

# Program Change Request

Date Submitted: 05/20/21 2:24 pm

## Viewing: **MATEMS : Materials Engineering, Master of Science in Materials Engineering**

Last approved: 05/12/20 9:07 am

Last edit: 06/03/21 12:48 pm

Changes proposed by: rickwise

Catalog Pages Using  
this Program

[Microelectronics–Photonics \(MEPH\)](#)  
[Materials Science and Engineering.\(MSEN\)](#)

Submitter: User ID: rickwise Phone:  
575-2875

Program Status Active

Academic Level Graduate

Type of proposal Major/Field of Study

Select a reason for this modification

Making Minor Changes to an Existing Degree (e.g. changing 15 or fewer hours, changing admission/graduation requirements, adding/changing Focused Study or Track)

Are you adding a concentration?

**No** Yes

Are you adding or modifying a track?

No

Are you adding or modifying a focused study?

No

Effective Catalog Year Fall 2022

College/School Code

### In Workflow

1. GRAD Dean Initial
2. GRAD Dean Initial
3. Director of Program Assessment and Review
4. Registrar Initial
5. Institutional Research
6. MSEN Chair
7. ARSC Dean
8. ENGR Dean
9. GRAD Dean
10. Global Campus
11. Provost Review
12. University Course and Program Committee
13. Graduate Committee
14. Faculty Senate
15. Provost Final
16. Provost's Office-- Notification of Approval
17. Registrar Final
18. Catalog Editor Final

### Approval Path

1. 05/20/21 2:45 pm  
Jim Gigantino  
(jgiganti): Approved for GRAD Dean Initial

Graduate School and International Education (GRAD)

Department Code

Materials Science and Engineering (MSEN)

Program Code

MATEMS

Degree

Master of Science in Materials Engineering

CIP Code

2. 05/20/21 2:46 pm  
Jim Gigantino  
(jgiganti): Approved  
for GRAD Dean  
Initial
3. 05/21/21 4:37 pm  
Alice Griffin  
(agriffin): Approved  
for Director of  
Program  
Assessment and  
Review
4. 06/03/21 12:49 pm  
Lisa Kulczak  
(lkulcza): Approved  
for Registrar Initial
5. 06/03/21 1:10 pm  
Gary Gunderman  
(ggunderm):  
Approved for  
Institutional  
Research
6. 06/22/21 2:04 pm  
Rick Wise (rickwise):  
Approved for MSEN  
Chair
7. 06/22/21 3:41 pm  
Jeannie Hulen  
(jhulen): Approved  
for ARSC Dean
8. 06/23/21 4:29 pm  
Norman Dennis  
(ndennis): Approved  
for ENGR Dean
9. 06/23/21 5:46 pm  
Jim Gigantino  
(jgiganti): Approved  
for GRAD Dean
10. 06/24/21 8:19 am  
Suzanne Kenner

(skenner): Approved  
for Global Campus  
11. 06/24/21 8:38 am  
Terry Martin  
(tmartin): Approved  
for Provost Review

### History

1. Mar 13, 2015 by  
Rick Wise (rickwise)
2. Jan 30, 2017 by  
Charlie Alison  
(calison)
3. May 12, 2020 by  
Rick Wise (rickwise)

14.1801 - Materials Engineering.

Program Title

Materials Engineering, Master of Science in Materials Engineering

Program Delivery

Method

On Campus

Is this program interdisciplinary?

Yes

College(s)/School(s)

College/School Name
Fulbright College of Arts and Sciences (ARSC)
College of Engineering (ENGR)

Does this proposal impact any courses from another College/School?

No

What are the total  
hours needed to  
complete the  
program? 33

## Program Requirements and Description

---

## Requirements

**Prerequisites to Degree Program:** Applicants to the program must satisfy the requirements of the Graduate School as described in this catalog and have the approval of the Graduate Studies Committee of the Materials Science and Engineering program.

