

MSE

Graduate Student Handbook

Department of Materials Science and Engineering, Iowa State University
Revision date – August 27, 2024

Office of MSE Graduate Programs

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Scope and Contents

This handbook outlines the requirements and policies pertaining to graduate degree programs offered by the Department of Materials Science and Engineering (MSE) at Iowa State University (ISU). The information provided is specific to MSE graduate programs and should be considered as supplemental to the information contained within the ISU [Graduate College Handbook](#). Students should be familiar with both documents. Until this document is superseded by a subsequent revision, the requirements outlined herein are applicable to any student whose first term of enrollment in an MSE graduate program is Fall 2022 or later. This includes start dates arising from program transfers within Iowa State University or within the MSE Department. General scope and contents are shown below, by section. Items not covered here include admission requirements, application and pre-enrollment procedures, and postdoctoral appointments.

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1. Graduate Degree Programs in Materials Science and Engineering

The Department offers three graduate degree programs representing a range of opportunities for advanced study. While they share several common features, these programs are designed to serve students with a variety of academic backgrounds, technical interests, and career aspirations. In all three programs, it is expected that our graduate students will acquire fundamental understanding of the structure, properties, processing, and performance of materials, underpinned by the foundational pillars of thermodynamics and kinetics and manifested by the immense landscape of engineered materials and the broad range of physical, chemical, and mechanical functionalities that may be realized in them. Our rigorous but flexible degree programs include classroom instruction, seminars, laboratory training, guided teaching experiences, individually mentored independent study, and various forms of materials research experiences, all intended to serve students with a wide range of educational goals. Students are admitted with undergraduate or prior graduate qualifications in a variety of technical areas, and each academic plan is tailored to meet the needs of the individual student. The accomplishments of our alumni demonstrate that our graduate training enables highly individualized career paths, but specific types of technical employment opportunities are targeted by the components contained within each of our degree programs, as summarized below.

1.1 Master of Engineering in Materials Science and Engineering

Purpose and design of the program: The Master of Engineering (M. Eng.) program in Materials Science and Engineering is a coursework-only degree program intended to provide broad knowledge related to materials processing, structure, properties, and performance, coupled with an understanding of the various materials challenges associated with existing and emerging technologies and industry/business sectors. The program is delivered mainly through classroom-based instruction but may also include laboratory-based courses and/or online courses. The curriculum combines a core of fundamental coursework with a highly flexible set of electives, which may include MSE courses and courses from other fields of study. This flexible coursework-only degree option is intended to provide advanced knowledge of fundamental and contemporary issues in Materials Science and Engineering relevant to a broad range of career paths. This degree option may be well-suited for certain groups of students, for example:

- New or returning B.S. graduates in the field of Materials Science and Engineering or other STEM disciplines, who are interested in an industry-based career and would like to strengthen their position for opportunities or potential advancement in areas of engineering, engineering management, or technical business administration.
- New or returning B.S. graduates in the field of materials or other technical disciplines who are interested in advanced degree options but are uncertain about committing to a longer-term advanced degree program. (Transfers from the M.Eng. to the M.S. or Ph.D. programs are allowed for students who change their plans and meet the respective admissions criteria.)
- New or returning B.S. graduates and graduate students from other technical disciplines who would like to broaden their knowledge and credentials in the area of materials.
- New or returning B.S. or B.A. graduates from non-technical disciplines (e.g. business, law, political science, arts), interested in advanced materials knowledge for application to various sectors of business or public policy.
- Working professionals in technical or related fields interested in part-time pursuit of an advanced degree in the area of materials, including online course options.
- New or working professionals (e.g. law, medicine, government, business, education) seeking complementary expertise and credentials related to materials science. This may involve full or part-time study, including online course options.

Curricular Requirements: The M.Eng. degree program requires a minimum of 30 credits of coursework, including a 6-credit core and a minimum of 12 credits of graduate level MSE elective courses. The remaining 12 credits may be MSE graduate courses or other approved non-MSE courses.

Graduation Requirements: A student will be awarded the M.Eng. degree after all curricular requirements have been satisfied and the student is eligible for graduation according to the policies of the Iowa State University Graduate College.

1.2 Master of Science in Materials Science and Engineering

Purpose and design of the program: The Master of Science (M.S.) program in Materials Science and Engineering is an intensive advanced degree program combining graduate coursework and project-based research. The program is intended to provide broad-based knowledge related to materials processing, structure, properties, and performance, coupled with an understanding of the various materials challenges associated with existing and emerging technologies and industry sectors. The program is delivered mainly through classroom-based instruction but may also include laboratory-based courses and/or online courses. The curriculum combines a core of fundamental coursework and a complement of MSE and non-MSE electives.

Two program options are available, and students enrolled in the MS degree program will select either the *Research Thesis* track or the *Research Portfolio* track. Both tracks include a substantial research component but with different focus.

