Department of
MATERIALS SCIENCE AND ENGINEERING
Clemson® University

# UNDERGRADUATE STUDENT HANDBOOK

# 2025-2026

Department of Materials Science & Engineering (MSE)
Clemson University
Clemson, South Carolina 29634–0971
(864) 656–3187

**Student** _____

**Advisor** _____

This handbook is available on the MSE website:
https://www.clemson.edu/cecas/departments/mse/students/advising.html#undergraduatestudents

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## Welcome to MSE

This handbook provides information about the MSE program of study and the MSE Department. Most of the information is available in Undergraduate Announcements as part of the University catalog or other sources. http://catalog.clemson.edu/index.php

Students must regularly check the CANVAS MSE Undergrad News and Advising workgroup and their Clemson email accounts.

If you have questions about anything regarding the curriculum, the department, or the MSE profession, please talk to the MSE Student Services Coordinator (Ms. Laura Kinard) or the MSE Undergraduate Program Director (Dr. DP Aidhy)

**Departmental Directory**

| | |
|---|---|
| Department Chair: | Dr. Kyle S. Brinkman 161 Sirrine Hall ksbrink@clemson.edu |
| Undergraduate Program Director: | Dr. DP Aidhy 299D Sirrine Hall daidhy@clemson.edu |
| Student Services Coordinator: | Ms. Laura Kinard 162-B Sirrine Hall lkinard@clemson.edu |
| Department Main Office: | 161 Sirrine Hall (864) 656-3187 www.clemson.edu/mse |
| Office Manager: | Ms. Tonya Bledsoe 161 Sirrine Hall bledsoe@clemson.edu |
| Administrative Assistant: | Ms. Diane Swope 161 Sirrine Hall dswope@clemson.edu |
| Lab Equipment and Safety Specialists: | Mr. James Lowe 280 Sirrine Hall jaelowe@clemson.edu<br>Ms. Kimberly Ivey G73 Sirrine Hall ikimber@clemson.edu |

Undergraduate Advisors:

Ms. Laura Kinard
162-B Sirrine Hall
lkinard@clemson.edu

Dr. DP Aidhy
299D Sirrine Hall
daidhy@clemson.edu

Each student is assigned an academic and professional advisor upon entering the MSE program. If you need clarification on your advisors, schedule an appointment with the Student Services Coordinator. As a reminder, all students are ultimately responsible for their course planning. Each student must satisfy the requirements of their curriculum to receive a degree.

# COMMUNITY

## Formal Recognition of Joining and Graduating from the MSE Program

The MSE program strives to build a cohesive student community for collaboration in the classroom and the lab as part of the professional development of a materials scientist and engineer. We formally recognize all new students joining the department and those who completed their B.S. in MSE at the annual MSE Department Awards Ceremony held each April. New students who have completed the sophomore year curriculum are presented with a Clemson MSE lapel pin to wear to professional events. Upon completing the B.S. degree in MSE, graduates are presented with a Clemson "MSE Alumni" pin at the Graduation Celebration following the commencement ceremony. Clemson MSE alumni work in companies and higher education institutions across the globe. These alumni are an invaluable network for co-ops, internships, jobs, and research. Wear your pin with pride and represent the Clemson MSE program with the tradition and excellence it is known for.

## Developing Colleagues in MSE

The MSE program provides an MSE-majors-only section of MSE 2100 (Introduction to Materials Science) every Fall semester. We strongly encourage all MSE undergraduates to join this cohort so that they meet and get to know the other students in the program. This network can help you navigate the MSE program by providing peer insight into the clubs to join, how to study for exams, etc. The next course in the MSE curriculum is offered Spring semester for MSE majors only, MSE 3100 (Introduction to Metals and Ceramics). This prepares students for placing them into lab groups for MSE 3010 and MSE 3020 the following year.

While the junior year will contain many MSE-only classes, some will be shared with other programs. One example is MSE 4150 (Polymer Science and Engineering). For this class, we usually offer an MSE-majors-only section of MSE 4150 (Polymer Science and Engineering) in the Fall semester. Please plan on registering for this section.

# CLEMSON UNIVERSITY UNDERGRADUATE ANNOUNCEMENTS

In general, students are subject to the rules and regulations during the year they enter the University and to the curriculum requirements of the year of their most recent major change. University Announcements can be found online at: https://catalog.clemson.edu/index.php

Specific areas of interest are listed below.

- Academic Regulations
- Admission
- Center for Career and Professional Development (Placement)
- Materials Science & Engineering Degree and Curricula
- College of Engineering Computing and Applied Science Academic Policies
- Cooperative Education
- Health, Counseling & Psychological Services

- Description of MSE Courses
- Accessibility Services
- Financial Aid
- Academic Integrity
- General Education Requirements
  (Arts & Humanities (A&H), Social Sciences (SS), Global Challenges (GLCH) lists)
- Minors
- Transfer Students and Transfer Credits
- Tuition and Fees

To access the **academic calendar**, please go to this link:
https://www.clemson.edu/registrar/academic-resources/academic-calendars.html

# ACCREDITATION OF CURRICULUM
## Accrediting Board of Engineering and Technology (ABET)

ABET currently accredits the MSE program. ABET, the recognized accreditor for university programs in applied science, computing, engineering, and engineering technology, accredits more than 3,700 programs presently in 30 countries. ABET is a nonprofit, non-governmental organization recognized by the Council for Higher Education Accreditation (CHEA). To learn more about ABET, students are directed to: https://www.clemson.edu/cecas/academics/accreditation.html

**Intended Student Outcomes: What will I learn in the Clemson B.S. MSE Program?**
The B.S. in MSE program at Clemson University has adopted the ABET Student Outcomes as specified in Criterion 3 for MSE or similarly named programs as our Student Outcomes. Thus, the MSE Student Outcomes require that graduates receiving the B.S. in MSE have:

1. An ability to identify, formulate, and solve complex engineering problems by applying engineering, science, and mathematics principles.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare and cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

These outcomes are assigned to core courses within the MSE curriculum.

| MSE Core Course | Student Outcomes | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| MSE 2100 – Introduction to Materials Science | x | | | | | | |
| MSE 3010 – Materials Synthesis and Fabrication Laboratory | | | x | | x | x | |
| MSE 3020 – Materials Characterization Laboratory | | | x | | x | x | |
| MSE 3100 – Introduction to Metals and Ceramics Engineering | | | | x | | | |
| MSE 3190 – Materials Processing I | | | | x | | | |
| MSE 3260 – Thermodynamics of Materials | x | | | | | | |
| MSE 3270 – Transport Phenomena | x | | | | | | |
| MSE 3450 – Practice of Materials Engineering | | x | | x | | | x |
| MSE 3910 – Undergraduate Research Fundamentals | | | x | | | x | |
| MSE 4050 – Solid-State Materials | x | | | | | | |
| MSE 4070 – Senior Capstone Design | | x | x | x | x | | x |
| MSE 4150 – Introduction to Polymer Science and Engineering | x | | | | | | |
| MSE 4220 – Mechanical Behavior of Materials | x | x | | | | | |
| MSE 4910 - Undergraduate Research | | | x | | | x | |

**Program Educational Objectives: What can I achieve with my Clemson education?**
Program Educational Objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Program Educational Objectives are based on the needs of the program's constituencies. The Program Educational Objectives for MSE are shown below.

- Our graduates will demonstrate technical expertise in problem-solving as it relates to the field of Materials Science and Engineering and advances made thereof.
- Our graduates will possess professional curiosity and actively seek to expand their current knowledge base, which will position them at the forefront of their field, whether in industry, government or higher education.
- Our graduates will be innovative leaders leveraging their skills, knowledge, and experience to address engineering grand challenges at the global scale.

The MSE curriculum develops skills in problem-solving, engineering analysis, design, and oral and written communication. Courses covering thermodynamics, kinetics, mechanical behavior, processing, fabrication, and characterization of materials prepare students for careers in industry and graduate school.

# PROGRAM

## What is materials science and engineering?

**Materials scientists and engineers design, develop, and produce traditional and new advanced materials with diverse applications in various industries.**

Materials Science and Engineering is based on the sciences of chemistry, physics, and mathematics. The curriculum at Clemson emphasizes a broad range of fundamental principles in science and engineering and communication skills and humanities and social sciences. As a result, our graduates are sought avidly by industries in many technology areas such as semiconductors, energy, biomaterials, electronics, defense, aerospace, and communication sectors.

Department of
MATERIALS SCIENCE AND ENGINEERING

## Curriculum for the BS in Materials Science and Engineering
## 2025-2026 Undergraduate Catalog

### Freshman Year

| *First Semester* | *Second Semester* |
|---|---|
| 4 – CH 1010 General Chemistry | 4 – CH 1020 General Chemistry |
| 3 – ENGL 1030 Composition and Rhetoric | 3 – ENGR 1410 Programming & Problem Solving |
| 3 – ENGR 1020 – Engineering Disciplines & Skills[2] | 4 – MATH 1080 Calculus of One Variable II |
| 4 – MATH 1060 – Calculus of One Variable I | 3 – PHYS 1220 Physics with Calculus I |
| 3 - Arts and Humanities Requirement[1] *or* 3 – Social Science Requirement[1] | 3 - Arts and Humanities Requirement[1] *or* 3 – Social Science Requirement[1] |
| 17 | 17 |

### Sophomore Year

| *First Semester* | *Second Semester* |
|---|---|
| 3 – CH 2230 Organic Chemistry | 3 – CE 2010 Statics |
| 1 – CH 2270 Organic Chemistry Laboratory | 3 – CH 2240 Organic Chemistry |
| 4 – MATH 2060 Calculus of Several Variables | 1 – CH 2280 Organic Chemistry Laboratory |
| 3 – MSE 2100 Introduction to Materials Science | 2 – ENGR 2080 Engineering Graphics and Machine Design *or* 2 – ECE 2070 Basic Electrical Engineering |
| 3 – PHYS 2210 Physics with Calculus II | 4 – MATH 2080 Intro to Ordinary Differential Equations 3– |
| 3 – Arts and Humanities Requirement[1] *or* 3 – Social Science Requirement[1] | MSE 3100 Introduction to Metals and Ceramics** |
| 17 | 16 |

### Junior Year

| *First Semester* | *Second Semester* |
|---|---|
| 2 – MSE 3010 Materials Synthesis and Fabrication Laboratory * | 2 – MSE 3020 Materials Characterization Laboratory** |
| 3 – MSE 3260 Thermodynamics of Materials* | 3 – MSE 3190 Materials Processing ** |
| 3 – MSE 4150 Polymer Science & Engineering | 3 – MSE 3270 Transport Phenomena** |
| 1 – MSE 3450 Practice of Materials Engineering* | 3 – MSE 4050 Fundamentals of Solid State Materials** |
| 1 – MSE 3910 Undergraduate Research Fundamentals | 3 – MSE 4220 Mechanical Behavior of Materials** |
| 3 – MATH 3020 Statistics for Science & Engineering | 2 – MSE 4910 - Undergraduate Research |
| 3 – Arts and Humanities Requirement[1] *or* 3 – Social Science Requirement [1] | |
| 16 | 16 |

### Senior Year

| *First Semester* | *Second Semester* |
|---|---|
| 3 – COMM 2500 Public Speaking | 3 – Arts and Humanities Requirement[1] *or* 3 – Social Science Requirement [1] *or* |
| 2 – ENGR 2080 Engineering Graphics and Machine Design *or* 2 – ECE 2070 Basic Electrical Engineering | 3 – IE 3840 Engineering Economic Analysis |
| 3 – MSE 4070 Senior Capstone Design* | 3 – Tech Requirement[3] |
| 3 – Tech Requirement[3] | 3 – Tech Requirement[3] |
| 3 – Tech Requirement[3] | 3 – Tech Requirement[3] |
| 14 | 15 |

*Offered only Fall terms **Offered only Spring terms **128 Total Semester Hours**

[1] See General Education requirements. Three General Education credits must also satisfy the SC REACH Act Requirement.

