

ENGINEERING AT THE NANO-SCALE

Degree Requirements

Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

The non-thesis residence-based Master of Science (M.S.) degree in Engineering at the Nano-scale is a one-year program. Students are required to start the program in the fall semester and complete their degree requirements, including all required course work and three credits of research resulting in a scholarly paper, and graduate by the end of summer following the second semester. The plan of study is as follows:

- Fall semester: 12 credits of course work+ 1 credit of ESC 596
- Spring semester: 12 credits of course work + 1 credit of ESC 596
- Summer semester: 3 credits of course work + 1 credit of ESC 596

At least 30 graduate credits must be earned, of which 18 must be from 500-level lecture/laboratory courses approved by the department. No more than 9 credits may be earned from 400-level courses including the required core course ESC 412.

| Code | Title | Credits |
|-------------------------------|---|-----------|
| Required Courses | | |
| ESC 412 | Nanotechnology: Materials, Infrastructure, and Safety | 3 |
| ESC 520 | Engineering at the Nano-scale | 3 |
| ESC 521 | Pattern Transfer at the Nano-scale | 3 |
| ESC 522 | Fabrication and Characterization for Top-down Nano-manufacturing | 3 |
| ESC 523 | Fabrication and Characterization for Bottom-up Nano-manufacturing | 3 |
| Electives | | 12 |
| Culminating Experience | | |
| ESC 596 | Individual Studies (3 semesters of 1 credit each) | 3 |
| Total Credits | | 30 |

As the culminating experience, students must write a scholarly paper incorporating at least one area represented in the course work, upon successful completion of which 3 total credits of ESC 596 will be earned. The scholarly paper must demonstrate the student's capability to integrate and apply concepts and techniques learned in the courses and thereby demonstrate the technical, environmental, ethical, and safety knowledge needed to practice engineering at the nano-scale. This scholarly paper should reflect the high quality of research required to meet the Engineering Science and Mechanics M.S. degree standards, as determined by the ESM Graduate Officer and the ESM Graduate Curriculum Committee. Students who need more time to complete the final paper may extend the submission due date after the third semester (summer). The degree will be granted after the paper has been reviewed and approved, and all degree requirements have been met. Students are not required to remain in residence while they complete the final paper.