Graduate Admissions (<http://catalog.uta.edu/academicregulations/admissions/graduate/>) section of the catalog. Applicants not meeting all criteria may be admitted on a provisional or probationary basis.

For applicants with no prior training in engineering or with insufficient undergraduate materials coursework, the same minimum criteria will apply. Additionally, their records will be reviewed in relation to their materials backgrounds, and probationary status with specific remedial work required may be a basis for acceptance of such applicants.

The UT Arlington Materials Science and Engineering Program uses the following guidelines in reviewing applicants for admission to its master's degree program.

## Unconditional Admission

An applicant will be considered for unconditional admission into the Materials Science and Engineering Program master's degree program if he/she meets the following requirements.

- a. Minimum undergraduate GPA of 3.0 in the last 60 hours of undergraduate work in an appropriate engineering or science discipline. (For some international applicants where GPA calculation based on a 4.0 scale is not performed, a minimum performance level of 70 percentile is expected. This minimum expectation may be higher for some countries, where less stringent grading criteria are used.) Performance in core materials-related courses is of particular importance.
- b. A GRE score of at least 146 (verbal) and 155 (quantitative). For those applicants whose GRE verbal score falls below 146, high TOEFL scores may be considered to offset the GRE verbal score.
- c. An applicant whose native language is not English must meet the minimum university English language requirements as detailed in the general admission requirements section of the catalog. However, meeting the minimum requirement does not guarantee admission. The program will give preference to students with a TOEFL iBT total score of 84 with sectional scores of 22 for writing, 21 for speaking, 20 for reading, and 20 for listening or an IELTS score of 6.5.

## Probationary Admission

Probationary admission into the Materials Science and Engineering Program master's program may be permitted when an applicant meets the general admission requirements of the University and at least one of the first two requirements for unconditional admission. Non-native speakers of English TOEFL or IELTS scores will also be considered and must meet or exceed University minimum standards as described above.

## Provisional Admission

An applicant who is unable to supply all required documentation prior to the admission deadline, but who otherwise appears to meet admission requirements, may be granted provisional admission.

## Deferred

If an applicant does not present adequate evidence of meeting admission requirements, the admission decision may be deferred until admission records are complete or the requirements are met.

## Denial of Admission

A candidate may be denied admission if he/she fails to meet at least one of the first two criteria for unconditional admission or unacceptable scores on the TOEFL or IELTS.

## Waiver of Graduate Record Exam

The Graduate Record Examination (GRE) requirement for admission has been temporarily waived for all students applying to start their studies in Fall 2023, Spring 2024, or Fall 2024. Once this accommodation ends, applicants for master's degrees may be eligible for a waiver of the Graduate record Exam if they are a UT Arlington graduate who graduated within the past three years and have completed an engineering or science degree closely related to materials science and engineering. This waiver of the GRE applies only to applicants for the master's degree programs. Interested applicants should contact the Materials Science and Engineering Graduate Advisor. To qualify these applicants must have a GPA equal or exceeding 3.0 in each of two calculations:

- a. in the last 60 hours of study and
- b. in all undergraduate coursework completed at UT Arlington.

This Graduate Record Examination waiver may be extended to include non-UT Arlington candidates for master's programs who have undergraduate degrees (with GPA of 3.3 or above) from U.S. universities with an ABET accredited engineering program or other select U.S. universities subject to graduate advisor's approval.

## Eligibility for Scholarships/Fellowships

Students that are admitted will be eligible for available scholarship or fellowship support. Award of scholarships or fellowships will be based on the student's relative standing with respect to other qualified applicants.

## Master's Degree Requirements

### Master of Science (MS) in Materials Science and Engineering:

The MS degree options available are: thesis option and thesis substitute option.

**The thesis option** is a research-oriented degree in which completion of a thesis is mandatory. The program consists of a minimum of 24 credit hours of coursework (a minimum of 18 credit hours in MSE courses) and an acceptable thesis (minimum of six credit hours).

**The thesis-substitute option** requires a minimum of 30 credit hours as specified below:

27 credit hours of coursework (a minimum of 21 credit hours in MSE courses);

3 credit hour MSE 5394 MASTER'S RESEARCH PROJECT IN MATERIALS SCIENCE AND ENGINEERING .

### Master of Engineering (ME) in Materials Science and Engineering:

The Master of Engineering degree is an engineering practice-oriented program requiring a minimum of 30 credit hours. A minimum of 24 credit hours of coursework must be in MSE courses.

MSE 5300: This course must be taken by any students whose academic backgrounds are different from Materials Science and Engineering. An exemption may be granted by the Graduate Advisor if it is determined that the student has a solid foundation for Materials Science and Engineering. The credit for MSE 5300 will not be counted towards the total credits required for graduation. However, the grade of MSE 5300 will be counted in calculating the GPA.