The *Research Thesis* track provides an opportunity for the student to complete a full-scale research project from beginning to end, including literature review, project design, planning, laboratory and/or computational investigation, data analysis, decision-making, formulation of conclusions, and appropriate reporting of outcomes. The research, culminating in a thesis document, will be conducted under the supervision of a major professor. In this track, the research efforts are aimed at making an identifiable contribution toward solving a relevant problem in a selected area of science and/or engineering. Project success is judged on the scientific soundness of the contribution and the quality with which it is presented in the thesis document and in a final oral presentation/examination.

The *Research Portfolio* track provides an opportunity for the student to complete several separate research projects involving multiple selected topics and methods of experimental and/or computational investigation in accord with their interests. In this track, research is conducted through a sequence of three 3-credit project-based courses, each supervised by a specific faculty member and focused on a different area of research and related methods and analysis techniques. Each project has specific scientific objectives, but the focus of the overall portfolio is for the student to develop expertise in a targeted set of laboratory and/or computational research skills. Assessment is based on practical examinations and documented research results associated with each project. The program also requires a comprehensive presentation and oral examination covering all of the student's project work. Each student's overall program is overseen by a major professor.

The Master of Science degree program may be best suited for the following groups of students. New or returning B.S. graduates from materials programs or other engineering disciplines who are interested in an industry-based career and would like to strengthen their position for opportunities or potential professional advancement in areas of materials testing, applied research, laboratory supervision, or technical management.

- New or returning B.S. graduates who are interested in industry-based materials testing and related laboratory work, including process/product development, quality control, field testing, technical customer service, failure analysis, and applied research.
- New or returning B.S. graduates who are interested in gaining substantial project-oriented research experience while earning an advanced degree but are undecided regarding industry/academic career path and uncertain about committing to the Ph.D. degree program. This degree option serves both pathways. Continuation or transfer from the M.S. program to the Ph.D. programs is certainly possible.
- Engineers or researchers with B.S. or advanced degrees in other fields looking to build substantive expertise in state-of-the-art research methods of materials processing, characterization, analysis, testing, and design.

Curricular Requirements: The M.S. degree program requires a minimum of 32 credits of coursework, including a 9-credit MSE core, a 1-credit core supplement, 3 credits of general graduate electives, and 1 credit of Responsible Conduct of Research in Science and Engineering (GRST 5650). In addition, the *Research Thesis* track requires 6 credits of MSE electives and a minimum of 12 credits of Graduate Thesis Research (MSE 6990). The *Research Portfolio* track requires an additional 9 credits of MSE electives, and 9 credits of research based Creative Component (MSE 5990). See Table 1 for a detailed breakdown of curricular requirements.

Graduation Requirements: A student is awarded the M.S. degree after all curricular requirements have been satisfied and the student is eligible for graduation according to the policies of the Iowa State University Graduate College.

1.3 Doctor of Philosophy in Materials Science and Engineering

Purpose and design of the program: The Ph.D. degree is the highest academic credential in the field. ISU's robust multifaceted program is intended to develop state-of-the-art competencies in academic scholarship, enabling graduates to make high-level career-based contributions in fields related to Materials Science and Engineering. The Ph.D. program combines graduate coursework with intensive and specialized project-based research expected to result in significant reportable scientific contributions in one or more selected areas, as evidenced by publication in peer-reviewed journals, industry standards, patents, or other forms of recognizable technical contributions. This degree option is best suited for students holding degrees (B.S., M.Eng., or M.S.) in Materials Science and Engineering, other engineering disciplines, physical sciences, or mathematics and data analytics, who are interested in careers involving fundamental or applied research of academic caliber. These career paths may include, but are not limited to:

- Tenure-track university academic faculty positions
- Non-tenure-track university research faculty positions
- Research scientist positions at national laboratories or other federal research facilities
- Industry-based research scientist positions or research and development specialists
- Industry or government research leadership and/or laboratory administration
- Private entrepreneurial endeavors and innovative technical enterprises
- Technical consulting positions related to entrepreneurial or legal activities
- Positions in public policy or legislation and related areas of analysis or management.

The Ph.D. program is a research-intensive program in which the student, under the direction of a major professor, undertakes a full-scale project, performing independent original research to address one or more relevant questions or challenges in advanced materials. Through this project, the student contributes to the field in a meaningful way, demonstrated through broad dissemination of research results in avenues such as peer-reviewed technical publications, trade journal articles, conference presentations and proceedings, books and book chapters, technical reports, patents, electronic codes and/or databases, industry standards and specifications, and open access electronic reports. Doctoral research projects are necessarily specialized, but the Ph.D. program is a broad and multifaceted traineeship. Centered around a primary research topic as directed by a faculty advisor, the student engages in a study of the research literature in the subject area and related applications and develops a detailed research plan aimed at answering a set of specific and significant questions. The student proposes a research plan and, after gaining approval from the Thesis Committee, the student performs the planned research under the supervision of the major professor and engages in a broad-based academic/professional development program aimed at building knowledge and high-level skills related to:

- Principles of scholarship - including citation practices, documentation, ethics, etc.
- Research methods – including experimental computational, and/or theoretical research;
- Best practices in technical communication - including field-specific written and oral communication, non-field-specific technical communication;
- Best practices in colloquial science communication – including communication with the general public and representative offices through press releases, news media, social media, and other public channels.
- Principles of project management - including documentation, technical supervision, budgeting, accounting, reporting, etc.
- Principles of laboratory and shop safety - including best practices for hazard control, laboratory management, emergence response, safety management program structure and program administration.

