SAN DIEGO STATE UNIVERSITY

Mechanical Engineering
College of Engineering

Undergraduate Student Handbook

Academic Year 2021-2022

Department of Mechanical Engineering
College of Engineering, E-326
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1323
619-594-7050
mech.engineering@sdsu.edu

Table of Contents

1. Introduction

This handbook contains important information about the undergraduate program in the Department of Mechanical Engineering at San Diego State University (SDSU). It is expected that you will study this handbook carefully, together with the SDSU general catalog. Furthermore, the department website at **mechanical.sdsu.edu** contains more detailed information about the department including the undergraduate and graduate programs, the faculty and staff, the laboratories, research activities, and various student organizations. If there are specific questions that have not been addressed in this handbook, the catalog, or on our website, please feel free to contact the ME Department. For academic information and advising related to non-departmental (General Education) courses, please contact the Center for Student Success in Engineering (CSSE) https://csse.sdsu.edu/. Students may also contact the Assistant Dean of Engineering for Student Affairs, Theresa Garcia (E-mail: tgarcia@sdsu.edu, Phone: 619-594-5807, Office: Engineering 200B).

2. General Information

2.1 Mission Statement

To prepare our graduates to apply basic and advanced mechanical engineering knowledge and skills to the design, analysis and research of engineering systems; to innovate and lead in providing engineering solutions to address societal challenges; to pursue lifelong learning that can exploit opportunities in a changing world.

2.2 Departmental Vision

We aspire to be among the best Mechanical Engineering Departments by offering high quality education, engaging in innovative research and high impact community activities that foster a cleaner, healthier, safer, and sustainable world. We strive to produce world-class engineers who are prepared to lead in providing engineering and technological solutions to societal challenges.

2.3 Program Educational Objectives

The Program Educational Objectives of the Mechanical Engineering Program at SDSU are to matriculate Bachelor of Science graduates who upon the years following graduation are committed to:

1. Applying an open-minded, critical, and pragmatic approach to the analysis of problems and the design of innovative and sustainable engineering solutions in professional practice (Professional Practice).
2. Actively participating in continuous professional development (Professional Development).
3. Responsible, professional and ethical conduct with a broad appreciation of the world and the role that engineering plays in society (Service and Citizenship).

2.4 Mechanical Engineering Program Outcomes

Program outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program. We have a continuous assessment process in place in order to collect and interpret data to evaluate the achievement of program outcomes. The nine program outcomes for the SDSU Mechanical Engineering program are listed in the table on the following page.

Mechanical Engineering Program Outcomes (POs)

PO 1:	An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics.
PO 2:	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental, and economic factors.
PO 3:	An ability to communicate effectively with a range of audiences.
PO 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.
PO 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.
PO 6:	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
PO 7:	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
PO 8:	An ability to apply principles of engineering, basic science, and mathematics (including multivariable calculus and differential equations); to model, analyze, design and realize physical systems, components or processes.
PO 9:	An ability to work professionally in either thermal or mechanical systems area.

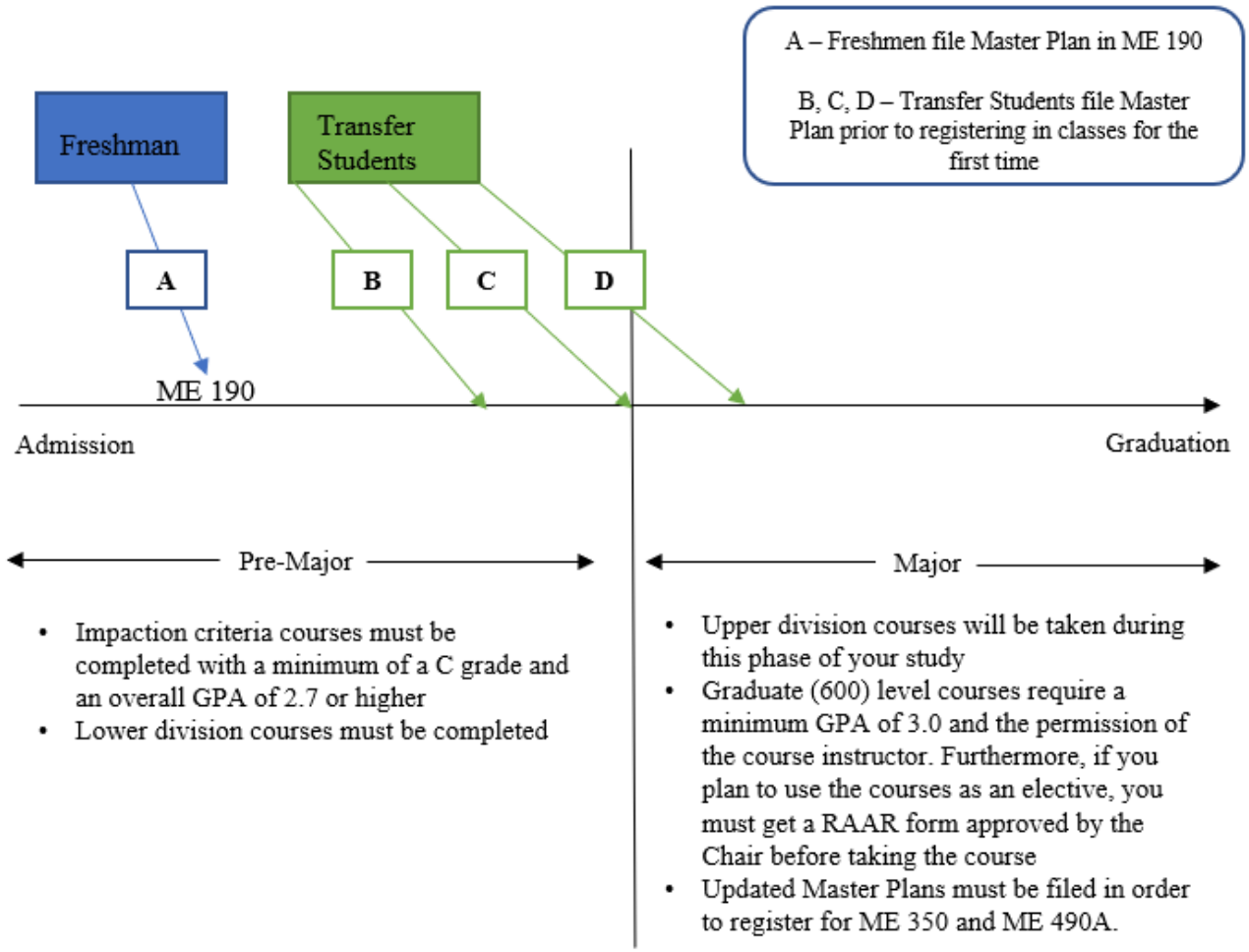
2.5 Programs of Study

The Bachelor of Science in Mechanical Engineering (BSME) offered by the Department is a rigorous blend of theory and practice, emphasizing engineering fundamentals. The program is accredited by ABET, i.e., the Accreditation Board for Engineering and Technology (www.abet.org). A BSME program with Bioengineering emphasis is also offered. The Department offers an integrated (4+1) BS/MS program (see page 20) to give our most qualified undergraduates the opportunity to earn a Master's Degree in either mechanical engineering or bioengineering. In addition, the Department offers courses of study leading to the Master's and Doctoral Degrees. The Doctoral degree in engineering disciplines is offered through the Joint Doctoral Program (JDP) with the University of California, San Diego (UCSD). Detailed information about these degrees is available at the departmental website.