The M.S. and M. Engr. degree programs require successful completion of the following four core courses:

|          |   |   |
|----------|---|---|
| MSE 5304 | ANALYSIS OF MATERIALS                               | 3 |
| MSE 5305 | SOLID STATE PHYSICS AND THERMODYNAMICS OF MATERIALS | 3 |
| MSE 5312 | MECHANICAL BEHAVIOR OF MATERIALS                    | 3 |
| MSE 5321 | PHASE TRANSFORMATIONS OF MATERIALS                  | 3 |

## Admission Requirements

Applicants for the master's or doctoral degrees must have either a baccalaureate or master's degree in engineering or science. Applicants who have completed a bachelor's degree and wish to pursue a doctoral degree without completing a master's degree may apply for admission into the B.S. to Ph.D. Track. The minimum admission requirements to this highly competitive track are the same as those for all doctoral applicants. Doctoral candidates shall also demonstrate through previous academic preparation the potential to carry out independent research in materials science and engineering. All applicants must meet the general requirements of the University as stated in the [Graduate Admissions \(http://catalog.uta.edu/academicregulations/admissions/graduate/\)](http://catalog.uta.edu/academicregulations/admissions/graduate/) section of this catalog. Applicants not meeting all criteria may be admitted on a provisional or probationary basis.

For applicants with no prior training in engineering or with insufficient undergraduate materials coursework, the same minimum criteria will apply. Additionally, their records will be reviewed in relation to their materials backgrounds, and probationary status with specific remedial work required may be a basis for acceptance of such applicants.

The UT Arlington Materials Science and Engineering Program uses the following guidelines in the admission review process:

### Unconditional Admission

An applicants will be considered for unconditional admission into the Materials Science and Engineering Program BS to Ph.D. or Ph.D. programs if he/she meets the following requirements.

- Minimum undergraduate GPA of 3.3 in the last 60 hours of undergraduate work in an appropriate engineering or science discipline. (For some international applicants where GPA calculation based on a 4.0 scale is not performed, a minimum performance level of 75 percentile is expected. This minimum expectation may be higher for some countries, where less stringent grading criteria are used.) Performance in core materials-related courses is of particular importance.
- A GRE score of at least 146 (verbal) and 159 (quantitative). For those applicants whose GRE verbal score falls below 146, high TOEFL scores may be considered to offset the GRE verbal score.
- Three favorable, veracious recommendations, via the university's recommendation form or via recommendation letter.
- An applicant whose native language is not English must meet the minimum university English language requirements as detailed in the general admission requirements section of the catalog. However, meeting the minimum requirement does not guarantee admission. The program will give preference to students with a TOEFL iBT total score of 84 with sectional scores of 22 for writing, 21 for speaking, 20 for reading, and 20 for listening or an IELTS score of 6.5.

### Probationary Admission

Probationary admission into the Materials Science and Engineering BS to PhD or Doctoral Programs may be permitted when an applicant meets the general admission requirements of the University and any two of the first 3 requirements listed above. Non-native speakers of English TOEFL or IELTS scores will also be considered and must meet or exceed University minimum standards as described above.

### Provisional Admission

An applicant who is unable to supply all required documentation prior to the admission deadline, but who otherwise appears to meet admission requirements, may be granted provisional admission.

### Deferred

If an applicant does not present adequate evidence of meeting admission requirements, the admission decision may be deferred until admission records are complete or the requirements are met.

### Denial of Admission

An applicant may be denied admission if he/she has less than satisfactory performance in two out of three of the first three admission criteria or unacceptable scores on the TOEFL or IELTS.

### Waiver of Graduate Record Exam

A waiver of the Graduate record Exam may be considered for a UT Arlington graduate who graduated within the past three years and has completed an engineering or science degree closely related to materials science and engineering. The student's GPA must equal or exceed 3.0 in each of two calculations:

- in the last 60 hours of study and
- in all undergraduate coursework completed at UT Arlington.

The GRE waiver may be extended to include non-UT Arlington candidates that have undergraduate degrees (with GPA of 3.3 or above) from U.S. universities with an ABET accredited engineering program or other select U.S. universities subject to graduate advisor's approval. The waiver of the GRE applies only to applicants for the master's degree programs. Interested applicants should contact the Materials Science and Engineering Graduate Advisor.

## Eligibility for Scholarships/Fellowships

Students that are admitted will be eligible for available scholarship or fellowship support. Award of scholarships or fellowships will be based on the student's relative standing with respect to other qualified applicants.

## Doctoral Degree Requirements

### B.S. to Ph.D. Track

In addition to the requirements listed below for the Ph.D. degree, a B.S.-Ph.D. Track student will be required to enroll in at least three hours of research each semester during the student's first two years, receiving a pass/fail grade (no R grade) in these hours. A B.S.-Ph.D. student must have a faculty research (dissertation) advisor prior to the start of the student's second full semester. A B.S.-Ph.D. student must take the Ph.D. diagnostic examination prior to the start of the student's third full semester.