The Ph.D. program includes a robust curriculum, consisting of both a fundamental core and flexible elective program intended to provide the student, in consultation with the major professor, an opportunity to build an academic experience that best complements and reinforces the student's research program and career interests. With evidence of independent contribution to the field, as described above, and after completion of the academic curriculum, the Ph.D. program culminates in the preparation and presentation of a detailed dissertation document, a public oral defense, and a final committee examination (closed to the public).

Curricular Requirements: The Ph.D. degree program requires a minimum of 72 credits of coursework, including a 12-credit MSE core, a 3-credit core supplement, a minimum of 6 credits of MSE electives, 1 credit of Responsible Conduct of Research (GRST 5650), and 36 credits of Thesis Research (MSE 6990). See Table 1 for a detailed breakdown of curricular requirements.

Graduation Requirements: The Ph.D. degree is conferred after all curricular requirements have been satisfied and the student is eligible for graduation according to the policies of the Iowa State University Graduate College.

Table 1. MSE Requirements by degree program

	M.Eng.	M.S. (RP)	M.S. (RT)	Ph.D.
MSE Core:				
MSE 5100	3	3	3	3
MSE 5200	3	3	3	3
MSE 5300		3	3	3
MSE 5400				3
MSE Core Supplement (P/NP):				
MSE 5010	--	1	1	1
MSE 5020	--	--	--	1
MSE 5030	--	--	--	1
GRST 5650	--	1	1	1
Electives:				
MSE Electives (5000 or higher)	12	9	6	6
Free electives (MSE or eligible non-MSE)	12	6	3	3
Other Credits:				
MSE 5990 - Creative Component	--	9	--	--
MSE 6990 - Academic Research	--	--	12	36
Additional elective courses <u>or</u> research credits as necessary to achieve the required credit total for the program.				11
Total Credits:	30	35	32	72

2. Examples of typical academic plans – by degree program

2.1 Master of Engineering (M. Eng)

Example 1: Emphasis in Structural materials and related materials analysis

Year	Sem.	Course	MSE Core	MSE Electives	Other Electives
1	F	MSE 5100 Structure and chemistry of materials	3		
		MSE 5190 Magnetism and magnetic materials		3	
		MSE 5520 Scanning electron microscopy and Auger microanalysis		3	
		MSE 5640 Fatigue and fracture of materials		3	
1	Sp.	MSE 5400 Mechanical behavior of materials	3		
		AERE 4800 Ultrasonic nondestructive evaluation			3
		MSE 5510 Characterization methods in Materials Science		3	
2	F	EE 5100 Topics in electromagnetics			3
		ME 5200 Materials and manufacturing considerations in design			3
		MSE 5810 Computational modeling of materials		3	
Totals			6	15	9

Example 2: Emphasis in Materials for electronic devices

Year	Sem.	Course	MSE Core	MSE Electives	Other Electives
1	F	MSE 5100 Structure and chemistry of materials	3		
		MSE 5190 Magnetism and magnetic materials		3	
		EE 5350 Physics of semiconductors			3
1	Sp.	MSE 5300 Solid state materials science	3		
		MSE 5510 Characterization methods in Materials Science		3	
		MSE 6510 Power diffraction methods		3	
		MSE 6520 Transmission electron microscopy		3	
2	F	EE 5100 Topics in electromagnetics			3
		EE 4370 Electronic properties of materials			3
		MSE 5320 Microelectronics fabrication techniques		3	
Totals			6	15	9

Example 3: Emphasis in Soft and biological materials

Year	Sem.	Course	MSE Core	MSE Electives	Other Electives
1	F	MSE 5100 Structure and chemistry of materials	3		
		MSE 5520 Scanning electron microscopy and Auger microanalysis		3	
		MSE 5530 Physical and mechanical properties of polymers		3	
		BBMB 4040 Biochemistry 1			3
1	Sp.	BIOL 4280 Cell Biology			3
		MSE 5200 Thermodynamics and kinetics of materials	3		
		MSE 5540 Polymer composites and processing		3	
2	F	MSE 5560 Biomaterials		3	
		CHEM 5370 Physical organic chemistry 1			3
		CHEM 5720 Spectrometric identification of organic compounds			3
Totals			6	12	12