2.6 Distinctive Features of our Program

- The program offers a unique blend of theory and practice culminating in the senior capstone design project which spans two semesters when students work in groups on sponsored projects.
- The broad range of professional electives offered allows students to tailor their studies to their own career interests.
- A BSME program with bioengineering emphasis is offered.
- There are opportunities for undergraduate research with professors of international reputation in the areas of bioengineering, energy and thermofluids, particulate material science and processing, manufacturing, mechanics, micro- and nano- electromechanical systems (MEMS and NEMS), mechatronics, robotics, and dynamic systems and control.
- There are excellent employment opportunities: many seniors have at least one job offer before graduation.
- The mechanical engineering major is an impacted program. Please see Section 4.3 for more details.

3. Timeline: Admission to Graduation



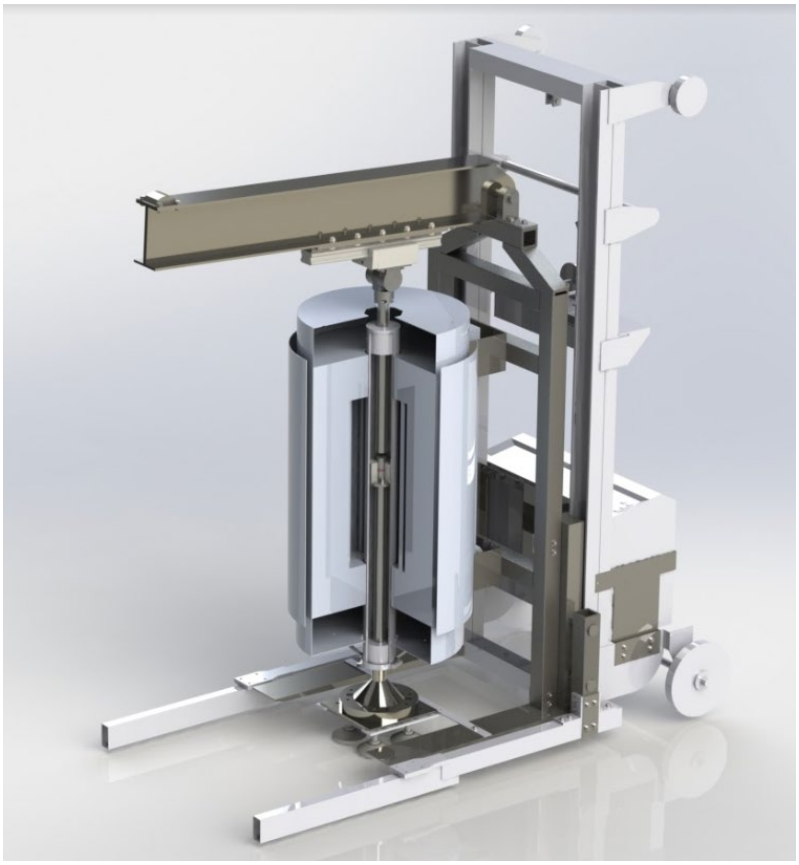
3.1 Transferring to Mechanical Engineering from Undeclared or another Department

The Department has explicit criteria for transfer into the program from other programs, including Undeclared status. Please see the worksheets on pages 18 – 19.

4. Curriculum for the B.S. Degree in Mechanical Engineering & B.S. Degree in Mechanical Engineering with Bioengineering Emphasis

4.1 Introduction

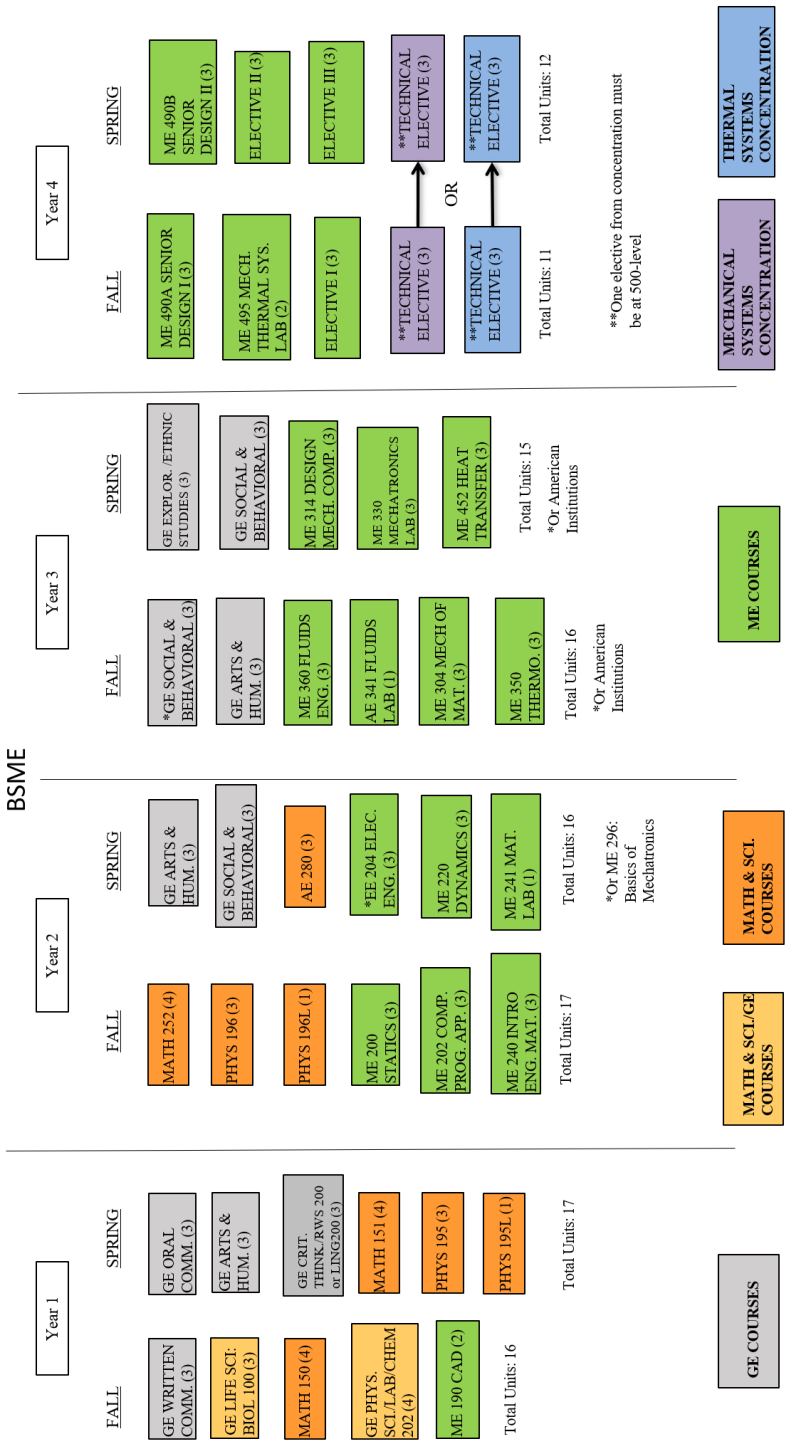
The undergraduate program in Mechanical Engineering (BSME) is built upon a rigorous academic foundation that includes a broad curriculum of natural sciences, mathematics, electives in General Education, core mechanical engineering courses, as well as professional electives in Mechanical Engineering. There are two informal pathways that students can choose from: Mechanical Systems or Thermal Systems. Students are encouraged to concentrate their professional electives in either of these subfields of interest in mechanical engineering. For students who entered the BSME program in the academic year 2021-2022, the Mechanical Engineering curriculum, i.e., the *SDSU Major Academic Plan (MAP),* is given below in Section 4.2.1 (see also, https://sunspot.sdsu.edu/pubred/!mymap.disp). The department also offers the option for students to pursue a BSME degree with an emphasis in bioengineering. This emphasis is a formal pathway. The MAP is given in section 4.2.2.



