

The 5-Year B.S./M.S. in Physics and Materials Science

Qualified senior students at the University of New Hampshire may be admitted to an accelerated five-year program leading to a combined Bachelor of Science degree in Physics and a Masters degree in Materials Science. This program is intended for highly motivated and qualified students who are currently enrolled in the BS Physics program. To be admitted to the program, students should follow “early admission” procedures to the UNH Graduate School. They must apply to the Graduate School during their 6th semester of study (e.g., the Spring semester of the Junior year) and be admitted prior to the start of their 7th semester of study (e.g., the Fall semester of their Senior year) when they will begin to take courses for graduate credit. Admission to the program is only available to undergraduates who meet certain criteria. To be eligible, the student must be: (1) currently enrolled in the Bachelor of Science program/Materials Science Option within the Physics Department, and (2) in good academic standing with a 3.20 cumulative grade point average at the end of the junior year of study.

The following actions *must* be taken by the prospective BS/MS student:

- Enroll in the Physics B.S./Materials Science Option at the end of the sophomore year (enrollment by the end of the Fall semester of the sophomore year is strongly recommended). Follow the Department’s recommendations and requirements for the Materials Science Option. The student’s advisor for the Option must be a Physics Faculty who also is a member of the Materials Science Program.
- Prior to the start of first semester of the senior year, the student must have formally been admitted to the Materials Science Program through the UNH Graduate School using early admission procedures. The requirement for the Graduate Record Examinations (GRE) is waived.
- Take graduate level (800/900 level) coursework in the senior year that will count simultaneously for both the B.S. degree in Physics and the M.S. degree in Materials Science. The Graduate School allows UNH students to pursue two degrees and register for a maximum of 12 credits of graduate-level courses prior to completing their bachelor’s degree. These courses may, upon approval by the Graduate School, count toward both a bachelor’s and master’s degree. Such credit will be granted only for graded course work completed with a grade of “B” or higher.
- Successfully obtain the B.S. degree in Physics/Materials Science Option by the end of the 4th academic year.

The following actions *are strongly encouraged* for prospective 5-year BS/MS students:

- The summer between the student’s junior and senior year should be spent working on a research project that is directed by a faculty of the Materials Science Program. With the approval of his/her B.S. advisor the student may opt to enroll in an off-campus research project that is related to Materials Science. For example, projects supported by UNH’s Hamel Center for Undergraduate Research, or the REU Sites program of the National Science Foundation, would qualify.
- The summer following the student’s senior year should be spent working on a research project that is directed by the student’s prospective M.S. project advisor.

B.S. and M.S. Degree Requirements

For the B.S. in Physics/Materials Science Option degree, all requirements hold as stipulated by the Physics Department.

For the Masters in Materials Science degree, 30 credits of graduate level (800-999) course work, including dual credit courses, must be completed, including at least 6 credits at the 900-level. Up to 12 credits taken before the conclusion of the senior year may be applied to both the B.S. and M.S. requirements.

Courses that satisfy these dual credit requirements include:

- MS 830 Mechanical Behavior Materials (4 cr.)
- MS 831 Fracture and Fatigue Engineering Materials (4 cr.)
- MS 844 Corrosion (4 cr.)
- MS 861 Diffraction and Imaging Methods in Materials Science (4 cr.)
- MS 862 Electronic Materials Science (4 cr.)
- MS 863 Thin Film Science and Technology (4 cr.)
- MS 905 Macromolecular Synthesis (3 cr.)
- MS 910 Macromolecular Characterization (3 cr.)
- MS 915 Processing and Properties of Polymer Fluids and Solids (3 cr.)
- MS 965 Advanced Surface & Thin Film Analysis (4 cr.)
- PHYS 818 Introduction to Solid State Physics (4 cr.)
- PHYS 965 Advanced Solid State Physics (3 cr.)

The remaining credit hours of graduate level work shall include each of the following:

- MS 860 Thermodynamics and Kinetics of Materials I (3 cr.)
- MS 961 Thermodynamics and Kinetics of Materials II (3 cr.)
- MS 900 Material Science Seminar (two semesters, 1 cr. each)
- 4 credit hours of additional Materials Science Program approved coursework, to be chosen in conjunction with the MSP advisor. The course(s) must be chosen such that, together with the undergraduate courses for which credit was applied toward the M.S. degree, at least one elective from each of the three areas within Materials Science is taken: Characterization, synthesis and processing, and structure/property relationships.
- MS 899 Master's Thesis (two semesters, 3 cr. each). Under certain conditions, described in the Materials Science Graduate Student Handbook, a student may pursue the Master's project option which requires only 3 credit hours of MS 899 but additional course work.