2.2 Master of Science (M.S.)

Example 1: M.S. Research Thesis option

Year	Sem.	Course	MSE Core	MSE Core Supp.	MSE Electives	Other	Res.
1	F	MSE 5010 Elements of Materials Science 1		1			
		MSE 5100 Structure and chemistry of materials	3				
		MSE 5200 Thermodynamics and kinetics of materials	3				
		MSE 6990 Research					1
1	Sp.	MSE 5210 Mech. behavior and manuf. of polymers and composites			3		
		MSE 5400 Mechanical behavior of materials	3				
		MSE 5540 Polymer composites and processing			3		
		MSE 6990 Research					2
1	Sum.	MSE 6990 Research					1
2	F	GRST 5650 Responsible conduct of research				1	
		MSE 6990 Research					5
2	Sp.	MSE 5690 Mechanics of composite and combined materials			3		
		MSE 6990 Research					4
Totals			9	1	9	1	13

Example 2: M.S. Research Portfolio option

Year	Sem.	Course	MSE Core	MSE Core Supp.	MSE Electives	Other	Res.
1	F	MSE 5010 Elements of Materials Science 1		1			
		MSE 5100 Structure and chemistry of materials	3				
		MSE 5200 Thermodynamics and kinetics of materials	3				
		GRST 5650 Responsible conduct of research					1
1	Sp.	MSE 5400 Mechanical behavior of materials	3				
		AERE 4800 Ultrasonic nondestructive evaluation				3	
		MSE 5510 Characterization methods in materials science			3		
1	Sum.	MSE 5990 Creative Component					3
2	F	MSE 5520 Scanning electron microscopy and Auger microanalysis			3		
		MSE 5640 Fatigue and fracture of materials			3		
		MSE 5990 Creative Component					3
2	Sp.	MSE 6520 Transmission electron microscopy			3		
		MSE 5990 Creative Component					3
Totals			9	1	12	4	9

2.3 Doctor of Philosophy (Ph.D.)

Year	Sem.	Course	MSE Core	MSE Core Supp.	MSE Electives	Other	Res.
1	F	MSE 5010 Elements of materials science I		1			
		MSE 5100 Structure and chemistry of materials	3				
		MSE 5200 Thermodynamics and kinetics of materials	3				
		MSE 6990 Research					2
1	Sp.	MSE 5020 Elements of materials science II		1			
		MSE 5300 Solid state science	3				
		MSE 5400 Mechanical behavior of materials	3				
		MSE 6990 Research					2
1	Sum.	MSE 5030 Elements of materials science III (Qualifier Exam)		1			
2	F	GRST 5650 Responsible conduct of research		1			
		MSE Elective of choice			3		
		MSE or other elective of choice				3	
		MSE 6990 Research					3
2	Sp.	MSE 5690 Mechanics of composite and combined materials			3		
		MSE or other elective of choice				3	
		MSE 6990 Research					3
2	Sum.	MSE 6990 Research					1
		Preliminary Oral Exam					
3	F	ME 5280 Micro/Nanomanufacturing				3	
		MSE or other elective of choice				3	
		MSE 6990 Research					6
3	Sp.	ME 5360 Advanced heat transfer				3	
		MSE 6990 Research					6
3	Sum.	MSE 6990 Research					1
4	F	MSE 6990 Research					6
4	Sp.	MSE 6990 Research					6
		Final Oral Exam					
Totals			12	4	6	15	36

3. Academic Performance Standards

The [ISU Graduate College Handbook](#) provides guidance on Graduate Student Rights & Responsibilities in chapter 8.

Minimum curricular requirements for each degree are listed in Table 1. Graduate students are required to maintain a cumulative GPA of 3.0 or higher (out of 4.0) for all graduate coursework. Registration privileges will be suspended for any student who does not maintain a satisfactory GPA. Requests for probationary removal of the academic hold on registration must be made by the major professor and submitted in writing (email) to the DOGE, with a copy to the student and to the Graduate Program Coordinator. The request should describe the circumstances of the case contributing to the sub-standard performance with relevant details about specific courses and should outline any remedial steps to be taken that are intended to lead to improved outcomes. Upon review of the case and approval by the DOGE and the Graduate College, the academic hold may be temporarily lifted to allow for registration.

In addition to the general requirements described above, the following qualifications must be satisfied to be eligible for the Ph.D. preliminary oral examination, typically taken during the second year of the program. Satisfactory completion of these requirements must be indicated on the student progress report for the year prior to that in which the request for oral examination is submitted. At the time of application for the Ph.D. preliminary examination, the student must have earned:

- a score of 70% or higher on the Doctoral Qualifying Exam, taken as a part of the MSE 503 course.
- a grade of "B" or higher in each of the four MSE core courses (or applicable substitutes),
- a cumulative GPA of 3.3 or higher for the four MSE core courses, and
- a minimum of 10 credits of MSE 699, with a cumulative GPA of 3.3.