4.2 Recommended Sequence of Courses

4.2.1 Mechanical Engineering BSME MAP

2021-2022 Mechanical Engineering Major Academic Plan

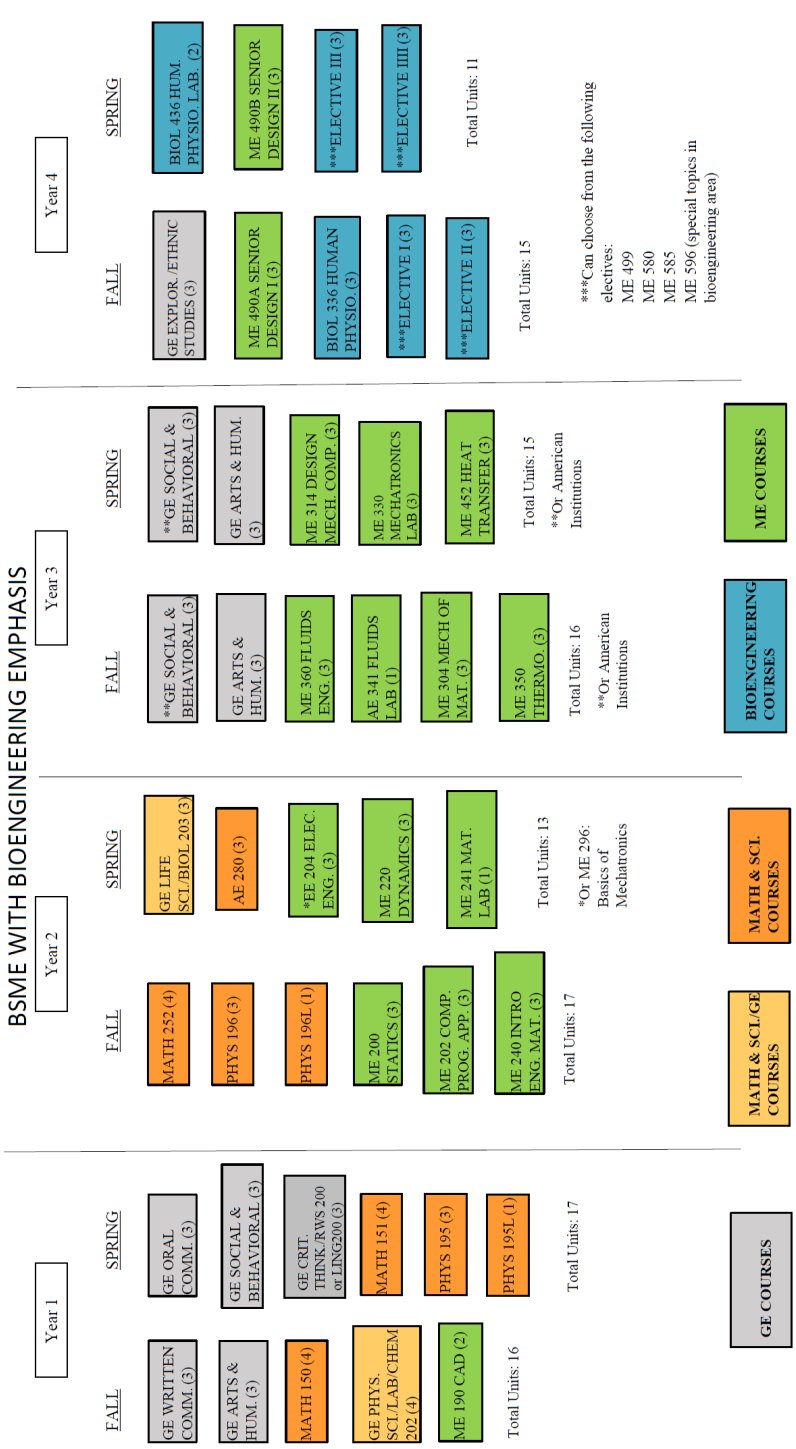


ME Course Prerequisites
Catalog Year 2021-2022

Course	*Equivalent*	*Prerequisite(s)*
ME 190		None
ME 200	AE 200	MATH 150 (w/ C or better) PHYS 195 (w/ C or better)
ME 202		MATH 151
ME 220	AE 220	MATH 151 (w/ C or better) ME 200 (w/ C or better)
ME 240		CHEM 202/ 200
ME 241		ME 240
ME 296		MATH 151 (w/C or better) PHYS 196 (w/C or better) PHYS 196L
ME 304	CIVE 301	ME 200
ME 314		ME 190 ME 202 ME 241 ME 304
ME 330		AE 280 EE 204 or ME 296 ME 202 ME 220 PHYS 196L
ME 350		MATH 252 ME 200 **Updated Master Plan**
ME 360		AE 280 ME 220
ME 420	Prof. Elective	ME 314
ME 430	Prof. Elective	ME 330
ME 450	Prof. Elective	ME 350
ME 452		ME 350 ME 360
ME 490A		ME 304 ME 314 ME 452 **Updated Master Plan**
ME 490B		ME 490A ME 495 (Not Req. Bio. Emph.)
ME 495		ME 330 ME 452
ME 499	Prof. Elective	Consent of Instructor **Completed Registration Form** **Submitted Master Plan**
ME 520	Prof. Elective	ME 304 ME 330
ME 530	Prof. Elective	ME 330
ME 532	Prof. Elective	ME 330
ME 535	AE 535 Prof. Elective	AE 280 ME 314
ME 540	Prof. Elective	ME 314
ME 543	Prof. Elective	ME 240
ME 552	Prof Elective	ME 452
ME 554	Prof. Elective	ME 452
ME 555	Prof. Elective	ME 452
ME 556	Prof. Elective	ME 360 ME 452
ME 580	Prof. Elective	ME 304 ME 360
ME 585	Prof. Elective	ME 220 ME 240
ME 596	Prof. Elective	Varies

4.2.2 Mechanical Engineering BSME with Bioengineering Emphasis MAP

2021-2022 Mechanical Engineering with Bioengineering Emphasis Major Academic Plan