Candidates have completed an ABET-accredited or equivalent Bachelor of Science degree in engineering (**Washington Accord**) and candidates' academic backgrounds will be evaluated by the Graduate Studies Committee for suitability to the graduate program. To be admitted to graduate study in Materials Engineering without deficiency, candidates are required to have completed a math course sequence through differential equations and an introduction to quantum mechanics through courses such as [PHYS 3603](#) Introduction to Modern Physics, [PHYS 3613](#) Modern Physics, or [CHEM 3504](#) Physical Chemistry I. Other undergraduate deficiencies may be identified during the evaluation process, and degree completion will be contingent on successful completion of these identified deficiencies.

Prospective students from foreign countries in which English is not the native language must submit nationally recognized standardized testing results on written English proficiency for consideration by the Graduate School during the admission process. Students may be given conditional admittance pending demonstration of English language skills in appropriate courses at the University of Arkansas. Students wishing to apply for graduate assistantships that require direct contact with students in a teaching or tutorial role must meet the Graduate School's English Language proficiency test requirements for such GA positions.

**Requirements for the Master of Science in Materials Engineering Degree:** Students choosing this degree program will be assigned an initial adviser upon acceptance to the program. Students will work with the MSEN Program Director to define their M.S. path to best support their career goals after graduation, with three curricula paths available to Materials Engineering students:

**Academic path:** Students who plan to complete an academic campus-based research thesis will take this path, although the research topic may include funding and collaboration with outside technical organizations.

Students who complete all requirements for M.S. graduation, including an independent research project and thesis acceptable to their thesis committee, will be eligible without Graduate Studies Committee review for admission to the Ph.D. program in Materials Science and Engineering.

**Professional path:** Students who plan to enter the technical marketplace after M.S. completion will find this path most beneficial as it requires independent graduate-level research in collaboration with an external technical organization. The research may be in the form of a traditional M.S. six-hour research topic and thesis, or may instead be in the form of two three-hour independent research efforts resulting in written reports with the clarity, style, analysis, and conclusions expected of a journal paper submission. Both the thesis and the written reports will be orally defended before the appropriate student committee. Students in this path will also be required to complete at least one internship of at least six weeks duration to experience a non-academic technical environment. Students completing this path may be considered by the Graduate Studies Committee for admission to the Ph.D. program in Materials Science and Engineering based on the strength of their academic course grades, their independent research depth, and the quality of the written research document.

**Non-thesis path:** Students who are funded by personal resources or by graduate assistantships not associated with research or educational grants may complete an M.S. degree with additional course work in place of independent research. While there may be specific narrow career options where this is an appropriate path, the

Materials Science and Engineering program strongly recommends the Professional or Academic paths as providing a much better overall career preparation for working in a technical position. Students completing this path cannot be accepted into the Ph.D. program in Materials Science and Engineering.

Students will form either a thesis committee or an advisory committee after they have chosen their M.S. path, defined any independent research areas, and have been accepted into a research group if appropriate. A thesis committee will be made up of at least three faculty members, with at least one faculty member each from the Fulbright College of Arts and Sciences and the College of Engineering (the student's research professor will chair the thesis committee). The advisory committee will include at least one member of the Graduate Studies Committee, the supervising faculty member for a research experience, and one additional faculty member. If the student is in the Professional path, then either committee must also include at least one technical professional from the partner external organization as an adjunct faculty member or an ex officio committee member. Students in this degree program can choose an Academic path, a Professional path, or a Non-thesis path. The course hours to meet the minimum requirements for each paths are as follows:

