College of Earth and Mineral Sciences

Department of Materials Science and Engineering

The Pennsylvania State University

GRADUATE STUDENT HANDBOOK

Accelerated Master of Science in Materials Science and Engineering

August 2021

The Department of Materials Science and Engineering (MatSE) in the College of Earth and Mineral Sciences is pleased to offer a one-year, residence-based, non-thesis Master of Science degree in Materials Science and Engineering (M.S. MatSE). This rigorous, interdisciplinary program requires 30 credits for completion and culminates in a residential research project, poster presentation, and a scholarly paper.

I. Course Offerings and Schedule

A total of 30 credits is required for the completion of the proposed M.S. MatSE degree.

The complete program is as follows.

Course Abbreviation and Number	Course Title	Number of Credits	Semester Offered
Core classes:			
MATSE 501	Thermodynamics of Materials	3	Fall
MATSE 504	Solid State Materials	3	Fall
MATSE 590	Colloquium	1	Fall
MATSE 512/ GEOSC 512	Principles of Crystal Chemistry	3	Spring
MATSE 582	Materials Science and Engineering Professional Development	1	Fall
MATSE 596	Individual Studies	1	Fall
MATSE 596	Individual Studies	1	Spring
MATSE 596	Individual Studies	4	Summer
Students must choose one of the following two required electives:			

MATSE 542	Polymeric Materials: The Solid State	3	Fall
MATSE 503	Kinetics of Materials Processes	3	Spring
Elective MatSE classes:			
MATSE 506	Interfacial Electrochemical Processes	3	Spring
MATSE 507/ BIOE 517	Biomaterials Surface Science	3	Fall
MATSE 510	Surface Characterization of Materials	3	Spring
MATSE 514	Characterization of Materials	3	Fall
MATSE 525	Communicating Topics in Materials Science	3	Fall
MATSE 530	X-Ray Crystallography and Diffraction	3	Spring
MATSE 535	Geometrical Crystallography	3	Fall
MATSE 545/ EE 545	Semiconductor Characterization	3	Fall
MATSE 555/ PHYS 555	Polymer Physics I	3	Spring
MATSE 556	Polymer and Composite Materials for Additive Manufacturing	3	Fall
MATSE 560/ MN PR 507	Hydrometallurgical Processing	3	Spring
MATSE 565	Metals in Electronics	3	Spring
MATSE 400	Crystal Chemistry	3	Fall
MATSE 401	Thermodynamics of Materials	3	Fall
MATSE 402	Materials Process Kinetics	3	Spring
MATSE 403	Biomedical Materials	3	Fall
MATSE 404	Surfaces and the Biological Response to Materials	3	Spring
NUC E 409/ MATSE 409	Nuclear Materials	3	Fall

MATSE 411	Processing of Ceramics	3	Fall
MATSE 412	Thermal Properties of Materials	3	Spring
MATSE 413	Solid State Materials	3	Spring
MATSE 415	Introduction to Glass Science	3	Fall
MATSE 417	Electrical and Magnetic Properties	3	Spring
MATSE 419	Computational Materials Science and Engineering	3	Spring
MATSE 421	Corrosion Engineering	3	Fall
MATSE 422	Thermochemical Processing	3	Spring
MATSE 425	Processing of Metals	3	Fall
MATSE 426	Aqueous Processing	3	Spring
MATSE 427	Microstructure Design of Structural Materials	3	Spring
MATSE 430	Materials Characterization	3	Fall
MATSE 435	Optical Properties of Materials	3	Spring
MATSE 436	Mechanical Properties of Materials	3	Fall
MATSE 440/ E MCH 440	Nondestructive Evaluation of Flaws	3	Spring
MATSE 441	Polymeric Materials I	3	Fall
MATSE 445	Thermodynamics, Microstructure, and Characterization of Polymers	3	Fall
MATSE 446	Mechanical and Electrical Properties of Polymers and Composites	3	Fall
MATSE 447	Rheology and Processing of Polymers	3	Spring
MATSE 450	Synthesis and Processing of Electronic and Photonic Materials	3	Fall
MATSE 455	Properties and Characterization of Electronic and Photonic Materials	3	Spring
MATSE/475 ESC/475	Particulate Materials Processing	3	Spring

It is also possible for students to take upper 400 and 500 level courses from other Departments at Penn State in subjects that are relevant to materials science and engineering and the student's research focus.

At least 18 credits must be in 500-level courses and the remaining credits may be at the 400 or 800 level. A professional development course on ethics in research is required in the fall, a 1-credit course of individual study for the development of a research project is required in the fall and spring, and a 4-credit course of individual study for the development of a research project is required in the summer.

Altogether, 15 credits of formal coursework must be from MATSE courses, with the remaining credits coming from formal courses offered by either MatSE or other Departments at Penn State that are relevant to the student's specialization.

A suggested schedule is shown below.

Fall (12 credits)

- MATSE 501 (3)
- MATSE 582 (1)
- MATSE 590 (1)
- MATSE 596 (1)
- MATSE 542 (3) – or a 3-credit elective, if the student chooses to take MATSE 503 (3) instead
- Elective 1 (3)

Spring (14 credits)

- MATSE 512 (3)
- MATSE 596 (1)
- MATSE 590 (1)
- MATSE 503 (3) – or a 3-credit elective, if the student has taken MATSE 542 (3) instead
- Elective 2 (3)
- Elective 3 (3)

Summer 2 (4 credits)

- MATSE 596 (4)

II. Research and Expectations

The culminating research experience takes place under the supervision of faculty within the Department of Materials Science and Engineering. These faculty have the responsibility for technical oversight of the work performed by the students and guide the students as they write the scholarly paper. The students are responsible for working with the supervising faculty on their project and carrying out the proposed research in the fall, spring and summer semesters.

To ensure that the students have a high-quality research experience and may begin to prepare for their research project as soon as possible, a Graduate Adviser, currently Prof. Susan Sinnott, meets

with the students at the start of the fall semester, ensures that they find supervising faculty for their research projects, and monitors their progress via weekly progress reports that are submitted to both the Graduate Adviser and the supervising faculty. In addition, the students meet with the Graduate Advisor in monthly in-person meetings.

At the end of the summer semester on **July 29, 2022**, the students present the results of their research projects in a poster session and submit the final drafts of their scholarly papers to both the supervising faculty and to the Graduate Adviser. The entire Department is invited to the poster session to interact with the students and view the posters. Both the posters and papers will be evaluated by the Graduate Adviser and a committee of faculty who will grade their work on a pass/fail basis.

All the scholarly papers are published on Scholars Sphere at Penn State and may additionally be submitted for publication to a peer-reviewed journal. Students who plan to publish their work in a journal will be able to delay access to their papers on Scholars Sphere until after publication. Students who need more time to complete their scholarly paper will be allowed to complete the paper, have it reviewed, and approved after the summer semester has ended. Students will not be required to remain in residence while they complete the scholarly paper. However, extensions granted to students in the program will comply with the Penn State Graduate Council policy on deferred grades.

III. Graduation

The summer Graduate School commencement ceremony will be held on Saturday, August 13, in the Bryce Jordan Center (if in person) or online. If you plan on participating in this celebratory event in person you should plan on obtaining regalia (cap, gown and hood) from the Penn State bookstore for a M.S. degree in engineering with an orange trim. During the ceremony, you will join other graduating students from the College of Earth and Mineral Sciences.