ME Course Prerequisites
Catalog Year 2021-2022

Course	*Equivalent*	*Prerequisite(s)*
ME 190		None
ME 200	AE 200	MATH 150 (w/ C or better) PHYS 195 (w/ C or better)
ME 202		MATH 151
ME 220	AE 220	MATH 151 (w/ C or better) ME 200 (w/ C or better)
ME 240		CHEM 202/ 200
ME 241		ME 240
ME 296		MATH 151 (w/C or better) PHYS 196 (w/C or better) PHYS 196L
ME 304	CIVE 301	ME 200
ME 314		ME 190 ME 202 ME 241 ME 304
ME 330		AE 280 EE 204 or ME 296 ME 202 ME 220 PHYS 196L
ME 350		MATH 252 ME 200 **Updated Master Plan**
ME 360		AE 280 ME 220
ME 420	Prof. Elective	ME 314
ME 430	Prof. Elective	ME 330
ME 450	Prof. Elective	ME 350
ME 452		ME 350 ME 360
ME 490A		ME 304 ME 314 ME 452 **Updated Master Plan**
ME 490B		ME 490A ME 495 (Not Req. Bio. Emph.)
ME 495		ME 330 ME 452
ME 499	Prof. Elective	Consent of Instructor **Completed Registration Form Submitted Master Plan**
ME 520	Prof. Elective	ME 304 ME 330
ME 530	Prof. Elective	ME 330
ME 532	Prof. Elective	ME 330
ME 535	AE 535 Prof. Elective	AE 280 ME 314
ME 540	Prof. Elective	ME 314
ME 543	Prof. Elective	ME 240
ME 552	Prof Elective	ME 452
ME 554	Prof. Elective	ME 452
ME 555	Prof. Elective	ME 452
ME 556	Prof. Elective	ME 360 ME 452
ME 580	Prof. Elective	ME 304 ME 360
ME 585	Prof. Elective	ME 220 ME 240
ME 596	Prof. Elective	Varies

4.3 Additional Notes on Courses

As shown on the previous pages, the curriculum consists of 120 units for BSME and BSME with Bioengineering emphasis that are distributed as follows:

4.3.1 Major Preparation [Major Prep] Courses

There are 48 units of *Major Preparation Courses*: ME 190, 200 [or AE 200], 202, 220 [or AE 220], 240, 241, 296 (or EE 204); AE 280; BIOL 100 or 101; CHEM 202 (or 200); MATH 150, 151, 252; PHYS 195, 195L,196, 196L for the BSME.
The following courses: ME 200 [or AE 200]; CHEM 202 (or 200); MATH 150, 151; PHYS 195, 196 **must be completed with a grade of C (2.0) or better**. These courses cannot be taken for credit/no credit (Cr/NC). BIOL 203 (instead of BIOL 100 or 101) is required for BSME with Bioengineering emphasis.

The mechanical engineering major is an impacted program. To be admitted to major status, students must complete MATH 150, 151, PHYS 195. 196, CHEM 200/202, and ME 200 with a C grade or better and have an overall cumulative GPA of at least a 2.7. These courses cannot be taken for credit/no credit (Cr/NC). The Department expects students to meet these criteria and get admitted to major status no later than the end of the sophomore year. The Department has a retention policy which is stated in Section 4.3.5 below.

4.3.2 General Education [GE] Courses

These requirements are specified in the University's General Catalog, https://catalog.sdsu.edu/preview_program.php?catoid=5&poid=3962 In summary, it requires students to demonstrate competencies in the following areas:

Area A: English Language Communication and Critical Thinking (9 units)
Area B: Scientific Inquiry and Quantitative Reasoning (12 units + 3 units of Explorations)
Area C: Arts and Humanities (9 units + 3 units of Explorations)
Area D: Social Sciences (9 units + 3 units of Explorations)
Area E: Lifelong Learning and Self Development (3 units)
Area F: Ethnic Studies (3 units), can be satisfied by double counting 3 units of Area D
Area Z: Cultural Diversity (3 Units), can be satisfied by double counting 3 units of Area C

This constitutes a total of 51 units after taking into consideration that the Ethnic Studies (3 units) and Cultural Diversity (3 units) requirements can be met by taking appropriate courses in Areas D and C, respectively, and double counting. "Explorations" are upper division GE courses in the areas specified. The 12 lower division units in Area B also meet the science and mathematics requirements of the mechanical engineering program. This leaves 39 general education units. Engineering majors automatically satisfy the Lifelong Learning and Self-Development foundations GE areas by completion of preparation for the major. Engineering majors automatically satisfy the Natural Sciences and Social and Behavioral Sciences explorations GE areas by completion of the major which results in a total of 30 general education units.

4.3.3 Graduation Writing Assessment Requirement

All students are required to either pass the Writing Placement Assessment (WPA) with a score of 10 or complete one of the approved upper division writing courses with a grade of C or better. See, the "Graduation Requirements for the Bachelor's Degree" of the 2021-22 General Catalog for a complete listing of requirements. If you have any questions about WPA or other placement tests, contact the Assistant Dean of Engineering for Student Affairs, Theresa Garcia (Email: tgarcia@sdsu.edu; Phone: 619-594-5807, Office: Engineering 200B).

4.3.4 Major [Major] Courses

For the BSME program, the major courses consist of 42 upper division courses: ME 304 (or CIV E 301), 314, 330, 350, 360, 452, 490A, 490B, 495; AE 341, 6 units of Electives selected from either Mechanical Systems or Thermal Systems areas, with at least three of the six units at the 500-level and 9 units of Professional Electives. These 9 units of coursework may be selected from any non-required 400- or 500-level mechanical engineering course, or approved courses from other departments. In rare situations, a student may be allowed to take a 600-level course as an elective with approval from the Instructor and the Chair (who must approve a RAAR form). To do this, the student must have a minimum GPA of 3.0.

For the BSME with Bioengineering emphasis program, a minimum of 42 upper division units to include ME 304 (or CIV E 301), 314, 330, 350, 360, 452, 490A, and 490B; AE 341, BIOL 336, 436 and 12 units of additional coursework may be selected from ME 499 (3 units), ME 580, ME 585 and any other 400-or-500 level courses in the bioengineering area with departmental approval, with at least 6 of the 12 units at the 500-level. BIOL 336 also satisfies three units of the GE Explorations of Human Experience, Natural Sciences requirement.

Pre-major students are not permitted to take major courses.

Elective courses can only be taken by students in senior standing.

4.3.5 Department Policies on Courses

The following policies will be applied by the Mechanical Engineering Department:

1) The Department does not approve a second retake of a course, i.e., taking a course a third time. If a student fails a course twice, the student is advised to find another program of study.
2) If a student takes a course at another institution with which SDSU has an articulation agreement for that specific course, a RAAR form (see page 16) does not have to be approved or filed. Please check at the websites www.assist.org and www.sdsu.edu/TAP to make sure that there is an articulation agreement. Note that the Department does not currently have an articulation agreement in place for any ME course with an Institution outside of California.
3) If an articulation agreement is not in place, the student must get a RAAR form approved by the Chair and have it on file before that course is taken. The content of the course, the mode of instruction, and the methods of assessment are among the factors that will be considered in evaluating a request. It is recognized that course syllabi for standard courses in engineering are generally similar across institutions and so the syllabus by itself will carry little weight in the decision on whether a RAAR form is approved. RAAR forms for major courses are approved only in exceptional cases. ME courses must be taken from an ABET-accredited program.
4) The Department has a retention policy (please refer to the 2021-2022 online General Catalog): "The engineering program expects all majors will make reasonable academic progress toward the degree. Engineering pre-majors who have earned 60 units but have not completed major preparatory courses or have less than a 2.7 cumulative GPA may be removed from the pre-major and placed in undeclared". The Department is currently phasing in the implementation of this policy with a warning given one semester in advance of the student's removal.