If a student scores below the minimum requirement on the doctoral qualification exam (July), a remedial study plan will be developed by the Major Professor, and the student may retake the exam at a scheduled time in November of the same year. If a student scores below the minimum requirement on the Fall retake, then the student will have the option to complete the MS(RT) program.

All requirements of the Graduate College are specified in the ISU Graduate College Handbook. Specific deadlines associated with these requirements are noted at:

<https://www.grad-college.iastate.edu/student#deadlinesandevents>

The MSE Program has several additional administrative requirements, as listed in Table 3. The program design and academic progress of each student is tracked using the Academic Plan in Workday. Once established and approved, the Academic Plan can be updated as needed over the duration of the program.

Thesis-based program students (MS(RT) and Ph.D.) are required to submit to the Graduate Program Coordinator a progress report form at the end of each academic year, summarizing academic progress, research accomplishments, and professional development. In addition, all graduate students (thesis and non-thesis) are required to respond to a program feedback survey and a review meeting with the student's major professor or academic advisor. Failure to complete the required annual review will result in an administrative hold on registration.

Table 3. Regular Administrative Requirements for MSE Graduate Programs

Administrative Item	M.Eng.	MS(N)	MS(T)	Ph.D.	Notes / due date
English Requirements for Nonnative Speakers of English	X	X	X	X	start of first semester
Name major professor to Graduate Committee			X	X	upon enrollment
Complete Graduate Committee	X	X	X	X	end of year 1
Complete initial Academic Plan	X	X	X	X	end of year 1
Annual Report / Program Survey	X	X	X	X	July 1 (annually)
Research Proposal Document				X	end of year 2
Request for Preliminary Oral Exam				X	end of year 2
Report of Preliminary Oral Exam				X	on exam date
Request for Final Oral Exam			X	X	4 weeks prior to exam
Report of Final Oral Exam			X	X	on exam date
Application for Program Completion (Graduation)	X	X	X	X	semester of graduation
Submission of thesis document			X	X	semester of graduation
Program exit survey	X	X	X	X	semester of graduation

4. Graduate Enrollment Options

4.1 Regular enrollment (on-campus graduate enrollment)

Graduate students on an assistantship are considered full-time if they are registered for at least one credit. Graduate students not on assistantship must be registered for a minimum of nine credits to be considered full-time students or five credits to be considered half-time students. Maximum credit load limits, as designated in the Graduate College Handbook, apply for each term. A student may request a waiver to exceed the credit load limit by written request to the DOGE, explaining the reason for the request. Students are responsible for checking with the offices of Financial Aid and/or the ISSO regarding specific enrollment requirements for the summer term.

4.2 Concurrent enrollment

The MSE Department offers B.S./M.S. and B.S./M.Eng. concurrent enrollment programs. This program is aimed at helping students who wish to continue into graduate school after completion of their B.S. degree by permitting the student to enroll in graduate coursework while still completing their undergraduate program. This enables the student to more efficiently or strategically schedule courses, according to the overall objective of obtaining both B.S. and M.S. or M. Eng. degrees.

Students accepted into a concurrent degree program may apply up to 6 credits of major or non-major graduate credit,

earned while in the concurrent program, to both the B.S. degree and the relevant graduate degree (M.S. or M. Eng.). Note, all ISU graduate students are permitted to apply up to 6 ISU undergraduate credits to a graduate program, whether or not they were applied to the undergraduate degree. All normal restrictions apply regarding the eligibility of various courses for graduate credit. See the Graduate College Handbook for more details.

Upon enrollment in the concurrent program, a student will be classified as a graduate student and will work with an undergraduate advisor to transfer courses to their undergraduate program transcript, as needed for completion of the program. Because graduate enrollment status may significantly affect eligibility for various types of financial aid, students receiving aid are advised to consult with the Office of Financial Aid before applying for concurrent enrollment.

- *Eligibility* – ISU undergraduate students who will have earned 90 credits toward the BS Mat E degree by the time of concurrent enrollment are eligible to apply.
- *Admission Requirements* – All regular MSE Graduate Program admission criteria apply. All regular MSE Graduate Program application materials. For non-native English-speakers, no English exam score is required, as graduates of Iowa State satisfy the English Proficiency Requirement
- *Application Process* – Applications for concurrent enrollment are submitted through the Office of Admissions online application system. There is a checkbox to indicate concurrent undergraduate / graduate program enrollment. To begin concurrent status for fall semester, plan to complete your application by August 1. To begin the spring semester, complete the application by December 15.

4.3 Online/distance enrollment

The MSE department makes no distinction between online and residential coursework, and online courses may be applied to any degree program without limitation. Accordingly, the M.Eng. degree may be earned completely online. MSE 6990 credit, however, cannot be earned online and must involve residential thesis research. For this reason, the MS(RT) and Ph.D. degree programs cannot be completed in a fully online manner. The degree to which the MS(RP) can be completed online depends on the nature of the MSE 5990 Creative Component work involved.