[2] Six credits must also satisfy the Global Challenges requirements. Three of the six credits must be at the 3000-4000 level. ENGR 1020 transferred in from another school does NOT meet the Global Challenges requirement.

[3] Students must complete 15 credits of technical electives, all of which must be at least 3-credit courses. Three of the courses must be 4000-level MSE courses. See catalog for complete details.

## Technical Requirements

The Materials Science and Engineering curriculum allows students flexibility in selecting courses and planning their future careers.
Students must complete 15 credits of technical electives, all of which must be at least three-credit courses. Three of the courses must be 4000-level MSE courses.

Students may select from:
MSE 4120, MSE 4130, MSE 4160, MSE 4170, MSE 4240, MSE 4280, MSE 4320, MSE 4340, MSE 4520, MSE 4530, MSE 4540, MSE 4560, MSE 4570, MSE 4580, MSE 4610, MSE 4650, MSE 4900, and MSE 4920

3000- or 4000-level courses in:
AMFG, AUE, BCHM, BE, BIOE, BIOL, BMOL, CE, CH, CHE, ECE, EES, GEOL, IE, MATH, ME, MICR, PHYS, PKSC or STAT,
**EXCLUDING** the following:

BCHM: 4900, 4910, 4920, 4930
BE: 3000, 3010, 3200, 3700, 3990, 4000, 4140, 4150, 4170, 4210, 4990
BIOE: 3000, 4000, 4150, 4500, 4510, 4600, 4610, 4900, 4910
BIOL: 3080, 3940, 4260, 4470, 4500, 4600, 4620, 4710,4760, 4820, 4880, 4890, 4910, 4920, 4930, 4940, 4950, 4960
CE: 3530, 3870, 3880, 3890, 3990, 4590, 4870, 4880, 4890, 4900, 4910, 4990
CH: 3410, 3990, 4000, 4430, 4440, 4500, 4990
CHE: 3000, 3190, 3950, 3990, 4450, 4910, 4950, 4970, 4990
ECE: 3000, 3990, 4910, 4920, 4930, 4990
EES: 3000, 3010, 4000, 4500, 4510, 4750, 4900, 4950
GEOL: 3910, 3920, 4110, 4910, 4920
IE: 3000, 3600, 3610, 3680, 3840, 4000, 4040, 4690, 4910
MATH 3020, 4820, 4910, 4990
ME: 3000, 3900, 4000, 4020, 4150, 4900, 4930
MICR: 3940, 4190, 4910, 4920, 4930, 4940, 4950
PHYS: 3000, 3990, 4010, 4750, 4990
PKSC: 4030, 4210, 4220, 4950, 4960, 4980, 4990
STAT: 3090, 3300

## Materials Science and Engineering

**FALL 2025**

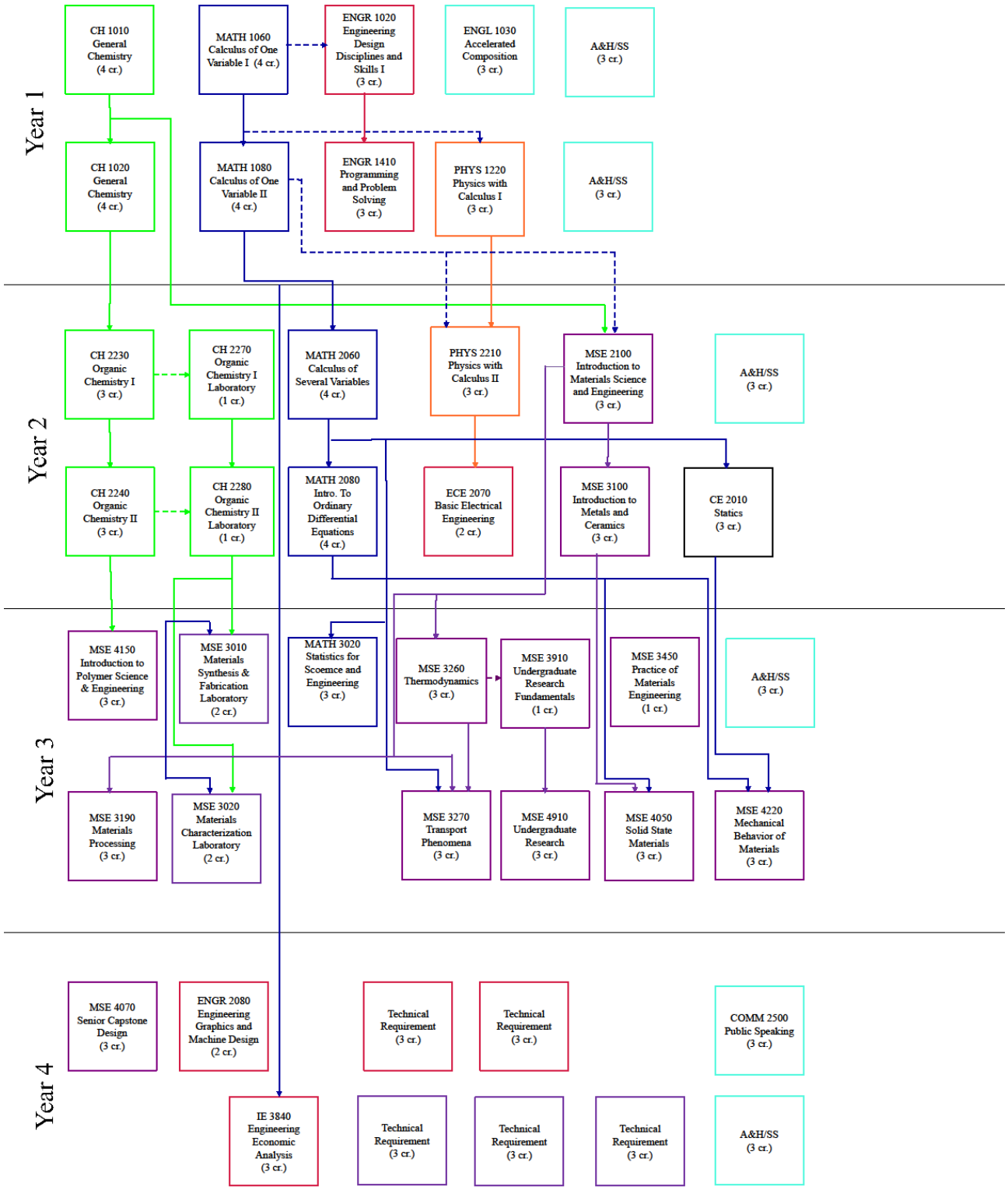
NAME_____

CU ID _____

| FRESHMAN | | SOPHOMORE | | JUNIOR | | SENIOR | |
|---|---|---|---|---|---|---|---|
| 1st | 2nd | 1st | 2nd | 1st | 2nd | 1st | 2nd |
| Hum/SS (3) SS 1 | Hum/SS (3) Non-Lit | Hum/SS (3) SS 2 | ENGR 2080 (2) or ECE 2070 (2) | MATH 3020 (3) | MSE 4220 (3)** | MSE 4070 (3)* | IE 3840 (3) |
| ENGR 1020 (3) | ENGR 1410 (3) | MSE 2100 (3) | CE 2010 (3) | MSE 3260 (3)* | MSE 3190 (3)** | Tech Engr Req (3) | Tech Engr Req (3) |
| MATH 1060 (4) | MATH 1080 (4) | MATH 2060 (4) | MATH 2080 (4) | MSE 4150 (3) | MSE 3270 (3)** | Tech Engr Req (3) | Tech Engr Req (3) |
| ENGL 1030 (3) | PHYS 1220 (3) | PHYS 2210 (3) | MSE 3100 (3)** | MSE 3450 (1)* | MSE 4050 (3)** | COMM 2500 (3) | Tech Engr Req (3) |
| CH 1010 (4) | CH 1020 (4) | CH 2230 (3) | CH 2240 (3) | MSE 3910 (1) | MSE 4910 (2) | ECE 2070 (2) or ENGR 2080 (2) | Hum/SS (3) 5th |
| | | CH 2270 (1) | CH 2280 (1) | MSE 3010 (2)* | MSE 3020 (2)** | | |
| | | | | Hum/SS (3) Lit | | | |
| 17 | 17 | 17 | 16 | 16 | 16 | 14 | 15 |
| | | | | | | | Total 128 |