5. The Master Plan

The Master Plan, forms of which are shown on pages 13-14 (BSME – Mechanical Systems, BSME – Thermal Systems) and 15 (BSME with Bioengineering emphasis), is a summary sheet showing the sequence of courses that the student plans to take and it provides a plan for graduation for the student and adviser. Each continuing student must see his or her adviser on a regular basis to monitor proper progress toward the degree, to adjust individual schedules as appropriate. Students are introduced to the Master Plan for the first time when they take ME 190 (Computer-Aided Design) in their freshman year. The instructor of ME 190 requires students to send a completed Master Plan electronically to the ME Department Office (mech.engineering@sdsu.edu) before the students are assigned a final grade for the course. Failure to do so will result in a reduction of one grade point. In addition, ME 350 and ME 490A are gateway courses for students. In order to enroll in these courses, students must have a registration hold removed from their computerized records. The hold is removed after they have turned in their completed and updated Master Plan electronically and the plans have been checked by the department. Failure to keep an updated Master Plan within the ME Department Office may result in delays of processing any requests from students and potentially delay graduation.

The electronic Master Plan forms are available at the ME website (https://mechanical.sdsu.edu/undergraduate/forms) and on Canvas (https://sdsu.instructure.com/).

EMAIL TO: MECH.ENGINEERING@SDSU.EDU

NAME: Last, First, Initial _____ Red ID _____ First Semester as ME Major _____ Expected Date of Graduation _____

Phone Number _____ Email _____ Catalog Year _____

MECHANICAL ENGINEERING MASTER PLAN AND ADVISING RECORD (MECHANICAL SYSTEMS)

STUDENT RESPONSIBILITIES (Please read before filling out Master Plan)

1. If you choose the Mechanical Systems specialization, you are required to take at least two courses from ME 420, 430, 520, 530, 532, 535, 540, 543, 580, 585, 587, or 596 (special topics courses in the mechanical systems area). You are encouraged to take the free electives also from this list.
2. Students must email the Master Plan Word Document electronically to **mech.engineering@sdsu.edu**
3. Transfer students must file the Master Plan **before they can be considered for major status**.
4. If a Master Plan is not filed as required above, you will not be allowed to register in subsequent ME classes.
5. Pre- and co-requisites will be enforced according to the catalog.
6. Ensure all ME and GE requirements are met for graduation.
7. Mechanical Engineering students are encouraged to take **ME 296: Basics of Mechatronics**, which is equivalent to EE 204.

SDSU COURSES		TRANSFER COURSES		ADVISING RECORD								
REQUIRED COURSES	GRADE	EQUIVALENT COURSE	SCHOOL	SEMESTERS AT SDSU (e.g., F19, or S20, or Su19)								
				F20	S21	F21	S22	F22	S23	F23	S24	
BIOL 100 (3)												
CHEM 202 (4)												
MATH 150 (4)												
ME 190 (2)												
MATH 151 (4)												
PHYS 195 (3)												
PHYS 195L (1)												
LING or RWS 200 (3)												
MATH 252 (4)												
ME 200 (3)												
ME 202 (3)												
ME 240 (3)												
PHYS 196 (3)												
PHYS 196L (1)												
AE 280 (3)												
EE 204 (3) **(refer to 6.)**												
ME 220 (3)												
ME 241 (1)												
ME 304 (3)												
ME 350 (3)												
ME 360 (3)												
AE 341 (1)												
ME 314 (3)												
ME 330 (3)												
ME 452 (3)												
ME 490A (3)												
ME 495 (3)												
Technical Elective I (3)												
Elective I (3)												
ME 490B (3)												
Technical Elective II (3)												
Elective II (3)												
Elective III (3)												

This is not a legally binding document. Advisors will do their best to assist students with course planning. It is the student's responsibility to ensure that they are following prerequisite and graduation guidelines.

EMAIL TO: MECH.ENGINEERING@SDSU.EDU

NAME: Last, First, Initial	Red ID	First Semester as ME Major	Expected Date of Graduation
	Phone Number	Email	Catalog Year

MECHANICAL ENGINEERING MASTER PLAN AND ADVISING RECORD
(THERMAL SYSTEMS)

STUDENT RESPONSIBILITIES (Please read before filling out Master Plan)

1. If you choose the Thermal Systems specialization, you are required to take two courses from ME 450, 552, 555, 556, or 596 (special topics courses in the thermal systems area). You are encouraged to take the free electives also from this list.
2. Students must email the Master Plan Word Document electronically to **mech.engineering@sdsu.edu**
3. Transfer students must file the Master Plan **before they can be considered for major status**.
4. If a Master Plan is not filed as required above, you will not be allowed to register in subsequent ME classes.
5. Pre- and co-requisites will be enforced according to the catalog.
6. Ensure all ME and GE requirements are met for graduation.
7. Mechanical Engineering students are encouraged to take **ME 296: Basics of Mechatronics**, which is equivalent to EE 204.

SDSU COURSES		TRANSFER COURSES		ADVISING RECORD								
REQUIRED COURSES	GRADE	EQUIVALENT COURSE	SCHOOL	SEMESTERS AT SDSU (e.g., F19, or S20, or Su19)								
				F20	S21	F21	S22	F22	S23	F23	S24	
BIOL 100 (3)												
CHEM 202 (4)												
MATH 150 (4)												
ME 190 (2)												
MATH 151 (4)												
PHYS 195 (3)												
PHYS 195L (1)												
LING or RWS 200 (3)												
MATH 252 (4)												
ME 200 (3)												
ME 202 (3)												
ME 240 (3)												
PHYS 196 (3)												
PHYS 196L (1)												
AE 280 (3)												
EE 204 (3) **(refer to 6.)**												
ME 220 (3)												
ME 241 (1)												
ME 304 (3)												
ME 350 (3)												
ME 360 (3)												
AE 341 (1)												
ME 314 (3)												
ME 330 (3)												
ME 452 (3)												
ME 490A (3)												
ME 495 (3)												
Technical Elective I (3)												
Elective I (3)												
ME 490B (3)												
Technical Elective II (3)												
Elective II (3)												
Elective III (3)												

This is not a legally binding document. Advisors will do their best to assist students with course planning. It is the student's responsibility to ensure that they are following prerequisite and graduation guidelines.