5. Graduate Student Research

Materials research is an integral component of the MSE graduate programs. As a part of their academic plans, students engage in various forms of experimental, computational, and theoretical research, utilizing various forms of university resources. While access to facilities, specific procedures, and usage/training requirements for any particular student is established by the major professor and/or research supervisor, some general information related to MSE policies are outlined below.

5.1 MSE Laboratory Safety Program

The MSE Department is heavily engaged in a wide variety of laboratory research, and the students, staff and faculty collectively share in the responsibility of maintaining the safest and most efficient environment in which to perform the research of the highest quality. We take this responsibility very seriously and every graduate student is required to participate fully in the MSE Safety Program and maintain appropriate safety training credentials.

This involves various programs, courses, and seminars along with formal university, department, and group level training. Every student performing research will have a personal safety plan, supervised by the major professor. Students should complete the basic safety training required by ISU before they begin working in MSE laboratories. Students and major professors are required to maintain safety training documentation consistent with the personalized plan and to review the plan and training documentation together every semester.

Information about safety training can be found on the MSE department website: <https://www.mse.iastate.edu/>

Personalized Safety plans and important safety documentation include components such as Laboratory Check-In forms, Hazard Inventory forms <https://hazard-inventory.ehs.iastate.edu/>, Hazard assessments, general and specific safety training, equipment training records, process and equipment Standard Operating Procedures (SOP's).

MSE department lab staff assist in facilitating the training and documentation for those who work in the MSE

department and serve as contacts to assist with safety concerns. ISU Environmental Health and Safety (EH&S <https://www.ehs.iastate.edu/>) are important partners to help everyone maintain a safe working environment.

5.2 Laboratory Access and Usage

The professional and scientific development of our students is a high priority and requires that students have hands-on access to state-of-the-art research facilities. To maintain safe working conditions and integrity of our research facilities and data, access to research equipment is generally limited to work that is directly related to thesis-based research or other contract research. Access to any laboratory space or use of any laboratory equipment must be expressly authorized by the student's major professor and the specific lab or equipment supervisor. Records of training on equipment should be maintained.

Access request to lab spaces can be found on the MSE dept website: <https://www.mse.iastate.edu/>

Many items of equipment are maintained by the MSE department through a system known as Fee for Service (FFS). Access to any of the FFS equipment is limited to users who have completed all required training and all users are charged the set rate of usage to access this equipment. Please use the MSE department website for the procedure to obtain training and access to Fee for Service equipment in the MSE department as well as lists and descriptions of equipment available.

It is prohibited to give access to equipment or facilities to unauthorized personnel or to leave doors unlocked or propped open. In addition, any known or suspected unauthorized entry to laboratory spaces or inappropriate use of equipment must be reported immediately to the MSE Graduate Program Coordinator, Safety Officer, or Director of Graduate Education.

5.3 Curricular Research (MSE 6990)

Except for special circumstances approved by the DOGE (typically involving an off-campus assignment), students in thesis-based programs are required to enroll in at least one credit of MSE 6990 during each semester, including summer. Curricular research assignments will be made at the start of each semester. Results will be evaluated and graded by the major professor at the end of each semester. Generally, an effort of approximately 3 hours per week is expected during the semester for each semester-credit-hour awarded. This effort should be considered separate from other coursework and assistantship-related research.

5.4 Graduate Research Assistantships (GRAs)

Any MSE graduate student supported on a GRA will have a formal letter of intent (LOI) which are signed by the student, the major professor, and the Department Chair or delegate. The LOI will describe the terms of the assistantship, including the start/end dates, the effort level (typically 1/4-time or 1/2-time), the semester stipend, the name of the major professor, and other details or conditions of employment related to the specific research project and expected outcomes. It is critical that the student reads and understands the LOI document prior to signing.

Graduate students are eligible for various types of internal and external scholarships and fellowships, and they are encouraged to seek nomination for these, as appropriate, by their major professor. In most cases, the funding provided by scholarship and fellowship awards will serve to offset MSE stipend and tuition costs and will not be awarded as an addition to the GRA stipend. There are a few exceptions, where awarded funds are intended to supplement the regular GRA stipend. Students are advised to read and understand the terms of scholarship and fellowship programs to avoid confusion.

Graduate research assistantships are generally supported by specific research grants, contracts, or scholarships, administered by the student's major professor, who must be a full member of the MSE Graduate Faculty. Most often, students are admitted into a degree program as a member of a specific research group, and agreements for GRA support are made at the time of admission. In some cases, graduate students are admitted prior to any such agreement, and it is expected that the admitted student will search for a GRA position within the department by arranging interviews with potential major professors. In many cases major professor GRA support can be arranged prior to the start of the first semester. In other cases, depending on position availability, these arrangements cannot be made by the start of the student's first semester. Typically, GRA appointments are made for 1-year terms and are renewable annually, contingent upon available funding and appropriate academic progress.