#### Requirements for the Master of Science Degree

Subject Area	Academic Path/Hours	Professional Path/Hours	Non-Thesis Path/Hours
<del>MEEG 591V Special Topics (Introduction to Manufacturing) (Core)</del>	<del>3</del>	<del>3</del>	<del>3</del>
<b><u>MSEN 5733L Fabrication at the Nanoscale OR ELEG 5243L Microelectronic Fabrication Techniques and Procedures OR ELEG 5293L Integrated Circuits Fabrication Laboratory OR MEEG 5633 Additive Manufacturing</u></b>	<b>3</b>	<b>3</b>	<b>3</b>
<u>MSEN 5322</u> Materials Characterization (Core)	2	2	2
<u>MSEN 5313</u> Fundamentals of Materials Science (Core)	3	3	3
<u>MSEN 5383</u> Research Commercialization and Product Development (Core)	3	3	3
<u>MSEN 5811</u> / <u>MSEN 5911</u> / <u>MSEN 6811</u> / <u>MSEN 6911</u> Operations Management Seminar Series (Core)	4	4	4
<u>MSEN 6323</u> Materials Engineering Design (Core)	3	3	3
Technical Electives from Concentration List	9	9	9
<u>MSEN 600V</u> Research Thesis	6	(Option) 6	0
<u>MSEN 5513</u> Applied Research in External Technical Organizations	Not Available	(Or Option) 3 + Not Available 3	
<u>MSEN 5523</u> Applied On-Campus Collaborative Research with External Technical Organizations	Not Available	(Or Option) 3 + Not Available 3	
<u>MSEN 555V</u> Internship in External Technical Organization or <u>GNEG 5811</u> Alternating Cooperative Education	Optional (hours do not apply to degree requirement)	>= 1	Optional (hours do not apply to degree requirement)

Subject Area	Academic Path/Hours	Professional Path/Hours	Non-Thesis Path/Hours
<a href="#">MSEN 5821</a> Ethics for Scientists and Engineers	1 (Applied in Ph.D. curriculum)	1	1
Additional Technical Elective	0	0	>/=2
<a href="#">MSEN 5253</a> Emerging Technologies in Industry	Recommended in PhD studies	Recommended in PhD studies	3
<a href="#">MSEN 5393</a> Product Development Process	N/A	N/A	3

If a University of Arkansas undergraduate student is pursuing a Bachelor of Science degree in a department that has implemented an accelerated B.S./M.S. program (typically allowing six hours of graduate-level course work to be shared between the two degrees), the student may implement the same acceleration for a B.S. departmental degree/M.S. Materials Engineering degree set. Both the undergraduate department and the MSEN Program Director must approve the shared courses prior to enrollment.

As part of each student's curriculum, nine hours of coursework must be taken through one of the following concentrations. Courses not listed in the concentration list, but clearly pertaining to the concentration area, may be substituted with the approval of the student's research adviser and the MSEN Program Director. Students who have acquired the knowledge contained in any of the required courses through prior education may petition the MSEN Program Director for permission to substitute other classes for these required courses. Additional core courses to develop operations management skills also have been defined for MSEN students. During year one of their graduate studies at the University of Arkansas, students are required to take [MSEN 5811](#) 1st Year Operations Seminar - Infrastructure Management and [MSEN 5911](#) 1st Year Operations Seminar - Personnel Management in the fall and spring semesters and [MSEN 5821](#) Ethics for Scientists and Engineers in their first summer. During year two, students are required to take [MSEN 6811](#) 2nd Year Operations Seminar - Management and Leadership and [MSEN 6911](#) 2nd Year Operations Seminar - Advanced Management and Leadership in the fall and spring semesters, respectively. Students who begin their graduate studies at the University of Arkansas during the spring semester will be required to take [MSEN 5811](#) in the fall semester following their completion of [MSEN 6911](#) or to take [MSEN 5811](#) concurrently with [MSEN 6811](#).

Students are required to attend monthly MSEN Research Communication Seminars during the first three semesters of their M.S. degree program, and will enroll in [MSEN 5611](#) Research Communication Seminar of MS Students in their third semester. Students working more than 20 hours per week in a non-local technology-based professional position approved by the MSEN Director will not be required to be enrolled in this class or attend the monthly seminars as a condition for graduation.

Research thesis hours will be chosen from the student's research adviser's section (MSEN 600V) and will require a written thesis successfully defended in a comprehensive oral exam given by the thesis committee.

A research thesis is required for Academic path students, and is optional for Professional path students.

Professional path thesis research must include direct collaboration with an external technical organization.