EMAIL TO: MECH.ENGINEERING@SDSU.EDU

NAME: Last, First, Initial	Red ID	First Semester as ME Major	Expected Date of Graduation
	Phone Number	Email	Catalog Year

MECHANICAL ENGINEERING WITH BIOENGINEERING EMPHASIS

MASTER PLAN AND ADVISING RECORD

STUDENT RESPONSIBILITIES (Please read before filling out Master Plan)

1. Students must send the Master Plan electronically to **mech.engineering@sdsu.edu**
2. Transfer students must file the Master Plan **before they can be considered for major status**.
3. If a Master Plan is not filed as required above, you will not be allowed to register in subsequent ME classes.
4. Pre- and co-requisites will be enforced according to the catalog. Ensure all ME and GE requirements are met for graduation
5. Mechanical Engineering students are encouraged to take **ME 296: Basics of Mechatronics**, which is equivalent to EE 204.
6. **Students in Bioengineering emphasis must select from ME 499 (independent research in the bioengineering area with a Faculty), ME 580, ME 585, or ME 596 (special topics courses available in the bioengineering area)**

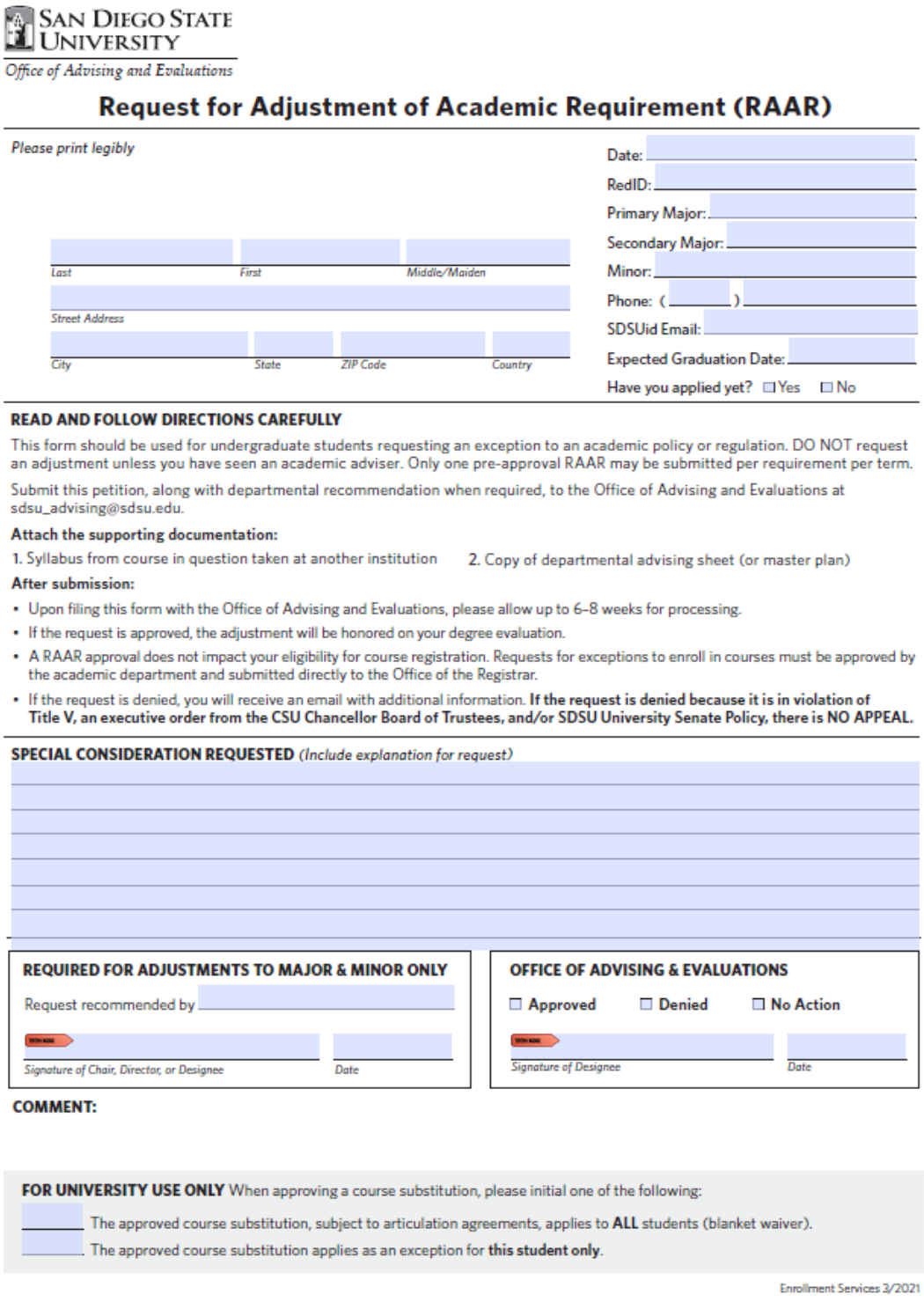
SDSU COURSES		TRANSFER		ADVISING RECORD								
REQUIRED COURSES	GRADE	EQUIVALENT COURSE	SCHOOL	SEMESTERS AT SDSU (e.g., F22, or S21, or Su23)								
				F21	S22	F22	S23	F23	S24	F24	S25	
CHEM 202 (4)												
MATH 150 (4)												
ME 190 (2)												
MATH 151 (4)												
PHYS 195 (3)												
PHYS 195L (3)												
LING or RWS 200 (3)												
MATH 252 (4)												
ME 200 (3)												
ME 202 (3)												
ME 240 (3)												
PHYS 196 (3)												
PHYS 196L (1)												
AE 280 (3)												
BIOL 203 (3)												
ME 296 (3) (refer to												
ME 220 (3)												
ME 241 (1)												
ME 304 (3)												
ME 350 (3)												
ME 360 (3)												
ME 314 (3)												
ME 330 (3)												
AE 341 (1)												
ME 452 (3)												
ME 490A (3)												
BIOL 336 (3)												
Elective I (3)												
Elective II (3)												
BIOL 436 (2)												
ME 490B (3)												
Elective III (3)												
Elective IIII (3)												

This is not a legally binding document. Advisors will do their best to assist students with course planning. It is the student's responsibility to ensure that they are following prerequisite and graduation guidelines.

6. Frequently Accessed Forms and Explanations

6.1 Request for Adjustment of Academic Requirement (RAAR) Form

This is the most frequently used form by undergraduate students. You will need to complete this form and get approval for any course variation from what is indicated in the MAP on pages 8-9 before you take such courses. This includes courses that you plan to take at other institutions. Furthermore, the RAAR form must be approved before you take any 600-level course as an elective. The Department Chair signs "Request for Adjustment of Academic Requirement" forms after they have been reviewed and approved by a faculty member who teaches the course.



SAN DIEGO STATE UNIVERSITY
Office of Advising and Evaluations

Request for Adjustment of Academic Requirement (RAAR)

Please print legibly

Last | First | Middle/Maiden

Street Address

City | State | ZIP Code | Country

Date:
RedID:
Primary Major:
Secondary Major:
Minor:
Phone: ( )
SDSUid Email:
Expected Graduation Date:
Have you applied yet? ☐ Yes ☐ No

READ AND FOLLOW DIRECTIONS CAREFULLY

This form should be used for undergraduate students requesting an exception to an academic policy or regulation. DO NOT request an adjustment unless you have seen an academic adviser. Only one pre-approval RAAR may be submitted per requirement per term.

Submit this petition, along with departmental recommendation when required, to the Office of Advising and Evaluations at sdsu_advising@sdsu.edu.