6. Graduate Program Administration and Procedures

Because graduate enrollment may involve various terms and conditions related to academic status, employment status, and immigration/visa status, graduate students (and major professors) are responsible for understanding the specific terms of their individual appointments. Graduate College administrative procedures are implemented through various official forms, available at the Graduate College website:

<https://www.grad-college.iastate.edu/student/forms>

Students should refer to the Graduate College Handbook for a complete description of college-level administrative policies. For Graduate College procedures, please reference WorkCyte Training by Role: Graduate Students (requires ISU log in): <https://www.workcyte.iastate.edu/phase-ii/training-resources/by-role/graduate-students>

Some of the most common administrative procedures are outlined below, along with administrative procedures specific to MSE graduate programs.

Graduate Student Advising and Review Process - In addition to any advising activities established by the major professor within the specific research group, all graduate students are required to participate in the departmental Student Advising and Review Process. The overall process is summarized below.

- *Annual self-assessment and survey* - Graduate students are required to submit an annual self-assessment related to all aspects of their academic progress and professional development. With the assessment, students are required to submit an updated CV/résumé and a complete anonymous survey form related to various elements of graduate program. These items are due July 1, each year of enrollment.
- *Annual Review and Performance Appraisal* – Referring to the student annual progress reports, CV/résumé, and all other knowledge of accomplishments through the year, the Major Professor (or DOGE for non-thesis programs) will complete a written review and performance appraisal. The appraisal will be made available to the student, and the Major Professor will meet with the student to discuss the review and to provide constructive feedback and advising guidance. The appraisal report and meeting certification are submitted by the Major Professor, due August 15.

Graduate Committee and Academic Plan - The Graduate Committee membership and the Academic Plan are established in Workday. The Academic Plan is the principal administrative document for all graduate degree programs. As such, it should be established early in the program (see Table 3) and updated as needed to reflect changes in curriculum planning. See Chapter 6 of the Graduate College Handbook for requirements regarding the makeup of the Graduate Committee. Having an approved Graduate Committee and Academic Plan on file is required for most other graduate student administrative procedures.

For doctoral students, the student's initial Academic Plan must be approved by the Graduate College at least three calendar months before the preliminary oral examination. For master's students, the initial Academic Plan must be approved by the Graduate College by the last day of the semester prior to the term of the final oral examination. For non-thesis master's students, the initial Academic Plan must be approved by the Graduate College no later than the last day of the semester prior to the graduation term.

For the initial Academic Plan to be approved in any given term, it must be received by the Graduate College by the published deadline for that term. Note that these deadlines reference the *initial* Academic Plan, and it is expected that a student will request changes to the initial Academic Plan as they progress through their studies. Thus, MSE recommends graduate students complete their initial Academic Plan in line with the dates in Table 3.

When requesting changes to the Academic Plan in Workday, the student must summarize the changes from the previous version in the comments box near the Submit button.

Change in Major Degree Program - Current graduate students who seek to change degree programs or pursue additional graduate degrees/credentials should refer to the [Workday Student: Graduate Program of Study Changes Effective Fall 2024 document](#).

Emergency Committee Substitution - In special cases involving unforeseen circumstances, it may be necessary to request permission for a substitute committee member to participate in a Graduate Examination. The following allowance is provided in the Graduate College Handbook (6.2.7).

Temporary discontinuation of program - A student will be changed from *active* to *inactive* status after not being registered during four consecutive semesters, excluding summer. Students in *inactive* status must be reinstated prior to further enrollment. Reinstatement requests should be initiated through the MSE Graduate Program Coordinator.

GRA/GTA leave of absence - Graduate Assistants (GRA and GTA) do not accrue sick leave, maternity leave, vacation time, or other forms of personal leave, but reasonable allowances are made using common professional practices of communication and advance notice. Unexpected absences should be communicated with the major professor in accordance with policies of the research group. It is important for graduate students to understand these policies and for major professors to communicate expectations. Requests for any planned leave of absence should be made directly to the major professor in advance of the absence, giving reasonable time for necessary planning (typically no less than one week plus the duration of the absence). Any special issues or concerns regarding appropriate handling of absence requests should be communicated to the DOGE, who will work to resolve the issue. Graduate students are referred to the Graduate College Handbook for a more complete description of responsibilities and benefits. Some special registration options are available for doctoral candidates (Ph.D. students who have completed the preliminary oral examination and all required coursework) requiring medical or personal leave.

