

# Materials Science, PhD

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<http://matsci.uah.edu> (<http://matsci.uah.edu>)

Degree: Materials Science, Ph.D.

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Interim Program Coordinator: Judith Schneider (EC)

The Materials Science Ph.D. program is novel in that the three University of Alabama System (UAS) campuses offer a joint doctoral degree without the existence of a separate Materials Science Department on any campus of the system. Under this program, faculty members from the various departments on each campus constitute the Materials Science faculty. Participating faculty come from the Departments of Chemical & Materials Engineering, Chemistry, Engineering Mechanics, Metallurgical Engineering, Mineral Engineering, and Physics at UA; from the Departments of Biochemistry, Biomedical Engineering, Biomaterials, Chemistry, Materials Engineering, Optometry, Physics, and the School of Medicine at UAB; and from the Departments of Chemical Engineering, Chemistry, Mechanical and Aerospace Engineering, and Physics at UAH. The program is governed by a Tri-campus Coordinating Committee consisting of faculty members representing each of the three campuses. The UAH faculty contingent is led by the UAH Materials Science Coordinator. Students successfully completing the program will receive a Ph.D. diploma issued jointly by all three universities. Although both science and engineering faculty participate, the curriculum stresses the science of materials, placing special emphasis on materials processing, the production of new materials, and on the application of materials to the needs of technology.

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## Admission Requirements

General requirements of the School of Graduate Studies (see Admissions Information section of this catalog) must be satisfied. Students entering the program are expected to have strong, but diverse, undergraduate training. They will typically have bachelor's degrees in chemistry, chemical engineering, materials science, materials engineering, mechanical engineering, or physics. In order to be successful in this program it is recommended that a student have:

1. A bachelor's degree or its equivalent from an approved college or university in engineering or one of the physical sciences;
2. A minimum B level scholarship overall or over the last 60 semester hours of undergraduate credit;
3. A minimum score of 300 on the Graduate Record Examination.

An applicant whose scholastic record reveals a deficiency may be admitted on a conditional basis as provided in the Graduate School regulations. The student must then follow the Graduate School's policies in achieving unconditional admission status before completing Program Examination I.

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## Program Objective

Materials Science objective is to have our Graduate students attain successful careers and recognition as leaders in industry, government, or academia and in the community within a few years of graduation. Our graduates will demonstrate the ability to create innovative solutions through application of their knowledge base and capacity for critical thinking.

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## Learning Outcomes

Materials Science students will:

- Acquire comprehensive knowledge, skills, and vision for successful careers in materials science and related fields
- Demonstrate the ability to carry out original scholarly research and to defend the scientific concepts in their research specialty
- Lecture their findings of their work

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## Program Examination Requirements

Upon entering the program, the student ordinarily chooses a faculty member to provide guidance on courses and supervise the research for the dissertation. The supervisor chairs a dissertation supervisory committee consisting of no fewer than four additional members. The committee members will be selected based on the student's academic interest and area of research. At least one of the committee members will be from the student's research area at one of the other cooperating universities and another will be a UAH materials science faculty member from a department other than that of the dissertation supervisor. The dissertation committee is charged with supervision and approval of the student's research and progress toward the completion of all requirements leading to the awarding of the degree.

Passage of the preliminary competency examination I is required of all candidates for the Doctor of Philosophy Degree. This is achieved by the student taking at least two courses in each of the three topical areas below within the first 24 months of enrollment into the program as part of the Plan of Study.

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

These courses provide examination of materials and questions that require substantive knowledge of experimental and theoretical topics in materials science. The examinations given in each of these courses are designed to assess the breadth and depth of the students' knowledge. As material science is inherently a multi-disciplinary subject, fulfillment of this course requirement to the specific topic can be met across a variety of courses in different home departments on each of the campuses.

Program Examination II is a comprehensive examination covering the subject of the student's proposed dissertation and consists of two parts. In part one, the student answers written questions submitted by the members of the supervisory committee. In part two, the student describes the plan of his dissertation in an oral presentation before the members of the committee.

Program Examination III is administered by the supervisory committee and consists of an oral presentation and defense of the results of the dissertation. Grading of student performance in Program Examinations II and III is the responsibility of dissertation supervisory committee.

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## Coursework Requirements

A minimum of 48 semester hours of graduate-level coursework plus at least 18 semester hours of MTS 799 (<https://catalog.uah.edu/search/?P=MTS%20799>) are required. A student may transfer up to 24 semester hours of approved graduate coursework toward the 48 semester hour requirement. The student and the dissertation supervisor select courses appropriate to the student's dissertation area and complete a Program of Study. Materials Science, by virtue of being multidisciplinary, enables the student, guided by the advisor, to tailor the courses across departments, colleges, and institutions to meet the graduate education and research needs and interest of the student. Students take courses to prepare for the Program Examination I or to complete their Program of Study as approved by their dissertation advisor.

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## Candidacy and Dissertation Requirements

Admission to candidacy for the doctoral degree will be contingent upon the successful completion of the qualifying exam, called Program Examination II. Normally, a student will be considered eligible to take Program Examination II when all of the required coursework has been completed. After being admitted to candidacy, the student must then complete the remaining requirements for the degree, with the principal remaining requirement involving the doctoral research and dissertation.

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## Residence Requirement

The minimum period in which the doctoral degree can be earned is three full academic years of graduate study. The student must spend the last or penultimate academic year in continuous residence as a full-time graduate student at one of the campuses.

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## Time Limits

The Program Examination I is generally to be completed by all full-time students within two years after first entering the program, with exceptions being made for part-time students.

The Program Examination II is to be attempted within a reasonable time after the Program Examination I. In general, it is to be taken no later than one year prior to submitting an application for graduation.

All requirements for the doctoral degree must be completed within a period of five years after the completion of Program Exam II. Credits earned towards an M.S. or Ed.S. degree may be applied to the doctoral degree provided that they are applicable to the area of specialization or to the core. Dated credits may be accepted if recommended by a student's supervisory committee, the UAH Materials Science Coordinator, and approved by the Graduate School. For application toward this degree, the student may be required to demonstrate competence in the dated coursework.

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## Advisement

Students admitted into the program without having already communicated with a dissertation supervisor will initially be assisted in program planning and other academic matters by a temporary faculty advisor appointed by the Materials Science Coordinator. Also, upon being accepted into the program, students will be assigned to one of the participating departments as their temporary "home" department. They may apply for an assistantship and, if awarded, the teaching or research duties associated with the assistantship will normally be assigned in that department by the department chair. A student may select a dissertation research project in a participating department other than the temporary home department. If the research project is

acceptable to the UAH Materials Science Program Committee, a permanent advisor (normally the research supervisor selected by the student) will be assigned.