Attach the supporting documentation:

1. Syllabus from course in question taken at another institution
2. Copy of departmental advising sheet (or master plan)

After submission:

- Upon filing this form with the Office of Advising and Evaluations, please allow up to 6–8 weeks for processing.
- If the request is approved, the adjustment will be honored on your degree evaluation.
- A RAAR approval does not impact your eligibility for course registration. Requests for exceptions to enroll in courses must be approved by the academic department and submitted directly to the Office of the Registrar.
- If the request is denied, you will receive an email with additional information. **If the request is denied because it is in violation of Title V, an executive order from the CSU Chancellor Board of Trustees, and/or SDSU University Senate Policy, there is NO APPEAL.**

SPECIAL CONSIDERATION REQUESTED *(Include explanation for request)*

REQUIRED FOR ADJUSTMENTS TO MAJOR & MINOR ONLY

Request recommended by

Signature of Chair, Director, or Designee | Date

OFFICE OF ADVISING & EVALUATIONS

☐ Approved ☐ Denied ☐ No Action

Signature of Designee | Date

COMMENT:

FOR UNIVERSITY USE ONLY When approving a course substitution, please initial one of the following:

_____ The approved course substitution, subject to articulation agreements, applies to **ALL** students (blanket waiver).

_____ The approved course substitution applies as an exception for **this student only**.

Enrollment Services 3/2021

6.2 Declaration of Mechanical Engineering Major Worksheet

This form is required if you are already in the ME pre-major, but the computerized system does not automatically transfer you into major status after you have satisfied all requirements.

SAN DIEGO STATE UNIVERSITY
Mechanical Engineering
College of Engineering

Declaration of Mechanical Engineering Major Worksheet

(For students already in the ME Pre-Major)

Name:_____RedID:_____

Prep Courses	**Completed at: (School)**	**Grade**
MATH 150: Calculus I	_____	_____
MATH 151: Calculus II	_____	_____
CHEM 202: General Chem. For Eng.	_____	_____
OR		
CHEM 200: General Chem	_____	_____
PHYS 195: Principles of Physics	_____	_____
PHYS 196: Principles of Physics	_____	_____
AE 200: Statics	_____	_____
OR		
ME 200: Statics	_____	_____

GPA?_____

Which, if any, Upper Division Courses have you taken?_____

_____

6.3 Criteria for Change of Pre-Major to Mechanical Engineering

SAN DIEGO STATE UNIVERSITY
Mechanical Engineering
College of Engineering

Criteria for Change of Pre-Major to Mechanical Engineering

If you are not in pre-major status in Mechanical Engineering and would like to be considered for transfer to pre-major status in the department, you must satisfy the following requirements:

1. You must have completed **a minimum of 24 units at SDSU.** These units must count toward the requirement for the BSME or BSME with bioengineering emphasis degrees.

   Units taken toward the major: _____

2. You must have **a minimum GPA of 3.0**.

   GPA: _____

3. You must have **completed MATH 150, MATH 151, PHYS 195, and either PHYS 196 or CHEM 200/202 at SDSU** and received at least **a minimum of B grade in each subject**.

Prep Courses	**Grade**
MATH 150: Calculus I	_____
MATH 151: Calculus II	_____
PHYS 195: Principles of Physics	_____
PHYS 196: Principles of Physics	_____
OR	
CHEM 202/CHEM 200: General Chem/General Chem for Eng.	_____

4. Have **no more than 15 units on your Degree Audit which do not count toward the BSME**.

   Maximum units on Degree Audit which do not count toward BSME: _____

5. You must **not have more than 60 units** on your Degree Audit.

   Total units on Degree Audit _____

6. You must not have any course retakes on your Degree Audit.

   # of course retakes: _____

Name:_____ RedID:_____

6.4 Criteria for Transferring to ME from Another SDSU Major or Pre-Major

This form is used when a student would like to switch directly into the Mechanical Engineering major (and not ME pre-major) from another SDSU major or pre-major.

SAN DIEGO STATE UNIVERSITY
Mechanical Engineering
College of Engineering

Criteria for Transferring to the Mechanical Engineering Major from another SDSU Major or Pre-Major

If you wish to transfer to the Mechanical Engineering major from another major or pre-major, you are expected to satisfy the following requirements.

1. Completed **a minimum of 15 units at SDSU.**

   Units taken at SDSU: _____

2. Have **a minimum overall SDSU GPA of 3.0**.

   GPA: _____

3. Have **a minimum GPA of 3.0 in the STEM courses** that count toward the BSME degree.

   GPA:_____

4. Receive a **C grade or higher in all courses** on your Degree Audit.

   Minimum grade on your Degree Audit:_____

5. Have **no more than 15 units on your Degree Audit which do not count toward the BSME**.

   Maximum units on Degree Audit which do not count toward BSME:_____

6. Have **no more than 60 units** on the Degree Audit

   Number of units on Degree Audit: _____

7. **At least 50% of units** on Degree Audit must be from STEM courses that count towards the BSME Degree

   Number of units on Degree Audit from STEM courses: _____

8. Have **no course retakes** on your Degree Audit

   # of course takes: _____

Name:_____RedID:_____

7. Integrated BS/MS (4+1) Programs

7.1 Introduction

Two integrated five-year Bachelor's-Master's programs are available in the Department of Mechanical Engineering. These programs are designed to give students the opportunity to focus in a subfield of interest in either mechanical engineering (design and manufacturing, dynamics and control, energy and thermofluids, materials and mechanics) or bioengineering (biomaterials, biomechanics). Upon successful completion of the required coursework and thesis, the students will be simultaneously awarded the B.S. degree in Mechanical Engineering and either the M.S. degree in Mechanical Engineering, or the M.S. degree in Bioengineering.

A BSME student who applies to the program is required to have a Master Plan on file in the ME Office before applying. This plan will show the semester in which the student completes the requirements for the BSME degree. If the student matriculates into the (4+1) BSME/MSME or BSME/MSBioE program, graduate tuition fees will be charged from the semester following the one in which the requirements for the BSME degree are completed as indicated in the Master Plan on file in the ME Office.

To satisfy the requirements for the BS/MS (4 + 1) degree programs, students must achieve at least a 3.0 average in the 30 units of courses used to satisfy the graduate program of study. Of the 30 units, a maximum of nine units may be in 500-numbered courses. Three 500-level courses may be used to fulfill the undergraduate requirements for the (4+1) BS/MS degree program at the same time as serving as courses for graduate study. For the BS/MS (4 + 1) degree program leading to the B.S. and M.S. in Mechanical Engineering, students can use any three 500-level ME courses toward their graduate degree. For the BS/MS (4 + 1) degree program leading to B.S. in Mechanical Engineering and M.S. in Bioengineering, students must take ME 580, and 585 for the biomechanics specialization; ME 580, 540 or 543, and 585 for the biomaterials specialization. Students in the BS/MS (4+1) degree programs must follow the thesis option. The minimum number of course units required for graduation in the (4+1) program is 150.

7.2 Important Information and Instructions

Please read the following information and instructions before completing this application to apply to the BS/MS (4+1) program.

Students must apply and be admitted to the BS/MS (4+1) program. A Master Plan must be on file in the ME Office before the application is accepted. If the student matriculates into the (4+1) program, graduate tuition fees will be charged from the semester following the one in which all the requirements for the BSME degree are to be completed as per the Master Plan on file. Once admitted into the program, the student must fulfill all requirements of the BS/MS (4+1) program **before being granted the BS or the MS degree. If a student decides to go back to the Mechanical Engineering major BS degree, s/he will not be able to reenter the BS/MS (4+1) program and the graduate units completed cannot count towards a graduate degree at SDSU. The requirements to apply to the program are stated below.**

BRING A COPY OF YOUR DEGREE EVALUATION TO ME OFFICE AT E326

STUDENTS MAY APPLY FOR THE PROGRAM AFTER SUCCESSFULLY COMPLETING A MINIMUM OF 82 AND A MAXIMUM OF 97 UNITS THAT COUNT TOWARDS EITHER THE BS OR THE MS PROGRAMS.