2/1/2019

*Fall Only ** Spring Only REACH ACT_____ GC #1_____ GC #2 3000/4000_____


Year 1
CH 1010 General Chemistry (4 cr.)
MATH 1060 Calculus of One Variable I (4 cr.)
ENGR 1020 Engineering Design Disciplines and Skills I (3 cr.)
ENGL 1030 Accelerated Composition (3 cr.)
A&H/SS (3 cr.)
CH 1020 General Chemistry (4 cr.)
MATH 1080 Calculus of One Variable II (4 cr.)
ENGR 1410 Programming and Problem Solving (3 cr.)
PHYS 1220 Physics with Calculus I (3 cr.)
A&H/SS (3 cr.)
Year 2
CH 2230 Organic Chemistry I (3 cr.)
CH 2270 Organic Chemistry I Laboratory (1 cr.)
MATH 2060 Calculus of Several Variables (4 cr.)
PHYS 2210 Physics with Calculus II (3 cr.)
MSE 2100 Introduction to Materials Science and Engineering (3 cr.)
A&H/SS (3 cr.)
CH 2240 Organic Chemistry II (3 cr.)
CH 2280 Organic Chemistry II Laboratory (1 cr.)
MATH 2080 Intro. To Ordinary Differential Equations (4 cr.)
ECE 2070 Basic Electrical Engineering (2 cr.)
MSE 3100 Introduction to Metals and Ceramics (3 cr.)
CE 2010 Statics (3 cr.)
Year 3
MSE 4150 Introduction to Polymer Science & Engineering (3 cr.)
MSE 3010 Materials Synthesis & Fabrication Laboratory (2 cr.)
MATH 3020 Statistics for Scoemce and Engineering (3 cr.)
MSE 3260 Thermodynamics (3 cr.)
MSE 3910 Undergraduate Research Fundamentals (1 cr.)
MSE 3450 Practice of Materials Engineering (1 cr.)
A&H/SS (3 cr.)
MSE 3190 Materials Processing (3 cr.)
MSE 3020 Materials Characterization Laboratory (2 cr.)
MSE 3270 Transport Phenomena (3 cr.)
MSE 4910 Undergraduate Research (3 cr.)
MSE 4050 Solid State Materials (3 cr.)
MSE 4220 Mechanical Behavior of Materials (3 cr.)
Year 4
MSE 4070 Senior Capstone Design (3 cr.)
ENGR 2080 Engineering Graphics and Machine Design (2 cr.)
Technical Requirement (3 cr.)
Technical Requirement (3 cr.)
COMM 2500 Public Speaking (3 cr.)
IE 3840 Engineering Economic Analysis (3 cr.)
Technical Requirement (3 cr.)
Technical Requirement (3 cr.)
Technical Requirement (3 cr.)
A&H/SS (3 cr.)

# DEPARTMENTAL POLICIES

## Academic Advising

Before registering for each semester, it is the student's responsibility to seek out their academic advisor to consult on their academic status and progress towards graduation. Advising is required before a student can be cleared to register for a particular term. Please note that the staff/faculty official email account is "@clemson.edu".

Students are responsible for checking their email and Canvas advising workgroup regularly for updates.

Before an advising meeting, each student needs to create an individualized curriculum map (use MSE curriculum worksheets) for a student's particular degree plan and academic year. This should show what degree requirements have been completed, what courses are planned for the upcoming semester, and a plan of classes to complete the degree. In preparation for advising, students might use the following resources:

- CU Navigate https://clemson.campus.eab.com/
- MSE Undergraduate Advising pages https://www.clemson.edu/cecas/departments/mse/academics/undergraduate/bs-degree.html#mseprogramcurriculum
- University Announcements for your curriculum year https://catalog.clemson.edu/
- iROAR/Degree Works https://dash.sis.clemson.edu/Dashboard/

The role of academic advisors is to confirm that your plan of courses is appropriate, and you are on the correct path toward graduation. A student's advising appointment is an opportunity to ask questions regarding the MSE curriculum and requirements for completing the MSE degree. If a student has prepared for the meeting by planning their academic pathway, they may also take this opportunity to ask their academic advisor other questions regarding other options in the department (e.g., research, co-op, internship, study abroad, graduate school, etc.).

Students should consult their academic advisor before making other decisions regarding their academic progress. Examples of these may include:

- Dropping a required MSE course after the drop date with implications for prerequisites

- See Academic Forgiveness Policy before submitting the form https://www.clemson.edu/registrar/student-records/academic-forgiveness.html

Highlights:

- The MSE department enforces course prerequisites. Students should familiarize themselves with all course prerequisites. Petitions can be made to the Undergraduate Program Director after the approval of the academic advisor and the course instructor. The Undergraduate Program Director has the final decision.

- For all MSE courses, D is a passing grade. However, some prerequisite courses must be completed with a C or better.

## Professional Advising

Every MSE student will be assigned a faculty member as a professional advisor from when the student changes their major until graduation. This faculty member can guide career path selection and professional growth opportunities while enrolled in the MSE UG program. Students can schedule to meet their professional advisor either individually or within a group setting for 15-30 minutes during each semester. Meetings are encouraged to be scheduled between 8 AM – 5 PM Monday – Friday.

**Professional Advising Process:**

Before the semester meeting, all UG students should:

- Identify your areas of academic interests, extracurricular activities, motivations, accomplishments
- Specify your aspirations, both as an undergraduate in MSE and after completing the degree
- Think about the steps to achieve your aspiration: internship or co-op, student clubs. (honor fraternity or professional association), study abroad, research, jobs, industry, etc.

**Best Practices:**

- The form following this page can help you conduct this self-audit before meeting with the professional advisor every semester.
- Realize you are gathering information to take steps and make decisions to meet your goals; your professional advisor is not there to make decisions for you
- Seek information from many sources (instructors in classes, parents, peers, professional work contacts) to get multiple perspectives.
- Be prepared for reflective questions and be open to listening to options
- Ask for advice on how to professionally resolve conflict or communicate better with peers, instructors, supervisors

**Questions Your Professional Advisor May Ask:**

- Why are you majoring in MSE?
- What is your overall goal in life?
- What do you hope to gain from experience (study abroad, co-op, internship, research)?
- How are you doing with the application process for the experience?
- What are the different career paths you are investigating? (continue into industry, graduate school in science/engineering programs, or into other fields (MBA, law, medical, K-12)

# MSE Undergraduate Program Professional Advising
# Student Form

*This form is to be filled out by the MSE undergraduate student and brought with them to the advising meeting. A copy will be made and kept by the professional advisor.*

Student Name: _____ Meeting Date: _____

Career types of interest (Industry, R&D, Academia, Law, Medicine, etc.): _____

_____

_____

Areas of interest (polymers, ceramics, metals, energy, biomaterials, etc.): _____

_____

_____

Steps student is taking to identify or progress towards career goals:

_____

_____

_____

_____

Areas student needs help from a professional advisor:

_____

_____

_____

***After the meeting, the Professional Advisor should copy this form and submit the form to the Student Services Coordinator.***

## Prerequisite Policy

Prerequisites to MSE courses are established by the MSE Undergraduate Curriculum and Standards Committee and approved at the university level to ensure that students are adequately prepared for the courses. The objectives are to prevent students from doing serious harm to their academic records by attempting courses they are not ready for, ensuring that students can do their fair share of teamwork, and ensuring that poorly prepared students do not impede the pace and scope of courses.

Generally, the Undergraduate Program Director is reluctant to waive prerequisites, but mitigating circumstances sometimes arise. Any student who wishes to enroll in a course that does not meet all conditions must submit a written document via email to the MSE Undergraduate Director and the MSE Student Services Coordinator. The memo should explain the circumstances with supporting documentation and be received no later than one week before classes start. Earlier submittals are encouraged, particularly during the academic registration period.

When the Undergraduate Program Director deliberates such requests, the primary factors considered are the reasons for the prerequisite deficiency and the student's academic record to date, with particular emphasis on engineering GPA and prior performance in MSE courses. Students who enroll in a class without meeting all prerequisites or receiving a waiver from the Undergraduate Program Director will be dropped from the course.

**Things for students to consider regarding Prerequisite Waivers**

- Do not drop or stop attending a class without consulting your academic advisor or the MSE Student Services Coordinator.
- Waivers are not automatically or routinely granted.
- The MSE curriculum is highly structured, with many courses being prerequisites to others.
- Many classes are offered only once a year. Before you drop any course, you must consider the consequences to your academic schedule and progress toward graduation.
- For more information, you should see your academic advisor and read the prerequisite table.

| Semester | Course | Prerequisites to Enroll in Course | The course is a Prerequisite For |
|---|---|---|---|
| Fall Freshman | **CH 1010** | SAT Math score 640 or higher; or ACT Math score 27 or higher; or CH 1040 or MATH 1050; or MATH 1010 or 1020, or 1030 with C or better | CH 1020 |
| | **ENGL 1030** | None | Literature |
| | **ENGR 1020** | MATH 1040, 1060 concurrently OR MATH 1060 C or better; or 65 or better CMPT | ENGR 1410 |
| | **MATH 1060** | SAT Math score 680 or higher; or ACT Math score of 27 or higher; or 80 or better on the CMPT | MATH 1080, PHYS 1220 |
| Spring Freshman | **CH 1020** | CH 1010 with C or better | CH 2230, CH 2270, MSE 3260 |
| | **ENGR 1410** | ENGR 1020 with C or better | CE 2010, ENGR 2080 |
| | **MATH 1080** | MATH 1060 or MATH 1070 with C or better | CE 2010, MATH 2060, PHYS 2210, |
| | | | MSE 2100, IE 3840 |
| | **PHYS 1220** | MATH 1060 or MATH 1070 with C or better | PHYS 2210 |
| Fall Sophomore | **CH 2230, CH 2270** | CH 1020 | CH 2240, CH 2280 |
| | **MATH 2060** | MATH 1080 or 1110, C or better | MATH 2080, ECE 2070, MATH 3020 |
| | **MSE 2100** | MATH 1080 or 1110, C or better | MSE 3100 |
| | **PHYS 2210** | PHYS 1220 | ECE 2070 |
| Spring Sophomore | **CE 2010** | ENGR 1410 with C or better, MATH 2060 | MSE 4220 |
| | **CH 2240/2280** | CH 2230/2270 | MSE 3010, MSE 3020, MSE 4150 |
| | **ECE 2070** | MATH 2060, PHYS 2210 | |
| | **ENGR 2080** | MATH 1080 C or better, ENGR 1410 C or better | |
| | **MATH 2080** | MATH 2060 with C or better | MSE 4220 |
| | **MSE 3100** | MSE 2100 | |
| Fall Junior | **MSE 3010** | CH 2280, MSE 2100 | |
| | **MSE 3260** | CH 1020, MSE 2100, MATH 1080, PHYS 2210 | MSE 3270, MSE 4050 |
| | | | MSE 4130, MSE 4280, MSE 4320, MSE 4330 |
| | | | MSE 3910 |
| | **MSE 3450** | | |
| | **MSE 4150** | CH 2240 | |
| | **MSE 3910** | MSE 3260 | MSE 4910 |
| | **MATH 3020** | MATH 2060 | |
| Spring Junior | **IE 3840** | MATH 1080, C or better | |
| | **MSE 3020** | CH 2280, MSE 2100 | |
| | **MSE 3190** | MSE 2100 | |
| | **MSE 3270** | MATH 2080, MSE 2100, MSE 3260 | |
| | **MSE 4050** | MATH 2080, MSE 3100 | |
| | **MSE 4220** | CE 2010, MATH 2080 | |
| Senior | **MSE 4070** | | |
| | **MSE 4130*, 4160*, 4170*** | MSE 2100, MSE 3100, MSE 3260 | |
| | **MSE 4240* 4280*** | MSE 3100, MSE 3260 | |
| | **MSE 4320*,4340*** | MSE 2100, MSE 3260 | |
| | **MSE 4520*, 4530*,4540*** | CH 1010; Junior standing; CH 2240 | |
| | **MSE 4570*, 4580*** | Junior standing in engineering or science | |
| | **MSE 4560*, 4610*, 4650*** | MSE 4150 | |
| | **MSE 4900*** | | |
| | **MSE 4910** | MSE 3910 | |
| | **MSE 4920*** | Consent of instructor | |
| | | | |

