

MATERIALS AND ENERGY SCIENCE AND ENGINEERING (MS)

Master of Science in Materials and Energy Science & Engineering

Unit: Speed School of Engineering (<https://engineering.louisville.edu/>) (GS)

Program Website (<https://engineering.louisville.edu/academics/areasofstudy/materials-and-energy-science/>)

Academic Plan Code: MESEMS, MESEMS_O

Program Information

This program can be completed 100% online (<http://louisville.edu/online/programs/masters/master-of-science-in-materials-and-energy-science-engineering/>).

The Master of Science in Materials and Energy Science and Engineering will offer advanced level training to provide students with in-depth knowledge of materials and energy science and engineering in areas such as materials science and engineering, materials chemistry and physics, processing, energy conversion and storage devices, and systems-level engineering. Student educational experiences will be enhanced by research opportunities in laboratories conducting basic and translational research on solar energy conversion, energy storage, biofuels and biomass conversion, solar fuels, materials characterization, and advanced energy materials. The MS in MESE will prepare students for career tracks in industry such as semiconductor/opto-electronics, catalysts and energy. This degree track will allow students to pursue entrepreneurialism and join government and corporate labs and provides a strong foundation for those wishing to pursue doctoral studies in their respective disciplines.

Degree Requirements

The program of study must be completed with a 3.00 GPA or better for all graduate courses used to satisfy degree requirements. Additionally, the program of study must be completed with a 3.00 GPA or better for all academic work attempted in graduate studies.

The requirements for the Master of Science degree are discussed in more detail in the Degree Requirements (<https://catalog.louisville.edu/graduate/general-policies-procedures-requirements/degree-requirements/>) section of this catalog.

Admission Standards

The admission standards for the Master of Science program in Materials and Energy Science & Engineering are as follows:

1. All admission applications for the program shall include:
 - a. A completed graduate application (<http://louisville.edu/graduate/futurestudents/apply-materials/application/>) for the Graduate School,
 - b. An application fee,
 - c. A current resume,
 - d. Written interest statement describing what motivated you to apply to the MESE program, including previous experience in the field and how this degree will help you fulfill your career goals.
 - e. At least two letters of recommendation, and

f. Official transcript(s) for all previous post-secondary coursework. All transcripts not in English must be certified as authentic and translated verbatim into English.

2. The minimum requirement for admission is the Bachelor's degree in Engineering or an equivalent bachelor's degree in Physics or Chemistry from an accredited university
3. The successful applicant will typically have an undergraduate grade point average of 3.0 or above (on a 4.00 scale).
4. International students whose primary language is not English must show English language proficiency by either TOEFL/IELTS/Duolingo score or demonstration of a degree awarded from an acceptable English language institution. The successful applicant will typically have a TOEFL score of 79 or higher or overall IELTS score of 6.5 or higher or a Duolingo score of 105 or higher.

Program Requirements

Remedial work may be specified for those applicants who, in the opinion of the faculty, do not have a sufficient background. Remedial courses do not count towards the degree.

The minimum curricular requirements for the master's program are:

Code	Title	Hours
MS in Materials and Energy Science & Engineering		
Core Courses		6
MESE 600	Energy Science and Engineering	
MESE 601	Materials Science and Engineering	
Fundamental Courses (Select 3 from the list below) ^{1,2}		9
Energy Processing Courses (Select 2 from the list below) ^{1,2}		6
Energy Conversion Courses (Select 2 from the list below) ^{1,2}		6
Select one of the following Energy Engineering Courses:		3
<i>Project Option</i>		
MESE 690	Master's Project ³	
<i>Course Option</i>		
Energy Engineering Course (Select 1 from list below) ^{1,2}		
Minimum Total Hours		30

The Master of Science degree must be completed with a 3.00 GPA or better for all graduate courses used to satisfy degree requirements. Additionally, the master of science degree must be completed with a 3.00 GPA or better for all academic work attempted in graduate studies.

¹ Courses must be chosen so that at least one-half of the credits counted toward the degree are 600-level.

² Any course substitutes that are not on the current list of approved courses must be approved by the department/faculty advisor.

³ The project can be replaced with an external internship or practicum opportunity. Faculty advisors will assist in developing plans for MESE 690 completion.

Fundamental Courses

Code	Title	Hours
CHEM 621	Electroanalytical Chemistry (On campus only)	3
CSE 532	Python and Data Analytics	3
ECE 542	Semiconductor Device Fundamentals	3

MESE 603	Fundamentals of Electrical, Optical and Thermal Properties of Solid Materials (Online only)	3
MESE 610	Materials Characterization: Microscopy & Diffraction	3
ME 551	Materials for Additive Manufacturing (Online only)	3
ME 685	Computational Modeling of Materials (On campus only)	3
PHYS 575	Solid State Physics (On campus only)	3

Processing Courses

Code	Title	Hours
CHE 581	Chemical Vapor Deposition and Processing	3
CSE 632	Data Mining	3
ECE 543	Fundamentals of Microfabrication and MEMS	3
ISE 600	Additive Manufacturing Processes	3
MESE 622	Roll to Roll Processing	3

Energy Conversion Courses

Code	Title	Hours
ECE 531	Power Electronics	3
MESE 612	Photovoltaics and Solar Fuels	3
MESE 614	Biomass Processing and Biofuels	3
MESE 616	Energy Storage Systems	3
or ME 572	Energy Storage Systems	
MESE 619	Industrial Catalysis	3

Energy Engineering Courses

Code	Title	Hours
MESE 640	Entrepreneurship in Renewable Energy	3
MESE 642	Techno-Economic Analysis and Energy Policy	3
MESE 644	Smart Manufacturing	3