### Doctor of Philosophy

The Ph.D. degree program involves an interdisciplinary and multidisciplinary approach which requires students to complete a set of Materials Science and Engineering core courses augmented by elective offerings in aerospace engineering, biomedical engineering, chemistry, civil engineering, electrical engineering, materials science, mechanical engineering and physics. The degree is a research degree which requires the candidate successfully to carry out independent research in an area acceptable to the Committee on Graduate Studies for Materials Science and Engineering. A student's research is directed by a faculty member from any of the departments or programs participating in the Materials Science and Engineering Program.

The Ph.D. degree program requires successful completion of the following curriculum components:

- a. A minimum of 24 semester hours of graduate coursework is expected for students entering with an appropriate master's degree or, for highly qualified students, a minimum of 30 semester hours of graduate coursework is expected for student's entering with a bachelor's degree, as approved by the Committee on Graduate Studies for Materials Science and Engineering. Additional coursework may be required by the student's doctoral dissertation committee.
- b. Four core courses or their equivalent are required for all doctoral students:

|                    |   |           |
|--------------------|---|-----------|
| MSE 5304           | ANALYSIS OF MATERIALS                               | 3         |
| MSE 5305           | SOLID STATE PHYSICS AND THERMODYNAMICS OF MATERIALS | 3         |
| MSE 5312           | MECHANICAL BEHAVIOR OF MATERIALS                    | 3         |
| MSE 5321           | PHASE TRANSFORMATIONS OF MATERIALS                  | 3         |
| <b>Total Hours</b> |   | <b>12</b> |

- c. At least four of the following supplemental elective courses must be taken by all doctoral students, as approved by the Committee on Graduate Studies for Materials Science and Engineering. Courses from other disciplines may also be taken, which requires permissions from the Graduate Advisor and student's Supervising Advisor.

|          |   |   |
|----------|---|---|
| MSE 5315 | FATIGUE OF ENGINEERING MATERIALS                      | 3 |
| MSE 5316 | TRIBOLOGY AND LUBRICATION                             | 3 |
| MSE 5320 | NANOSCALE MATERIALS                                   | 3 |
| MSE 5330 | CORROSION SCIENCE AND ENGINEERING                     | 3 |
| MSE 5333 | MAGNETIC PROPERTIES OF MATERIALS                      | 3 |
| MSE 5335 | ELECTRICAL PROPERTIES OF MATERIALS                    | 3 |
| MSE 5341 | TRANSMISSION ELECTRON MICROSCOPY IN MATERIALS SCIENCE | 3 |
| MSE 5345 | CERAMIC MATERIALS                                     | 3 |
| MSE 5350 | INTRODUCTION TO COMPUTATIONAL MATERIALS SCIENCE       | 3 |
| MSE 5347 | POLYMER MATERIALS SCIENCE                             | 3 |
| MSE 5351 | CURRENT TOPICS IN NANOTECHNOLOGY                      | 3 |
| MSE 5352 | SOLAR ENERGY MATERIALS AND DEVICES                    | 3 |
| MSE 5353 | FUNDAMENTALS OF SUSTAINABLE ENERGY                    | 3 |
| MSE 5354 | ELECTRONIC MATERIALS AND DEVICES                      | 3 |
| MSE 5355 | MATERIALS FOR ENERGY                                  | 3 |

Elective courses will be taken by all doctoral students which will allow specialization within a particular academic discipline. Graduate courses in chemistry, physics and engineering will be selected for this purpose in consultation with the student's research advisor, subject to approval by the Committee on Graduate Studies for Materials Science and Engineering.

- MSE 5300: This course must be taken by any students whose academic backgrounds are different from Materials Science and Engineering. An exemption may be granted by the Graduate Advisor if it is determined that the student has a solid foundation for Materials Science and Engineering. The credit for MSE 5300 will not be counted towards the total credits required for graduation. However, the grade of MSE 5300 will be counted in calculating the GPA.

After completion of the first year's coursework (i.e., core courses), students must satisfactorily complete diagnostic examinations which may be written or oral or written and oral with a supplemental interview with faculty members, as determined by the Committee on Graduate Studies in Materials Science and Engineering.

Upon completion of all or nearly all of the coursework requirements and after having demonstrated research ability through partial completion of dissertation research, a student must satisfactorily complete a comprehensive examination.

The dissertation research will be formulated in conjunction with the student's faculty research advisor who may be associated with any of the following academic disciplines participating in the Materials Science and Engineering Program: aerospace engineering, biomedical engineering, chemistry, civil engineering, electrical engineering, materials science, mechanical engineering, and physics. The dissertation research represents the culmination of the student's academic efforts and is expected to demonstrate original and independent research activity and be a significant contribution to knowledge in the field.