## Substitution Process for Both Clemson Courses and Courses Taken Elsewhere

**Substitution for Required Courses**
The MSE Undergraduate Curriculum and Standards Committee has designed the curriculum carefully to ensure that our graduates are well prepared to undertake their professional careers and ensure that all accreditation requirements and university requirements are met. Thus, substitution for a required course in the curriculum is not approved without scrutiny. Nevertheless, there are rare circumstances in which such substitution is justified and will be permitted with the necessary approvals. Such events include a substitution of an equivalent or higher-level course in the same subject matter or a substitution that allows a student to take advantage of a change made in a later curriculum. In all cases, the proposed substitution must be such that it does not cause any violation of accreditation or university requirements. The course substitution process is accessed through your iROAR account. University policy and procedures are listed here: https://www.clemson.edu/registrar/student-menu/student-records/course-substitution.html

**Courses Taken Elsewhere**
In the summer or during terms away from campus (e.g., on co-op or study abroad), it is sometimes advantageous for students to take one or more courses at another institution. For such course transfers to be accepted, the department that offers the equivalent course at Clemson must certify the course equivalency. Thus, for example, the Chemistry Department must certify an organic chemistry course as equivalent to CH 2230 or 2240 at Clemson for it to be accepted in our curriculum. This certification should be obtained in advance of taking the course. Many courses offered at nearby schools have already been certified and included on the University's Transfer Credit Equivalency List (TCEL). Their approval requires only verification that they are on the list and your advisor's signature. The relevant form, "Approval of Credits to Be Earned at Another School," is available online here: https://www.clemson.edu/registrar/documents/credits-taken-elsewhere.pdf

There are several university policies concerning course transfer which are found here: https://www.clemson.edu/registrar/student-menu/transfer-credits.html
There are three notes, in particular, to remember about course transfer:

1. You must earn at least a grade of C for any transfer to be accepted.

2. Transfer of any Materials Science & Engineering course not on the University's Transfer Credit Equivalency List (TCEL) requires a Materials Science & Engineering academic advisor's signature.

3. See https://www.clemson.edu/admissions/tcel/ for transfer evaluation equivalency information for specific colleges and universities.

## MINORS

Information about minors can be found in the Undergraduate Announcements.
https://catalog.clemson.edu/content.php?catoid=35&navoid=1093

Students majoring in MSE can easily earn the chemistry minor by thoughtfully choosing a course that meets the Chemistry minor and the technical elective requirement for the B.S. in MSE.
Information about the Chemistry minor is listed here:
https://catalog.clemson.edu/preview_program.php?catoid=35&poid=8885

Students majoring in other engineering and applied sciences programs may be able to earn a minor in Materials Science and Engineering.
Information about the Materials Science and Engineering minor is listed here:
https://catalog.clemson.edu/preview_program.php?catoid=35&poid=9906

## GENERAL EDUCATION REQUIREMENTS

Information about General Education requirements can be found in the Undergraduate Announcements (http://catalog.clemson.edu/). Each undergraduate student must fulfill the conditions stipulated in the announcements published the year of their initial enrollment at Clemson or in the year of their re-enrollment if the student withdraws from the university and returns. Any exception to curricular or general education requirements must be approved via the course substitution procedure.

**Specific notes on General Education for Materials Science & Engineering students**

- Students who complete the Materials Science & Engineering curriculum coursework at Clemson University automatically satisfy the following General Education coursework requirements.
    A. Communication
    B. Mathematics
    C. Natural Sciences with lab
    F. Global Challenges (GLCH)

- It is possible to satisfy all General Education A&H/SS requirements of the University (D-E) by taking four courses. However, the Materials Science & Engineering curriculum requires 15 credits of A&H/SS or five classes.

- A worksheet and guide to completing A&H/SS/GLCH General Education requirements in Materials Science & Engineering is available.

# 2022 – 2023 General Education Worksheet for MSE

**Arts & Humanities (A&H), Social Sciences (SS), Global Challenges (GC)**

| | Category | Course |
|---|---|---|
| 1. | C: Arts & Humanities: Literature | |
| 2. | C: Arts & Humanities: Non-Literature | |
| 3. | D: Social Science * | |
| 4. | D: Social Science * | |
| 5. | **Additional A&H/SS** | |
| 6. | E: Course that Satisfies Global Challenge* | |
| | E: Course that Satisfies Global Challenge 3000-4000 level* | |

* Must be from 2 different fields: AGRB and ECON are considered the same field

- **Prior to graduation,** all MSE students must complete 15 credit hours of A&H/SS General Education courses.
- Not all courses are offered every semester
- Check the current Undergraduate Catalog for exact credit hours, pre-requisites and concurrent enrollment requirements
- Courses in **bold** on page 2 have **no pre-requisite** requirements *(However, 3000/4000 level courses are generally recommended for upperclassmen)*
- Double dippers are courses that fulfill multiple requirements at one time and are noted with superscripts
- The Additional A&H/SS options are defined on the back of this sheet

**Check the Undergraduate Catalog of your official curriculum year for the authoritative list.**

# 2022 – 2023 General Education Worksheet for MSE

Complete Lit **C. Arts and Humanities: Literature [Lit]** ..... ***3 credits***

ENGL 2020, 2120, 2130, 2140, 2150, 2160 **CHIN 4010, 4020 GER 2600**, HON 1900, 2210, **JAPN 4010, RUSS 3600, 3610**

*Literature taught in a foreign language:* FR 3000, 3040, GER 3060, 3600, 3610, ITAL 3010, 3020, JAPN 4060, SPAN 3040, 3110, 3130

NL **C. Arts and Humanities: Non-Literature [NL]** ..... ***3 credits***

**AAH 1010, ART** 2100[CCA], 3750, ASL 3050[CCA], CAAH 2010[CCA], CHIN (PHIL) 3120, (PHIL) 3130, (PHIL) 4140,4990, COMM 1800[CCA], 3030, 3080, 3090, 4020, ENGL (GW) 3010, 3550, (WCIN) 3570, ENGL (LANG, WCIN) 4540, FR 3070, GW (ENGL) 3010, 4050, GER 3400, HON 1910, 2010[STS], 2030, 2100, 2220, **HUM 3010, 3020, HUM 3060,** 3090[CCA], JAPN 3070, 3080, LANG 3400, 3420, 3560, (ENGL) 4540, **LARC** 1160[STS], **MUSC** 2100[CCA], **3080, 3090, 3110, 3120, 3130,** 3140[CCA], **MUSC 3170, 3610, 3620, 3630, 3640, 3690, 3700, 3710, 3720, PHIL 1010, 1020, 1030,** 1240[STS], 2100[STS], **(CHIN) 3120, (CHIN) 3130, 3160, 3170, 3180, PHIL 3230,** 3240[STS], **3250,** 3260[STS], **3270, 3440,** 3450[STS], **PHIL (WS) 3490, (CHIN 4140) REL** 1010[CCA], 1020[CCA], **3010, 3020, 3030, 3060, 3070, 3090, 3120, 3130, 3150, RUSS 3400,** SPAN 3070, 3080, **STS** 1010[STS], 1020[STS], 2150[STS], 3010[STS], 3030[STS], **THEA 2100, 2790, 3080, 3090,** THEA 3150, 3160, **3170,** WCIN (ENGL) 3570, 4540, WS 3010, (PHIL) **3490**

SS SS **D. Social Sciences [SS]** ..... ***6 credits***

**AGRB 2020, ANTH** 2010[CCA], **ECON 2000, 2050, 2110,** 2120, **GEOG 1010,** 1030[CCA], **1060, HIST 1010, 1020,** 1220[STS], 1240[STS], 1720[CCA], 1730[CCA], 1930[CCA], HON 1920, 2020, 2200, **PAS** 3010[CCA], **POSC 1010,** 1020[CCA], **1030,** 1040[CCA], **PSYC 2010,** 2500[CCA], 2750[STS], RS 3010, **SOC 2010, 2020**

GC **E. Global Challenges [GC]** ..... ***6 credits***

AAH 1020, **AGRB** 2050[STS], **ANTH** 2010[SS], **3250, 4280,ART** 2100[NL], ASL 3050[NL], CAAH 2010[NL], **COMM** 1800[NL], **ENGL 2120, 2160, GEOG** 1030[SS], **HIST** 1720[SS], 1730[SS], 1930[SS], HON 1930, 2090, **HUM** 3090[NL], IS 1010, 2100, **LANG 2500, 2540, MUSC** 2100[NL], 3140[NL], **PAS** 3010[SS], **POSC** 1020[SS], 1040[SS], **PSYC** 2500[SS], **REL** 1010[NL], 1020[NL], **WS 1030,** *or through a University-approved global challenge experience*

5th 8th **Additional A&H/SS Requirement** ..... ***as required by MSE***

*Any 1000 – 4999 course in the following rubrics:* AAH, ANTH, ARAB, ART, ASL, CHIN, DANC, ECON, FR, GEOG, GER, GW, HIST, HUM, ITAL, JAPN, LANG, LAW, MUSC, PA, PAS, PHIL, PORT, POSC, PSYC, REL, RS, RUSS, SOC, SPAN, THEA, WS

*Rubrics with exceptions for additional requirement:* AGRB 1000-2999, CAAH 2010, COMM [except 1500, 2500], EAS 1230, ENGL 2000-4999 [except 2170, 3040, 3100, 3120, except ENGL 3140, 3150, 3160, 3330], HON 1900, 1910, 1920, 2010, 2020, 2030, 2100, 2200, 2210, 2220, IS 2100, STS 1010, 1020, 3030

**BOLD** indicates no pre-reqs required  Underline indicates MUSC courses require auditions, are 1 hour, may be repeated or grouped to achieve credit required.

