Materials Science, MS

Degree: Master of Science
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Program Director: Judith Schneider, Ph.D.

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Program Coordinator: Judith Schneider, Ph.D.

Admission Requirements
General requirements of the Graduate School (see Admissions Information section of this catalog) must be satisfied. In addition, students admitted to the graduate Materials Science Program are assumed to have background training in chemistry, mathematics, physics, and possibly biology and engineering, depending upon the student's research interests. Students should realize that if deficiencies exist, some additional undergraduate courses may be required. The time required to complete the degree may then be proportionately increased.

Program Objective
The objective of the Materials Science program is to educate and enhance student skill sets so that they can participate in meaningful research that supports the research, education, policy, and manufacturing sectors.

The Materials Science M.S. program at The University of Alabama in Huntsville (UAH) is an interdisciplinary masters program that "focuses on the general application of mathematical and scientific principles to the analysis and evaluation of the characteristics and behavior of solids, including internal structure, chemical properties, transport and energy flow properties, thermodynamics of solids, stress and failure factors, chemical transformation states and processes, compound materials, and research on industrial applications of specific materials." The UAH M.S. in Materials Science is not part of the tri-campus program. Students receiving a master's degree in materials science may be based in one of several departments including chemistry, physics, materials engineering, chemical engineering, civil engineering or mechanical engineering. Students may receive their masters in materials science as a precursor to their doctoral program. Although a non-thesis option is available, students are encouraged to pursue the thesis option as it enhances the student's technical skill set, exposes them to new research opportunities and makes them more attractive to employers.

Learning Outcomes
Materials Science students will

- acquire a comprehensive knowledge of materials science at an introductory graduate level,
- perform semi-independent research (M.S. Plan I students), and
- develop project management skills.

Research
Research in Materials Science focuses on the fundamental relations that exist between the structure of materials and properties and the methods for synthesizing and processing these materials. This is known as the materials triangle. A material may be a metal, a ceramic, or a polymer, and it may be dispersed in the solid, liquid or gaseous state. Depending upon the desired application, the structure of the material may have to be investigated at the nuclear, atomic, molecular, granular, or larger length scales. The property that is determined by the structure may be mechanical, electrical, magnetic, optical, thermal, chemical, or biological. Synthesizing may be done by thermal, mechanical, photochemical, electrochemical, or biological processes. Many basic academic disciplines can be fruitfully applied to the solution of materials science problems. Among them, we note particularly chemistry, physics, biology, and engineering. Faculty members guiding students in the Materials Science Program represent all four of these areas.

Master of Science Degree Requirements
General requirements of the Graduate School under Plan I or Plan II must be satisfied. The M.S. degree is a general degree in materials science. As such, it is based upon a core sequence of courses emphasizing areas of materials science, in particular:
Materials Science, MS

- Structure and Properties of Materials
- Characterization and Testing
- Thermodynamics and Processing

Plan I
This plan requires 24 credit hours of graduate coursework in addition to six hours of Master’s Thesis (MTS 699). The 24 credit hours of graduate course work is comprised of six credit hours of core classes listed in addition to 18 credit hours of electives. The elective courses should consist of six credit hours (two courses) each from the subcategories of: Structure and Properties of Materials, Characterization and Testing, and Thermodynamics and Processing. This allows the electives to be tailored to a student’s area of research as selected in consultation with their advisor.

Materials Science Core Courses:
- MTS 601 - Nature of Materials
- MTS 602 - Properties of Materials

Students should also register for MTS 780 (one credit hour) during every semester they are in residence at UAH, although these credits do not apply toward the 30 credit hours required for the M.S. degree.

Additional Information
Of the 18 credit hours of electives, no more than nine credit hours can be below the 600 level. A Program of Study (POS) must be planned in consultation with a member of the materials science faculty serving as an advisor. A list of courses within the approved subcategories can be obtained from the Program Director.

After a student following Plan I selects a thesis topic and research advisor, a supervisory committee will be formed. This committee should consist of three members of the materials science faculty, including the research advisor as Committee Chair (if the research advisor is a full member of the UAH Graduate Faculty). A student must complete a written thesis and successfully defend it by an oral presentation before the supervisory committee.

Plan II
This plan requires 30 or more credit hours of graduate coursework in Materials Science or a related discipline. The 30 credit hours of graduate course work is comprised of six credit hours of the core classes listed in addition to 24 credit hours of electives. The elective courses should consist of six credit hours (two courses) each from the subcategories of: Structure and Properties of Materials, Characterization and Testing, and Thermodynamics and Processing. The remaining six credit hours from be from any of the approved subcategories in addition to any special topics offered. This allows the electives to be tailored to a student’s area of research as selected in consolation with their advisor.

Materials Science Core Courses:
- MTS 601 - Nature of Materials
- MTS 602 - Properties of Materials

Students should also register for MTS 780 (one credit hour) during every semester they are in residence at UAH, although these credit hours do not apply toward the 30 credit hours required for the M.S. degree.

Additional information
Of the 24 credit hours of electives, no more than 12 credit hours can be below the 600 level. A POS must be planned in consultation with a member of the materials science faculty serving as an advisor. A list of courses within the approved subcategories can be obtained from the Program Director.