A student in the Professional path may substitute two Applied Research efforts for a thesis under

[MSEN 5513](#) (External location) or [MSEN 5523](#) (Internal on-campus location), provided each semester's research is of graduate-level quality and is reported at the end of the semester through a written paper and in an oral

presentation to the advisory committee (note that the written paper must match the clarity, style, analysis, and conclusions expected of a journal paper submission). Regardless of where the research is performed, it must include direct collaboration with an external technical organization.

If a student is taking either a special problems independent study course (such as [MSEN 588V](#)) or a special topics course (such as [MSEN 587V](#)) to meet partial requirements for their M.S. degree, the instructor must supply the MSEN program office with a syllabus of that class to be included in their program records. The syllabus must include at least the course title, semester, instructor name, a list of specific course objectives, a list of student learning outcomes, sources of content knowledge, and method by which the student's mastery of the learning objectives is demonstrated.

Each student is required to enroll in at least one hour of course work each fall and spring semester until the M.S. degree is issued. If all required course work has been completed, the student may enroll in one hour of master's thesis, or in one hour of a special problems course for credit only.

Students should also be aware of Graduate School requirements with regard to [master's degrees](#).

#### Are Similar Programs available in the area?

No

Estimated Student Demand for Program 40

Scheduled Program Review Date **2027-2028** ~~2020-~~  
~~2021~~

Program Goals and Objectives

#### Program Goals and Objectives

1. Provide students with interdisciplinary education and training in materials science and engineering to meet the needs of emerging technology industries.
2. Place students in interdisciplinary groups performing rigorous and challenging research to prepare them for careers in industrial research teams, national labs, and academic positions.
3. Prepare students to be effective in technology management and entrepreneurship.

Learning Outcomes

#### Learning Outcomes

### Learning Outcomes

1. Conduct independent investigations in an interdisciplinary environment, expanding the breadth and depth of state-of-the-art knowledge in the field of materials, materials processing, and devices enabled by advances in materials.
2. Master knowledge, practices, and skills from traditional graduate level programs in Physics, Chemistry, Electrical Engineering, Chemical Engineering, Mechanical Engineering, Biological Engineering, and Biomedical Engineering, regardless of prior traditional educational background.
3. Communicate effectively deep level knowledge of their work to persons well-versed in their field, detailed technical concepts to persons with strong technical backgrounds outside of their field, and general concepts and applications to the general public.
4. Work efficiently in interdisciplinary team environments, fully supporting team goals through active membership or through team leadership as appropriate.
5. Implement intellectual property management and research commercialization processes, encouraging migration of ideas from formulation to societal benefit during their professional careers.
6. Execute duties found in entry-level professional positions with the operational skills equivalent to at least one year's experience in that position.

### Description and justification of the request

Description of specific change	Justification for this change
Replacing a MATEMS core course (MEEG 591V Special Topics - Introduction to Manufacturing) with an option to take one of four courses (MSEN 5733L, ELEG 5243L, ELEG 5293L, MEEG 5633).  Add Washington Accord as clarification of ABET equivalency for admission to MATEMS program.	MEEG 591V (Special Topics - Introduction to Manufacturing) is no longer offered; believe it is important to keep a "make" course as part of the MS core. Approved by faculty at August 31, 2020 faculty meeting.

### Upload attachments

### Reviewer Comments

**Alice Griffin (agriffin) (05/21/21 4:21 pm):** Revised scheduled program review date.

**Alice Griffin (agriffin) (05/21/21 4:22 pm):** ATTENTION REGISTRAR: Please change response to "NO" for adding a concentration.



**Alice Griffin (agriffin) (05/21/21 4:23 pm):** Changed effective date from fall 2021 to fall 2022. It is too late to complete approval for the fall 2021 catalog of studies.

**Alice Griffin (agriffin) (05/21/21 4:37 pm):** Due to the addition of the ELEG and MEEG courses, this minor program change will require campus approval.

**Lisa Kulczak (lkulcza) (06/03/21 12:48 pm):** Updating response to adding a new concentration question--concentrations already exist.