This is an unofficial document: Responsibility for satisfying these requirements rests with the student. Evaluation based on catalog year 2021 – 2022  Updated – June 1, 2021

# GRADUATION REQUIREMENTS

### Undergraduate Exit Survey

Engineering is a professional calling. Part of a profession is contributing time to make improvements. All graduating seniors will be asked to complete a survey and/or interviews to allow for the continued development and improvement of the MSE undergraduate program for future students and stakeholders (graduate schools, industry, research centers)

# SCHOLARSHIPS

Several unique scholarship opportunities exist in the Department of Materials Science and Engineering, including:

- AVX Scholarship*
- Frank and Reba Bobo Scholarship
- Ceramic Engineering Alumni Fund Scholarship
- Efland Textile Scholarship
- Ben and Kitty Gossett Scholarship
- Charles A. Grant Family Endowment
- Jewell Memorial Foundation's Textile Scholarship Fund
- Kentucky-Tennessee Clay Company Scholarship
- Kentwool Educational Endowment
- Rose Matic-Leigh Scholarship
- George McMillan Scholarship Fund
- Norris Textile Scholarship
- Carl Poorman Scholarship
- Robert C. Reinhardt Jr. Memorial Scholarship
- Gilbert Robinson Undergraduate Endowment
- Gilbert Robinson Memorial Endowed Scholarship
- Sandoz Foundation Scholarship
- Textile Industry
- Glee Thompson Scholarship
- John and Evelyn Wells Scholarship
- David Wilkinson Scholarship
- John Wilson Textile Salesmen's Scholarship
- Brockington T. Woodham Scholarship

MSE scholarship recipients are selected by the Scholarship and Awards Committee in consultation with the MSE Department Chair (indicated with *). Financial Aid picks all the other scholarships.
There is no need to apply for these scholarships. These scholarships are awarded based on academic standing.

These awards can complement many state and federal financial aid and scholarships. For more information about scholarships and grants, please visit http://www.clemson.edu/financial-aid/

Another opportunity for Clemson MSE students is the American Association of Textile Colorists and Chemists (AATCC) scholarship program. There are $3000 and $6000 scholarships available for juniors and seniors with a 2.85 GPA or above to apply and compete with students from NC State University.

- aatcc.org

Some AATCC scholarships (Piedmont Section) require student membership in AATCC.
Student memberships are currently $35/year and enable students to network for co-op, internship, research, and job opportunities.

- https://members.aatcc.org/join/intro.html?Action=Join

# ENRICHMENT OPPORTUNITIES

## Cooperative Education

**How Cooperative Education Works**
The Cooperative Education Program enables students to alternate semesters of work and study to gain a year or more of practical experience in their chosen field while earning their academic degrees. About 20% of Clemson MSE majors participate in the Co-op Program. As the term implies, Cooperative Education represents a partnership between the University and participating industry, business, and government organizations. At least three work periods are required to obtain the minimum 12 months of experience needed to earn the Cooperative Education Certificate, awarded with the degree at graduation. The recommended schedule is designed to ensure that students who choose to co-op will enter the program with a solid foundation of engineering skills and be prepared to do progressively more meaningful and productive work in each co-op session.

The MSE program strongly suggests that students start a co-op program after completing their junior year courses (beginning in the summer following their junior year). A course plan with co-op is available.

**Advantages for MSE Students**
Students who elect to participate in the co-op program realize several benefits:

- Co-ops provide valuable on-the-job learning experiences that cannot be acquired in the classroom.
- Co-ops provide students with opportunities to evaluate their initial career path choice.
- Often, students are offered permanent employment with their co-op employer after graduation.
- Career-related, on-the-job experience enhances classroom academic work through increased motivation and conceptual understanding.
- Co-ops provide students with additional opportunities to develop confidence, maturity, responsibility, and human relations skills professionally.
- Co-ops allow students to earn substantial wages and salaries that can be used to finance a portion of college expenses.
- More and more employers require that new hires have relevant work experience.

**Eligibility and Participation**
All Clemson students must complete at least 27 semester hours with a minimum 2.50 GPA before beginning their first co-op work term. The MSE department strongly encourages all MSE UG students to wait to start the co-op program until after their junior year courses are completed. Some employers require more semester hours completed and a higher GPA than these criteria.

**Special Notes:**

- If you have a scholarship and go on co-op, talk with the Financial Aid Office about administering your scholarship. Some scholarships require that you complete a minimum number of hours in 12 months, influencing your course scheduling. See your advisor if you need to depart from the suggested schedule.

- Pay careful attention to the suggested schedule you follow and consult with your MSE academic advisor each semester. This will ensure that you can get the courses you need when you plan to take them and that you will have all the prerequisites for each class.

**Additional Information**

The first step should be to meet with your assigned professional or academic advisor. Next, students should visit the Center for Career and Professional Development in The Nieri Family Alumni and Visitors Center, 220 Madren Center Drive Clemson SC 29634; phone (864) 656-3150. Many helpful resources are available through their website:
https://career.clemson.edu/channels/cooperative-education-program/

Finally, a best practice would also be to talk to MSE students currently participating in the co-op program. You can meet these students through the Material Advantage student chapter.

## Materials Science and Engineering

**Co-op Senior Year**

NAME _____

CU ID _____

Co-op #2 Summer

| FRESHMAN | | SOPHOMORE | | JUNIOR | | SENIOR | |
|---|---|---|---|---|---|---|---|
| 1st | 2nd | 1st | 2nd | 1st | 2nd | 1st | 2nd |
| Hum/SS (3) SS 1 | Hum/SS (3) Non-Lit | Hum/SS (3) SS 2 | ENGR 2080 (2) ECE 2070 (2) | MATH 3020 (3) | MSE 4220 (3)** | CO-OP #1 Fall | MSE 4910 (2) |
| ENGR 1020 (3) | ENGR 1410 (3) | MSE 2100 (3) | CE 2010 (3) | MSE 3260 (3)* | MSE 3190 (3)** | | Tech Engr Req (3) |
| MATH 1060 (4) | MATH 1080 (4) | MATH 2060 (4) | MATH 2080 (4) | MSE 4150 (3) | MSE 3270 (3)** | | Tech Engr Req (3) |
| ENGL 1030 (3) | PHYS 1220 (3) | PHYS 2210 (3) | MSE 3100 (3)** | MSE 3450 (1)* | MSE 4050 (3)** | | COMM 2500 (3) |
| CH 1010 (4) | CH 1020 (4) | CH 2230 (3) | CH 2240 (3) | MSE 3910 (1) | IE 3840 (3) | | ECE 2070 (2) ENGR 2080 (2) |
| | | CH 2270 (1) | CH 2280 (1) | MSE 3010 (2)* | MSE 3020 (2)** | | |
| | | | | Hum/SS (3) Lit | | | |
| 17 | 17 | 17 | 16 | 16 | 17 | | 13 |

Last revised: 1 May 2025

Crossed out = Completed  TermYR = Plan to take  Circled TermYR = currently enrolled in  *Offered only Fall term  **Offered only Spring term

## Materials Science and Engineering

**Co-op Senior Year**

NAME _____

CU ID _____

**Co-op #2 Summer**

| 5th YEAR | 5th YEAR | | | | | | |
|---|---|---|---|---|---|---|---|
| 1st | 2nd | | | | | | |
| MSE 4070 (3) | CO-OP #3 Spring | | | | | | |
| Tech Engr Req (3) | | | | | | | |
| Tech Engr Req (3) | | | | | | | |
| Tech Engr Req (3) | | | | | | | |
| Hum/SS (3) 5th | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 15 | | | | | | | |
| | Total 128 | | | | | | |

Last revised: 9 May 2022

Crossed out = Completed  TermYR = Plan to take  Circled TermYR = currently enrolled in

# Internships

## How Internships Work

Internships provide work experience with industry, business, and government organizations but are limited to a single term- typically a summer term. Many students will prefer an internship opportunity based on gaining multiple internship opportunities with different organizations. It does not delay graduation, or the availability of positions offered by other organizations. Some companies may only provide opportunities for internships. Students may have a chance to complete multiple internship rotations if desired. Some students will opt to participate in co-op and internships before they graduate.

### Advantages for Students

Students who elect to participate in internship programs realize several benefits:

1. Internships provide valuable on-the-job learning experiences that cannot be acquired in the classroom.
2. Internships allow students to evaluate their initial career path choice.
3. Often, students are offered permanent employment with their internship employer after graduation.
4. Career-related, on-the-job experience enhances classroom academic work through increased motivation and conceptual understanding.
5. Internships provide students with additional opportunities to develop professionally concerning confidence, maturity, responsibility, and human relations skills.
6. Internships allow students to earn substantial wages and salaries that can be used to finance a portion of college expenses.
7. More and more employers require that new hires have relevant work experience.

### Eligibility and Participation

Internships are available to all MSE undergraduate students. Eligibility for internships is dictated by the internship position advertised by the sponsoring organization. Students should attend the Clemson University CAREER fairs, visit the Michelin Career Student Services Center, and read announcements the MSE Student Services Coordinator posts in the MSE Undergrad News and Advising CANVAS workgroup to learn about internship opportunities.

### Additional Information

The first step towards identifying an internship opportunity should be to visit the Center for Career and Professional Development in The Nieri Family Alumni and Visitors Center, 220 Madren Center Drive Clemson SC 29634; phone (864) 656-6000. Many helpful resources are available through their website: https://career.clemson.edu/channels/off-campus-internships/
The internship office can be reached at Center for Career and Professional Development in The Nieri Family Alumni and Visitors Center, 220 Madren Center Drive Clemson SC 29634; phone (864) 656-2160

Please contact your assigned professional advisor or academic advisor for department-specific advice.

## The Honors Program and the MSE Departmental Honors Program

The Honors Program of Clemson University is facilitated through Clemson University Honors College. Students enrolled in honors work are called Clemson University Scholars. To enter or remain in Clemson University Honors College, a student must have a cumulative grade-point ratio of 3.4. Admission to Clemson University Honors College is by invitation, based primarily on SAT scores and high school academic records for incoming first-year students. The Clemson University Honors College Student Handbook is available here: https://www.clemson.edu/cuhonors/academics/curriculum-tracks/index.html

All students can apply for Departmental Honors even if they are not elected to the Honors Program as first-year students. The Departmental Honors Program is defined by the MSE Department's Undergraduate Curriculum and Standards Committee and administered by the MSE Undergraduate Program Director. Students graduating with Departmental Honors will receive the Senior Departmental Honors Medallion at an honors ceremony shortly before graduation. The medallion is worn during the commencement ceremony. Students' diplomas also reflect honors graduation designation.