A suggested schedule for the 5-year BS/MS Degree is attached below.

Financial Assistance

Limited financial support for the M.S. component of this combined degree program may be available through University Financial Aid or from the student's project advisor.

Sample schedule for 5-year BS/MS degree in Physics/Materials Science

| Freshman Year | Fall credits | Spring credits |
|---------------------------------------|---------------------|-----------------------|
| Phys 407-408 General Physics I and II | 4 | 4 |
| Math 425-426 Calculus I and II | 4 | 4 |
| Chem 403-404 General Chemistry | 4 | 4 |
| English 401 Freshman English | - | 4 |
| Gen Ed Elective | 4 | - |
| Totals | 16 | 16 |

| Sophomore Year | Fall credits | Spring credits |
|-----------------------------------------------|---------------------|-----------------------|
| Phys 505 General Physics III | 4 | - |
| Phys 508 Thermodynamics & Statistical Mech. | - | 4 |
| Phys 615 Introduction to Mathematical Physics | - | 4 |
| Math 525-526 Linearity I and II | 4 | 4 |
| CS 410 Introduction to Scientific Programming | 4 | - |
| ME 561 Introduction to Materials Science | - | 4 |
| Gen Ed Elective | 4 | - |
| Totals | 16 | 16 |

| Junior Year | Fall credits | Spring credits |
|-------------------------------------------------------|---------------------|-----------------------|
| Phys 605 Electronics Laboratory | 5 | - |
| Phys 616 Physical Mechanics | 4 | - |
| Phys 701 Quantum Mechanics I | - | 4 |
| Phys 703 Electricity and Magnetism I | - | 4 |
| ME 730 Mechanical Behavior of Materials ¹⁾ | 4 | - |
| ME 760 Physical Metallurgy ¹⁾ | 4 | - |
| Gen Ed Electives | - | 8 |
| Student applies to Grad School ²⁾ | | x |
| Totals | 17 | 16 |

Recommended: During the summer student works on a research project, on or off campus

| Senior Year | Fall credits | Spring credits |
|-----------------------------------------------------------|---------------------|-----------------------|
| Phys 705 Modern Physics Lab | - | 4 |
| Electives in Option (800/900-level courses) ³⁾ | 8 | 4 |
| Gen Ed Electives | 4 | 4 |
| Phys 795 Independent Study | 4 | - |
| Phys 799 Thesis | - | 4 |
| Totals | 16 | 16 |

Required: During the summer student works on a research project (on campus)

| Fifth Year | Fall credits | Spring credits |
|--------------------------------------------------------|---------------------|-----------------------|
| MS 900 Materials Science Seminar | 1 | 1 |
| MS 860/MS961 Thermodynamics & Kinetics of Materials | 3 | 3 |
| MS 899 Master's Thesis | 3 | 3 |
| Elective in Materials Science ⁴⁾ | 4 | - |
| Totals ⁵⁾ | 11 | 7 |

- 1) If ME 730 and/or ME 760 are not offered during this year, student should take one or two of the courses listed under (3) but with 700-designation, e.g. Phys718, MS 762 or ME 731. ME 730 and/or ME 760 may then be taken during the senior year (designation MS 830 and/or MS 860, respectively).
- 2) Student applies to Graduate School during their 6th semester of study
- 3) Three electives in Option at 800-level or above. Examples:
MS 831 Fracture and Fatigue
MS 844 Corrosion
MS 861 Diffraction and Imaging Methods in Materials Science
MS 862 Electronic Properties of Materials
MS 863 Thin Film Science and Technology
MS 905 Macromolecular Synthesis
MS 910 Macromolecular Characterization
MS 915 Processing and Properties of Polymer Fluids and Solids
MS 965 Advanced Surface & Thin Film Analysis
PHYS 818 Introduction to Solid State Physics
PHYS 965 Advanced Solid State Physics (has prerequisites!)
- 4) This course, chosen from the list above, may be taken in the spring semester instead. It should be chosen to meet the requirements for at least 6 credits at the 900-level (including MS 961), and at least one 800/900 level course each in the areas of synthesis, characterization and properties.
- 5) Total of 18 credits in the 5th year, plus 12 credits for 800/900-level courses taken during the 4th year for a total of 30 credits of graduate level course work.