Request for transfer credit - In some cases, credits from other institutions may be applied to an Academic Plan at ISU. Applications for transfer credit are made and granted on a case-by-case basis through the Academic Plan approval process. As a part of the request process, students must provide a course syllabus and may be asked for additional information about the courses being considered for transfer credit (e.g. textbooks, exams, etc.). Except for highly unusual circumstances, no more than 6 transfer credits will be considered for any MSE graduate degree program. Transfer credits cannot be used to satisfy the MSE core course requirements. However, if a transferred course that appears on the Academic Plan is judged by the course instructor and DOGE to be substantially equivalent to a core course, then the student may replace that core course with a topically related elective course (MSE or non-MSE, 5xxx or higher) that is approved for core substitution by the Major Professor and DOGE. Only one such core substitution may be included on an Academic Program. Transfer of research credits equivalent to MSE 6990 is not permitted.

Minor Program of Study - MSE graduate students in thesis-based programs are encouraged to enroll in an optional minor program of study. Requirements for minor programs are established by the home department for each program.

For ISU graduate students in other programs of study, the MSE Department offers a Minor in Materials Science and Engineering. The graduate minor in MSE requires 12 credits of MSE graduate coursework, including 6 credits selected from MSE 5100, 5200, 5300, and 5400. In addition, the minor program requires that the Graduate Committee includes at least one member of the MSE Graduate Faculty. Request for an MSE Minor will be made in Workday with a yet to be announced process.

7. Description of Program Responsibilities

Successful completion of any of our graduate degree programs requires an understanding of the roles and responsibilities of the student and various program officials. These are briefly described here, but students are encouraged to discuss these with their major professor, since expectations and standard practices may vary between research groups.

The Director of Graduate Education (DOGE) - is responsible for overseeing the execution of all graduate degree programs, ensuring that graduate examinations are properly conducted and that academic requirements are met upon conferring graduate degrees. The DOGE will monitor academic progress through the Academic Plan forms and departmental progress reports and will engage in intervention activities as deemed appropriate.

The Graduate Program Coordinator (GPC) - will facilitate program administration and will coordinate with other university officers on matters related to academic programs, assistantships, fellowships, international status, etc. The GPC will also serve as the primary administrative contact for students. All forms requiring DOGE signature/approval are to be submitted to the GPC.

The Major Professor (MP) - will serve as the principal student advisor for all matters related to research, academics, assistantships, and overall programmatic progress. The major professor will also serve as the primary evaluator of student performance and will be assisted by the Graduate Committee and the MSE Graduate Program Coordinator. Under normal circumstances, the major professor is expected to meet with each graduate student individually for at

least one hour per week to discuss research progress, professional development, and other issues as might arise with the student's program. The MP is responsible for providing safe laboratory facilities and ensuring that the student has received proper training to perform work safely.

The Graduate Committee - is responsible for working with the MP to review proposal (Ph.D.) and thesis (M.S. and Ph.D.) documents and to conduct preliminary/final oral examinations. In addition, the Graduate Committee serves as a technical advisory board, available to provide advice, guidance, or recommendations regarding research activities, as appropriate. The Graduate Committee must be established in Workday by the second semester of enrollment. Refer to the ISU Graduate College Handbook for policies regarding the composition of the Graduate Committee.

The MSE Safety Coordinator (SC) - will coordinate general safety orientation programs and oversee usage of centralized department facilities (i.e. those not controlled by a specific faculty member or research group). The SC will organize and manage a Graduate Student Safety Committee with membership from each research group. The SC has the authority to stop work or to access to any room or instrument without notice and for any reason. Such stoppage will immediately be reported to the major professor and DOGE so that a timely resolution may be achieved.

The Graduate Research Assistant (GRA) - is expected to engage professionally in the research activities assigned by the major professor. For a half-time assistantship, a minimum of 20 hours per week of non-credit research is expected. More time may reasonably be expected under certain circumstances for fulfillment of commitments, as outlined by the MP. The GRA is expected to observe professional standards with regard to attendance and notification of absences, as directed by the MP.

The Graduate Student (whether on assistantship or not) - is expected to engage professionally in academic coursework and curricular research assignments (MSE 6990). Students are also expected to read, understand, and follow the administrative procedures outlined in this document and the Graduate College Handbook. Graduate students are responsible for completing all required safety training and providing/maintaining appropriate records of such training, as assigned by the MP or course instructor. Students are expected to maintain the highest standards of integrity during academic, research, and reporting activities. Plagiarism, falsification, or misrepresentation of research results will not be tolerated.

8. Closing Remarks

The faculty and staff of the Materials Science and Engineering Department take great pleasure in mentoring and guiding future scientists, engineers, innovators, entrepreneurs, and educators on their way to becoming leaders and influential practitioners in their chosen areas of expertise. We value the contributions of our students and the opportunity to engage with them on their journey. This handbook is intended to provide basic information related to the structure and requirements of our graduate degree programs. In addition, we hope that the program descriptions provide deeper insights into the broad academic and career-centric aims of our curricula. If questions remain, we invite the reader to contact our office at the address listed on the front page.