**MSE Departmental Honors Program**
Departmental Honors in MSE requires the following sequence of courses totaling seven credit hours:

| | |
|---|---|
| 3910 | Undergraduate Research Fundamentals (1) - Honors Section |
| 4910 | Undergraduate Research (2) - Honors Section |
| 4950 | Honors Research II (3) |
| 4970 | Honors Thesis (1) |

During this research sequence, students can conduct research over four semesters with a faculty research mentor. The research project will begin in MSE 3910, generally taken in the first semester of the junior year. Students will attend weekly meetings to gain essential skills to conduct research within materials science and engineering, identify a faculty research mentor and outline their research objective/hypothesis. In most cases, the research faculty member will be from the Department of MSE. If a student wishes to pursue a materials science research project with a faculty member outside of the department, it must be approved by the instructor of MSE 3910. Students will continue their research projects by enrolling in MSE 4910 (Spring semester of junior year) and MSE 4950 (Fall semester of the senior year). Students are expected to gain more independence as they progress through these classes. During the Spring semester of the senior year, the honors student will write their honors thesis based on the research done in MSE 3910, MSE 4910, and MSE 4950 while enrolled within MSE 4970.

**Admission**
Students who wish to participate in the MSE Departmental Honors Program must meet the eligibility requirements set by Clemson University Honors College and the MSE Department, which include:

- Students applying for admission to the MSE Departmental Honors Program must have completed or be about to complete the sophomore courses of the MSE curriculum.
- If not already a Clemson University Honors Student, you must have a 3.4 GPA and apply to the Clemson University Honors College.
- For Spring admission, the application is open 1 Oct - 1 Dec.
- For Fall admission, the application is open 1 Mar - 15 Apr.

## Study Abroad Opportunities

Study Abroad programs are an excellent way to broaden your undergraduate experience. Every year, 2 – 7% of MSE students participate in a Study Abroad program. It is recommended that MSE students experience Study Abroad either very early in the curriculum and take General Education courses (such as Arts & Humanities Literature and Non-Literature, COMM 2500, Social Sciences, and Global Challenges courses) or participate during their senior year and utilize the flexibility of the technical electives. Another option is to pursue a study abroad opportunity in the summer (full-term or mini-mester program) so that they can continue with the standard curriculum path. In all cases, students are encouraged to thoroughly research courses at schools they plan to attend and ensure that Clemson University will accept course credit.

There are currently no MSE Faculty-led study abroad programs; however, there are several options for MSE students, including:

- Faculty-led programs facilitated by other departments and offered typically during the summer terms. Prior MSE students have traveled to Ireland, Spain, Argentina, and France. Examples of these programs are below:

| **Materials Science & Engineering Study Abroad Options through Clemson University** | | |
|---|---|---|
| | | |
| **Program** | **Country** | **Clemson Equivalent Course Credit** |
| Sustainable Engineering & German Culture | Germany | BE 4400/CE 4400, IS 2100 |
| International Bioengineering Research Topics | Japan | BIOE 4600, BIOE 4910 |
| Sustainability and GIS (Geospatial Info Sys) | Spain | EES 4860, EES 4910 |
| DTU Chemical Engineering | Denmark | CHE 4070/4071 |
| Automotive Engr & Advanced Manufacturing | Germany | AMFG 3800, STS 1010 |

- Take part in a Clemson University formalized Exchange program. In these programs, Clemson University has entered an existing exchange program. MSE students have used this mechanism to study at the University of Newcastle in Australia and the University of Strathclyde in Scotland.
- Directly enroll at an institution without an existing contract with Clemson University. Students have completed exchanges with Lund University in Sweden and KAIST in South Korea. MSE students who are National Scholars may participate in NSP faculty-directed experiences. Prior MSE students have traveled to South Africa through this program.

If you are interested in pursuing a study abroad option, you are encouraged to take the following steps:

- Take Study Abroad 1010. This workshop is offered Mondays 3:30 pm and Thursdays 12:30 – 1:30 pm in E-304 Martin Hall.
  https://www.clemson.edu/studyabroad/get-started.html

- Meet with a staff member within the CECAS Global Engagement office. This office will have the current list of programs CECAS faculty offers and knowledge of programs that CECAS students have utilized.
  https://www.clemson.edu/cecas/global-engagement/index.html

- Look at some sample curriculum plans our academic advisors suggest. These are within the MSE Undergrad News and Advising Canvas portal.

- Speak with your MSE academic and professional advisors to help with your career goals and obtain course transfer approval before participating in a study abroad opportunity.

## Materials Science and Engineering

**Study Abroad Senior Year**

NAME _____

CU ID _____

STUDY ABROAD

| FRESHMAN | | SOPHOMORE | | JUNIOR | | SENIOR | |
|---|---|---|---|---|---|---|---|
| 1st | 2nd | 1st | 2nd | 1st | 2nd | 1st | 2nd |
| Hum/SS (3) SS 1 | Hum/SS (3) Non-Lit | Hum/SS (3) SS 2 | ENGR 2080 (2) or ECE 2070 (2) | MATH 3020 (3) | MSE 4220 (3)** | Tech Engr Req (3) | MSE 4910 (2) |
| ENGR 1020 (3) | ENGR 1410 (3) | MSE 2100 (3) | CE 2010 (3) | MSE 3260 (3)* | MSE 3190 (3)** | Tech Engr Req (3) | Tech Engr Req (3) |
| MATH 1060 (4) | MATH 1080 (4) | MATH 2060 (4) | MATH 2080 (4) | MSE 4150 (3) | MSE 3270 (3)** | COMM 2500 (3) | Tech Engr Req (3) |
| ENGL 1030 (3) | PHYS 1220 (3) | PHYS 2210 (3) | MSE 3100 (3)** | MSE 3450 (1)* | MSE 4050 (3)** | Hum/SS (3) 5th | Tech Engr Req (3) |
| CH 1010 (4) | CH 1020 (4) | CH 2230 (3) | CH 2240 (3) | MSE 3910 (1) | IE 3840 (3) | MSE 4070 (3)* | ECE 2070 (2) or ENGR 2080 (2) |
| | | CH 2270 (1) | CH 2280 (1) | MSE 3010 (2)* | MSE 3020 (2)** | | |
| | | | | Hum/SS (3) Lit | | | |
| 17 | 17 | 17 | 16 | 16 | 17 | 15 | 16 |

5/9/2022

Crossed out = Completed  TermYR = Plan to take  Circled TermYR = currently enrolled in  *Offered only Fall term  **Offered only Spring term

## Research Opportunities for MSE Undergraduates

All MSE undergraduate students must complete research during their junior and senior years by completing two courses- MSE 3910 (Undergraduate Research Fundamentals) and MSE 4910 (Undergraduate Research). During this research sequence, students will be able to conduct research over two semesters with a faculty research mentor. The research project will begin in MSE 3910, generally taken in the junior year's first (preferred) or second semester. Students will attend weekly meetings to gain essential skills to conduct research within materials science and engineering, identify a faculty research mentor and outline their research objective/hypothesis. In most cases, the research faculty member will be from the Department of MSE. If a student wishes to pursue a materials science research project with a faculty member outside of the department, it must be approved by the instructor of MSE 3910. Students will continue their research projects by enrolling in MSE 4910 (during their senior year). Students are expected to gain more independence as they progress through these classes.

Additional research experience can be gained through either other academic or paid research opportunities.

**Undergraduate Research Experiences at Clemson University**

***Creative Inquiries at Clemson University (Academic credit and not paid)***

Description: This program started in 2005, allowing a student or group of students to develop their project and research. You may also join one of the 250 projects already started. Website for more information: http://www.clemson.edu/academics/programs/creative-inquiry/

***Paid Research Experiences at Clemson University***

These positions can typically be found by reading emails from the MSE Student Services coordinator and directly contacting faculty whose research focus interests you. Your email should contain a short statement of interest and your resume.

**Undergraduate Research Experiences at other Universities**

***National Science Foundation Research Experience for Undergraduates (REU)***

Description: This program is "designed to help participants have a positive research and social experience and encourage them to pursue graduate studies and research careers." You will work with a group of other undergraduates and attend workshops, but typically you will conduct your research project.

- Website for more information: https://www.nsf.gov/funding/initiatives/reu
- Brief facts about the programs:
  - Typical Benefits: summer stipend ($5 K), free housing, and travel stipend
  - Deadlines for sites range from January to mid-March
  - Need to apply to each site, but applications are similar between sites
  - Should apply to at least four REU sites

## Pursuing MSE Graduate Programs after completing a B.S.

**What is graduate school?**

You may choose to attend graduate school to earn a materials science & engineering M.S. degree (thesis or non-thesis), a Ph.D. degree, or both. An M.S. degree typically requires two (2) additional years beyond a B.S. degree, while the Ph.D. degree typically requires four to five (4-5) years beyond

a B.S. degree. For most M.S. and Ph.D. programs, you would take advanced courses and begin a research project in the first one or two years. Then, students in the Ph.D. program will continue to work on their research projects for the next three years.

**Why does one attend graduate school?**

- Graduate school is challenging and fun - Most of your graduate courses will be in areas that interest you and will offer considerable interaction with the professor and the other students. Moreover, most of your time spent on a Ph.D. degree will be researching a challenging problem of interest to you. You will be able to develop close-knit relationships with other entering class and research group members.

- Graduate school can be a wise investment - Although there is a short-term financial sacrifice in not taking a professional job with a B.S. degree, those who obtain advanced degrees generally receive higher starting salaries. More important, though, is that the type of job you qualify for will change, increasing job satisfaction. In addition, a Ph.D. degree may be a distinct advantage for upper-level management jobs and is a requirement for an academic position.

- Graduate students can be supported with a stipend to go to school - Most full-time Ph.D. graduate students have their tuition paid and receive a sufficient salary to live on. While you are applying for your graduate program and in the following years, students also can apply for fellowships. A good example is the National Science Foundation Graduate Research Fellowship. In addition to Ph.D. students, some programs also support M.S. students through a tuition waiver and a stipend.

**When is the best time to attend graduate school?**

Advice on this will vary. Many people will say that it is generally best to attend graduate school shortly after completing a B.S. degree and cite the ability to live on a small income, be familiar with academic processes (like studying for exams), etc. A smaller percentage of graduate students work a few years in industry first and then return to school. These students often return with a clearer vision of how an advanced degree can improve career opportunities and a more focused research direction.

**Who should attend graduate school?**

If you are interested in research and are in the top one-third of your class, you should consider attending graduate school. A graduate degree is a definite advantage for research and development or teaching at a higher education institution, if not a requirement. If your GPA exceeds 3.5/4.0, your chances of being accepted into a Ph.D. program with financial aid are excellent. If your GPA is between 3.0/4.0 and 3.5/4.0, you can probably gain admission to graduate school with financial assistance, but your choices may be limited. Please note that students with a lower GPA may still gain entrance into a graduate program depending on additional factors such as their publication record, GRE scores, etc.

**Where does one attend graduate school?**

First, we recommend you consider attending multiple schools and not just focus on a single program. You must apply to schools with active research programs in one or more areas that interest you. Discuss your desire to attend graduate school with your MSE professional advisor or undergraduate research advisor. Ask them for advice on well-suited schools and have faculty members with active research programs in areas that interest you.

Of course, Clemson has active research programs in several areas and a strong graduate program of study. We have found that Clemson undergraduates are some of our best graduate students and indeed encourage you to consider studying here.

**How does one apply for graduate school?**
While application dates will vary by institution, below are some general examples for those applying to enter a graduate program during the fall term:

- Sept: Applications Open:
- Oct-Dec: Graduate Fellowships:
- Dec: Graduate School Application:
  - University of California Santa Barbara, Dec 1st
  - Clemson University, Dec 2nd
- Feb- Mar: Campus Visits
- mid-Mar: Target date for applicants to be told admissions decision
- Apr 15th: Decision response deadline

The first person you should talk with is your professional advisor or undergraduate research advisor. These can help you identify the type of program you are interested in pursuing and which institutions you should apply to. They can also suggest other Clemson faculty about specific research areas.

We suggest limiting your applications to five to six faculty programs with research aligned with your interest. If you want to apply to the Clemson MSE program, the MSE Student Services Coordinator can guide you through the necessary forms.

For your application package, you will need to typically identify two-three letter writers for recommendations, draft a statement of purpose or personal statement, a statement of your research interests, and have a copy of your current resume and a copy of your transcript. Some suggested guidelines for these documents may be found here:
https://www.clemson.edu/graduate/admissions/preparing-to-apply/supporting-materials.html

When a school accepts you for graduate study, it will specify a decision date. An essential element in making your decision will be the financial aid available. If you are interested in a Ph.D. and have good qualifications, most schools will offer you a fellowship, teaching assistantship, or research assistantship that will cover tuition and provide a monthly stipend adequate for living expenses. Also, visiting the one or two schools you are most interested in is a good idea. Often, the school will pay for part of your visit.

## B.S./M.S. Option within MSE

**What is the MSE B.S./M.S. program?**
Undergraduate MSE majors who have completed at least 90 credit hours with a cumulative Clemson GPA of 3.4 can apply to begin work toward a non-thesis M.S. (Master of Science) in MSE while still completing their undergraduate program. This process is done by first completing the MSE B.S./M.S. departmental form, and the Graduate School Application form synchronously and then working with your academic advisor to enroll in approved graduate courses that will meet your undergraduate technical elective requirements. A total of 12 graduate course credits can be taken, and 6 of the 12 credits may be used to meet both the undergraduate and graduate program requirements.

**Technical elective selection for those pursuing the MSE B.S./M.S. program**
Additional information on the MSE B.S./M.S. program can be found in the MSE Graduate Handbook. Once students have applied to be in the B.S./MS program using both the MSE B.S./MS departmental form and the GS6-Bachelor-to-Graduate form, they will need to work with their academic advisor to select courses that will fulfill both their B.S. and M.S. program requirements.

Undergraduate students can take up to 12 credit hours from a 6000 level or higher course, of which six credit hours may satisfy the requirements of both their B.S. and M.S. degrees. The 6000-level versions of courses required in the B.S. curricula may not be used. For example, MSE 6150 cannot be used since the curriculum calls for MSE 4150 to be taken by undergraduate majors. However, students could take MSE 6580, which would fulfill a technical elective requirement for the B.S. degree and count towards the requirements for the M.S. graduate degree.

Course options for technical requirements outlined in the MSE B.S. program can include the following:

- MSE 6120 – Nuclear Fuel Cycle and Radioactive Waste Management
- MSE 6130 – Noncrystalline Materials
- MSE 6160 - Electrical Properties of Materials
- MSE 6170 – Innovations in Sustainable Energy Materials
- MSE 6240 - Optical Materials and Their Applications
- MSE 6280 – Phase Diagrams for Materials Processing and Applications
- MSE 6320 – Manufacturing Processes and Systems
- MSE 6340 – Fundamentals of Additive Manufacturing
- MSE 6520 – Corrosion and Oxidation
- MSE 6530 – Non-Destructive Evaluation
- MSE 6540 – Supramolecular and Hybrid Materials
- MSE 6560 - Polymer Materials Engineering
- MSE 6570 - Color Science
- MSE 6580 - Surface Phenomena in Materials Science and Engineering
- MSE 6610 – Polymer Fiber Engineering
- MSE 6650 – Frontiers in Polymer Chemistry
- MSE 6900 - Selected Topics in Materials Science and Engineering
- MSE 8090 - High-Temperature Materials
- MSE 8100 - Fundamentals of Materials Science
- MSE 8150 – Materials Surfaces
- MSE 8160 - Constitution and Structure of Glasses
- MSE 8170 – Energy Materials
- MSE 8190 - Inorganic Materials Characterization Techniques
- MSE 8191 - Inorganic Materials Characterization Techniques Laboratory
- MSE 8200 - Deformation Mechanisms in Solids
- MSE 8210 - Fracture and Fatigue
- MSE 8220 - Scanning Electron Microscopy
- MSE 8221 - Scanning Electron Microscopy Laboratory
- MSE 8230 - Transmission Electron Microscopy
- MSE 8231 - Transmission Electron Microscopy Laboratory
- MSE 8240 - Magnetic and Electrical Ceramic Materials
- MSE 8250 – Solid State Materials Science
- MSE 8260 - Phase Equilibria in Materials Systems
- MSE 8270 - Kinetics of Phase Transformation
- MSE 8280 - Phase Transformations in Materials Science
- MSE 8400 - Analytical Methods for Organic Materials

- MSE 8401 - Analytical Methods for Organic Materials Laboratory
- MSE 8540 - Multicomponent Polymeric Materials
- MSE 8550 - Stimuli-Responsive Materials
- MSE 8580 - Polymer Materials: Chemistry
- MSE 8590 - Polymer Materials: Structure & Properties
- MSE 8610 - Fiber Physics I
- MSE 8620 - Fiber Physics II
- MSE 8650 – Advanced Composites Manufacturing Processes
- MSE 8660 - Fiber Formation
- MSE 8900 - Selected Topics in Materials Science and Engineering

The following courses may not be used for a B.S./M.S. student's list of courses on their GS2 since the 4000-level equivalents are required for the B.S. program:

- MSE 6050 Solid-State Materials
- MSE 6150 Introduction to Polymer Science and Engineering
- MSE 6220 Mechanical Behavior of Materials

## Senior Enrollment in MSE Graduate Courses

MSE undergraduates with senior standing that have a 3.0 or higher cumulative GPA are eligible to request enrollment in graduate-level courses by completing the GS6 form through the Clemson Graduate School.

There are many reasons to look at taking a graduate course. The first may be to see what it feels like to be a graduate student. Many students find that the pace and interaction with their instructors in a graduate-level class are different than an undergraduate-level course.

**What is the difference between GS6 and GS6-Bachelor-to-Graduate form?**
The GS6 form allows you to take graduate-level courses, but there are no double-counting undergraduate and graduate degree requirements. Graduate courses taken using the GS6 form can be used to meet either the B.S. requirements or the M.S. requirements but not both. On the other hand, the GS6B.S./MS form allows you to double-count up to 6 of the 12 credit hours towards both B.S. and M.S. requirements in Clemson programs.

## Combined Bachelor of Science in Materials Science and Engineering And Master's Degree Departmental Application

For admission to the BS/MS non-thesis program within the Materials Science and Engineering program, please fill in the appropriate box and secure needed signatures. This form needs to be filled out prior to submitting the GS6-BSMS form. Applications will be reviewed for alignment with the BS/MS requirements. This program was initially designed for materials science and engineering undergraduates and therefore students outside of this program may or may not be allowed entry depending on their current undergraduate major. Instead, those students may be offered the ability to take graduate classes using the GS6- Senior Enrollment form. For policies and procedures for combined BS and MS, refer to the corresponding section of the MSE Graduate Student Manual. After acceptance into the BS/MS non-thesis program and identification of a thesis advisor, student may apply for BS/MS thesis program. **This form must be returned to the Student Services Coordinator.**

Full Name, Clemson ID number:_____

Expected UG Graduation Date (Month/Year):_____

Graduate Program of Initial Entry: BS/MS Non-thesis

Expected full-time MS Program Entry Date (Month/Year): _____

Applicant's signature _____ Date _____

Processing Section to be filled out internally.

**Approval for BS/MS Program**

☐ **Master of Science in Materials Science and Engineering (non-thesis option)**
Signature of either UG Director or Grad Director

UG or Grad Director Signature _____ Date _____

**Switch to BS/MS Thesis Program**

☐ **Master of Science in Materials Science and Engineering (thesis option)**

Name of thesis advisor _____

Thesis Advisor Signature _____ Date _____

Last revised: 1 August 2019

## Professional Chapters and Societies Open to MSE Undergraduates

Joining a professional chapter or honor fraternity can be an excellent way to network with other MSE students at Clemson, peers from other universities, and materials science and engineering professionals. Students develop solid real-world skills through activities, projects, traveling, and conventions, are exposed to various career paths, and connect with potential employers nationally. Social functions help students network and build relationships with peers and mentors on campus.

**Material Advantage Student Chapter**
The Material Advantage™ student program is a national organization that provides students access to a single low-cost membership to four prominent material engineering professional organizations:

- ACerS - The American Ceramic Society
- AIST - Association for Iron & Steel Technology
- ASM International - The Materials Information Society
- TMS - The Minerals, Metals and Materials Society

Students can join the local student chapter of this organization. This chapter focuses on providing both technical events as well as social activities.

Current advisors are Dr. DP Aidhy and Laura Kinard. Meetings are announced throughout the semester.

## Fundamentals of Engineering (FE) Exam

The MSE curriculum at Clemson University is designed to offer students the opportunity to prepare for the Fundamentals of Engineering (FE) Exam. Passing the FE Exam is the first step in pursuing a professional engineering license. The National Council of Examiners for Engineering and Surveying manages and documents the process on its website (http://ncees.org/exams/fe-exam/).
An optional study guide students may use to prepare for the exam is:
https://www.prepfe.com/fe-exams/disciplines/other-disciplines

# INFO & ADVICE FOR STUDENTS

**Extracurricular Activities**
Students in the MSE program learn the foundational knowledge needed to complete the B.S. in MSE and become successful engineers. Since learning occurs inside and outside the classroom, we encourage you to sharpen your study skills and participate in co-curricular activities while here and in classes. Participating in co-curricular activities related to your degree (such as joining a student club or completing an internship) will help you solidify the concepts presented in your classes. You can also participate in other co-curricular activities, such as personal participation in sports or music.

**Studying**
Many students fail in higher education because they don't know how to study, and indeed, some students entering Clemson did not need to study in high school. We encourage you to develop good study habits and stick to them. The Academic Success Center is a fabulous resource provided at no additional cost. Tutoring, Peer-Assisted Learning (PAL), and Academic Coaching are available at https://www.clemson.edu/asc/ You may also ask your instructors during office hours for help.

Some immediate actions you might use to improve your study habits might be:

- Find a quiet place to study. If your residence hall or apartment is not suitable, go to one of the University libraries or academic buildings such as Olin or Sirrine Hall.
- Work at a reasonably sized desk to see your resources (books, papers, calculator, laptop).
- Take notes both in class and as you complete assigned readings. You should review these notes to identify your questions and ensure you understand the fundamental equations and assumptions used in their development.
- Be sure to ask questions in class about the material you do not understand from the prior class period or assigned reading.
- Identify a time in each day to study for your classes. Plan for at least two hours outside of class for every one hour inside a class lecture to complete homework or read.

**Scholastic regulations**

Become familiar with the Academic Regulations of Clemson University as written in the University Announcements here: http://catalog.clemson.edu/ The University accepts no excuses for ignorance of these regulations. Be sure that you know how to compute your overall GPA and your engineering GPA and be sure that you know the prerequisites for the courses you must take.

**If you fall behind in a course**

If you become aware that you are falling behind in a course, you should immediately see your instructor for advice on catching up. All faculty members maintain office hours to be available to students, but you must take the initiative to ask for help promptly.

**Your profession and academic advisors**

Each materials science & engineering student is assigned to an academic and professional faculty advisor. Please get to know your advisors, and don't hesitate to ask them for help with scheduling, studying career plans, or anything else related to materials science & engineering.

**Conflict resolution**

One of the skills you will learn while completing the materials science and engineering program will be to resolve conflicts professionally. The Student Services Coordinator, Program Director, and Advisors are there to provide you with resources to do this. The first step will typically be to resolve the conflict with an instructor or peer by discussing it with them directly first. Examples of disputes where you should do this are 1) Not understanding how an assignment was graded or 2) Not getting group assignments completed promptly.

***Conflict with instructor or staff member:***

- Make an appointment with the instructor to discuss your concern first. To prepare for this meeting, it is best to clarify your primary and secondary concerns. Your instructor or staff member should respond in a professional timeframe. We suggest that it is within 1-2 business days from when you contacted them. Therefore, expect that your emails will be responded to M-F within 48 hours.
- If the concern is not resolved after meeting with the instructor or staff member, make an appointment with the MSE Student Services Coordinator or the MSE Undergraduate Program Director. In most instances, they will work to help you identify how to resolve the conflict and identify resources for you. In most cases, they cannot advocate or negotiate on your behalf (such as meeting with your instructor for you to discuss grades, how homework is assigned, etc.

***Conflict with a peer in group work***[1]:
Not every group works well together. We typically suggest that you initially try resolving the conflict yourself utilizing the following steps:

- Take time to understand the problem and consider the other person's perception.
- Listen actively and repeat the difference in opinion in a neutral, objective manner.
- Keep communicating and exchanging information and ideas.
- Maintain your objectivity and take a break if necessary.
- Discuss the problem and how to solve it understanding all points of view.

If you have tried to meet with the individual or are satisfied with the other individual and still have not reached a resolution, reach out to the instructor for the class or the student chapter advisor.

If you are concerned about your safety or the negative consequence of interacting with the instructor or student you have a conflict with, you can immediately contact the MSE Student Services Manager or Undergraduate Program Director.

[1] https://blog.cengage.com/top_blog/tips-for-students-managing-conflict-in-your-group/

**DO**

- Gather needed information and make your own decisions.
- Be active in your education, i.e., participate.
- Memorize fundamental principles (there aren't that many).
- Learn to separate important principles from less essential details.
- Learn to distinguish between causes and effects.
- Read written instructions carefully and interpret them logically.
- Look for analogies and use them to interpret new ideas.
- Use knowledge and methods from previous courses and experiences.
- Try to connect textbook and lecture material with "the real world."
- Develop systematic procedures to solve problems.
- Learn to analyze data for consistency, reliability, and meaning.
- Learn to ascribe physical meaning to equations.
- Learn to use fundamental logic to reach a conclusion.
- Try to judge the reasonableness of your answers.
- Learn to write coherent paragraphs.
- Present your work in a neat and orderly fashion.
- Exercise and stay healthy.
- Anticipate the consequences of your actions and realize that you alone are responsible for them.
- Do everything you do ethically and with respect for others.

**Don't**

- Accept all authoritative statements as truths. No one has all the answers.
- Expect instructors to give cookbook procedures for everything.
- Copy homework.
- Expect to find all the answers in a book.
- Expect all problems to have closed-form solutions; some require iteration, i.e., trial & error.
- Expect all problems to have a single solution (or any solution).
- Expect quizzes to be just like old homework problems.
- Submit reports that look good but contain nonsense.

# MATERIALS SCIENCE & ENGINEERING FACULTY

**Dilpuneet S. Aidhy, Associate Professor, Ph.D. –** University of Florida (2009). Computational materials science, molecular dynamics simulations, ion transport, interface chemistry, materials-by-design

**John M. Ballato, J. E. Sirrine Foundation Endowed Chair of Optical Fibers and Professor, Ph.D. --** Rutgers University (1997). Optical and optoelectronic properties of materials; Optical fiber fabrication; Rare-earth doping for active and passive optical applications

**Vincent Blouin, Associate Professor, Ph.D. –** University of Michigan (2001): Materials, Mechanical Engineering; Modeling of structural and thermal systems

**Rajendra Bordia, George J. Bishop, III Endowed Chair of Ceramics and Professor, Ph.D.** - Cornell University (1986): Multilayered ceramics, Ceramic coatings; Nano & microstructure control in ceramics; Porous ceramics; Ceramic matrix composites; Advanced composites; Molecular precursor-derived ceramics

**Kyle S. Brinkman, Professor and MSE Department Chair, Ph.D. –** Swiss Federal Institute of Technology (2004): Ceramics, Fuel cells, energy materials, Interfacial engineering; Crystalline materials for nuclear waste immobilization

**Philip J. Brown, Sweetenburg Endowed Chair and Professor, Ph.D. –** University of Leeds (1991): Polymer membranes; Textile Chemistry; Photonic fibers; Spinning, electrospinning fibers; Melt spinning multi-component materials; Dyeing & finishing

**Stephen H. Foulger, Gregg-Graniteville Endowed Chair & Professor, Ph.D.** - Massachusetts Institute of Technology (1996): Polymer physics; Multifunctional materials; Optical & optoelectronic properties of materials; Colloid synthesis; Intrinsically conductive polymers; Biomedical contrast colloids; Protein separation nanoparticles; Photodynamic therapy nanoparticles

**Dong Hou, Assistant Professor, Ph.D** – NC State University (2017); Solid-state synthesis; Microstructure engineering; Crystallography; Energy Storage; Electrochemistry; Advanced characterization; Machine learning

**Luiz G. Jacobsohn, Associate Professor, Ph.D. –** Pontifical Catholic University of Rio De Janeiro (1999): Luminescent materials; Scintillators; Nanoparticles

**Mark A. Johnson, Thomas F. Hash Endowed Chair in Sustainable Development & Professor, Ph.D.** – NC State University (1999): Sustainability, Adv manufacturing, Energy

**Marian Kennedy, Associate Professor, Ph.D.** – Washington State University (2007): Mechanical behavior of biological nanocomposites; Tribology of coatings & thin films; Engineering education - motivation

**Konstantin Kornev, Professor, Ph.D.** - Kazan State University (1988): Advanced materials; Biomechanics of insects; Magnetics in nanocomposites; Optical and magneto-optical; Physics, Mathematics

**Olga Kuksenok, Associate Professor and Director of MSE Graduate Program, Ph.D.** – Kyiv State University (1997): Computational design of biomimetic materials; Theory & computer simulations of multi-component polymer blends; Interfacial phenomena & surface properties; Pattern formation in non-equilibrium systems; Heterogeneous liquid crystalline systems

**Yanying Lu, Assistant Professor, Ph.D.** – Nankai University (2018): Ceramic engineering, composite materials, battery material manufacturing

**Igor Luzinov, Kentwool Endowed Chair and Professor, Ph.D.** - Lviv Polytechnic Institute (1990): Nanofabrication of thin polymer films; Multi-component polymer systems and composites

**Petro Maksymovych, Professor, Ph.D.** – University of Pittsburgh (2007): Phase transitions, quantum materials, complex oxides, thin films, nanolithography, defect engineering; AI/ML

**O. Thompson Mefford, Associate Professor, Ph.D. -** Virginia Tech (2007): Polymers, Nanomaterials, Magnetism, Environmental

**Fei Peng, Associate Professor, Ph.D.** - Georgia Institute of Technology (2008): Additive manufacturing of ceramics; Smart manufacturing; Sintering & grain growth; High-temperature kinetics & microstructure, High-temperature ceramics; Ceramic fibers, coatings, & ceramic composites

**Enrique Martinez Saez, Associate Professor, Ph.D. –** Polytechnic University of Madrid (2008): Microstructure evolution under extreme conditions; Thermodynamic and kinetics of alloys; Advanced manufacturing; Mechanical properties of heterogeneous solids; Elasticity and plasticity; Defect properties; Data analytics and machine learning

**Cheng Sun, Associate Professor, Ph.D.** – Texas A&M University (2013); Additive manufacturing; Electron microscopy; Computational modeling; Molecular dynamics; Machine learning

**Jianhua Tong, Associate Professor and Director of MSE Undergraduate Program, Ph.D.** – Dalian Institute of Chemical Physics (2002): Sustainable clean energy; Electrochemical cells; Solid electrolyte batteries; Catalytic membrane reactors; Hydrogen production; Ammonia synthesis; Carbon dioxide reduction; Solar fuel production; Solid-state Ionics; 3D printing; Laser processing

**Marek W. Urban, JE Sirrine Foundation Endowed Chair in Advanced Fiber-Based Materials & Professor, Ph.D.** – Michigan Technological University (1984): Polymer design; Colloidal synthesis; Self-healing polymers; Surface and interfacial reactions; Stimuli-responsive materials; Biopolymers; Vibrational spectroscopy and molecular imaging.

**Kimberly Weirich, Assistant Professor, Ph.D.** – the University of California, Santa Barbara (2012): Soft matter; Biological and bio-inspired materials; Active matter; Biological physics; Liquid crystals; Biopolymers

**Tianyu Zhu, Assistant Professor, Ph.D.** – University of South Carolina (2019) Polymer synthesis; Ceramic engineering; coating; composite materials; Battery electrolytes and electrodes; Battery manufacturing