REQUIREMENTS TO APPLY FOR THE BS/MS (4+1) PROGRAM:

1. B grade or better in ME 304 (or CIVE 301), ME 350, and ME 360
2. 3.0 overall GPA
3. 3.0 ME Upper Division Major GPA
4. Sum of verbal and quantitative GRE scores must be greater than 306. GRE Quantitative score must be 160 or higher
5. Satisfactory score on the TOEFL, if needed
6. Submission of a Thesis Adviser Form signed by the Thesis Adviser.

Exceptions may be considered if a statement of justification is provided by the ME Faculty Adviser and is then approved by the departmental Graduate Committee and the Graduate Division.

SUBMIT COMPLETED APPLICATIONS TO E-326

SAN DIEGO STATE UNIVERSITY

Department of Mechanical Engineering

BS/MS (4+1) APPLICATION

MS in ME____ MS in Bioengineering ___

Please Print

Name_____ Red ID _____
Last First MI

Address_____ Email_____

City_____ State_____ Zip _____ Phone_____

Units that Count towards the SDSU BS or MS Degree Programs

DEGREE UNITS COMPLETED _____

Undergraduate Courses	**Grade/Score**
ME 304 or CIV E 301	_____
ME 350	_____
ME 360	_____

Test Scores

TOEFL	_____
GRE Total (V+Q)	_____
Verbal %	_____
Quant %	_____
Writing %	_____
WPA	_____

I HAVE READ, UNDERSTOOD, AND WILL ABIDE BY THE INSTRUCTIONS ON THE BACK OF THIS SHEET. I UNDERSTAND THAT I AM NOT ELIGIBLE FOR THE BS/MS IF I HAVE APPLIED TO GRADUATE FOR THE B.S. DEGREE.

_____ _____
Student Signature Date

_____ _____
Department of Mechanical Engineering Approval Date

Office Use Only

_____
_____
_____
_____
_____
_____
_____
_____
Overall GPA
_____
SDSU GPA
_____
ME UD GPA

8. Faculty and Their Research Areas

8.1 Tenured/Tenure-Track Faculty and Their Research Areas

JOHN ABRAHAM, Professor and Chair of Mechanical Engineering. Ph.D., Princeton University.

Research Interests
Dr. Abraham's research interests are in the areas of multiphase flows, sprays, combustion, internal combustion engines, fuel chemistry, computational fluid dynamics, and high-performance computing.

ASFAW BEYENE, Professor of Mechanical Engineering, Director of Industrial Assessment Center. Ph.D., Warsaw University of Technology.

Research Interests
Dr. Beyene's research has been concerned with energy systems: renewables, efficient power sources with emphasis on combined heat and power applications, cycle and energy analyses, mathematical modeling, and simulation.

AMNEET BHALLA, Assistant Professor of Mechanical Engineering. Ph.D., Northwestern University.

Research Interests
Dr. Bhalla's research interests include Fluid-Structure Interaction, Multiphase Flows, Aquatic Locomotion, Renewable Energy Device Modeling, Numerical Methods, High Performance Computing, and Scientific Software Design.

SUBRATA BHATTACHARJEE, Professor of Mechanical Engineering. Ph.D., Washington State University.

Research Interests
Dr. Bhattacharjee's research is on microgravity combustion and radiation heat transfer, flame dynamics in the space environment, fire detection, infra-red pyrometry, knowledge-based distributed intelligence, and development of the software **TEST**, **T**he **E**xpert **S**ystem for **T**hermodynamics**.**

JOAQUIN CAMACHO, Assistant Professor of Mechanical Engineering. Ph.D., University of Southern California

Research Interests
Dr. Camacho's research interests span from Multiphase flows, Sustainable Energy, Nanomaterial Theory and Fabrication, Combustion, Aerosol dynamics, and Carbon Materials.

QIZHI HE, Assistant Professor of Mechanical Engineering. Ph.D., University of California, San Diego

Research Interests
Dr. He's research lies in the areas of computational mechanics, computational mathematics, and scientific machine learning, with a focus on developing machine learning enhanced computational modeling tools for multiscale and multiphysics problems

SUNGBUM KANG, Assistant Professor of Mechanical Engineering. Ph.D., Georgia Institute of Technology

Research Interests
Dr. Kang's research interests lie in the areas of smart optical metrology, mechatronics/robotics, industrial automation and smart factory.

SAMUEL K. KASSEGNE, Professor of Mechanical Engineering. Ph.D., Virginia Polytechnic Institute and State University, Director of Bioengineering Program

Research Interests
Dr. Kassegne's research interests are in the areas of MEMS, biotechnology and computational sciences. He is particularly interested in developing novel applications of microfluidic and microarray technology (e.g., in molecular diagnostics), and a multi-scale hybrid algorithm for transport of charged species in micro-devices.

PARAG KATIRA, Associate Professor of Mechanical Engineering. Ph.D., University of Florida.

Research Interests
Dr. Katira's research interests lie in using mathematical modeling techniques to study the dynamics of active matter such as cells, tissues, bacterial biofilms and synthetic molecular-motor assemblies as well as the design of synthetic materials that can mimic the self-regulating and self-organizing properties of cells and tissues

KAREN MAY-NEWMAN, Professor of Mechanical Engineering, Ph.D., University of California, San Diego.

Research Interests
Dr. May-Newman's research is in the area of Cardiovascular Biomechanics with a focus on the mechanical interaction of the cardiovascular system with implanted medical devices, such as heart valves and left ventricular assist devices (LVADs).

FLETCHER J. MILLER, Professor of Mechanical Engineering. Ph.D., University of California Berkeley.

Research Interests
Dr. Miller's interests are in the field of thermal sciences, particularly in microgravity combustion and sustainable energy fields. He is especially interested in developing solar thermal applications in the southwest and California.

KEE S. MOON, Professor of Mechanical Engineering, Ph.D., University of Illinois, Chicago.

Research Interests
Dr. Moon's research interests are in the field of micro- and nano-fabrication technologies. In particular, he has recently developed various smart sensor/actuator systems including custom designed MEMS-gas and pressure sensors, nano-indentation systems, as well as precision instrumentation and testing devices.

KHALED MORSI, Professor of Mechanical Engineering, Director, Advanced Materials Processing Laboratory. Ph.D., University of Oxford, UK.

Research Interests
Dr. Morsi's research area is processing and properties of metals, intermetallics, ceramics *and* their composites. His current activities include synthesis of carbon nanotubes, nanotube reinforced aluminum composites, lightweight in-situ dual matrix composites, and processing-microstructure-properties relations.

PEIMAN NASERADINMOUSAVI, Associate Professor of Mechanical Engineering, Ph.D., Villanova University, PA.

Research Interests

His research interests include smart valves, nonlinear dynamics, control theory, optimization, magnetic bearings, and mathematical modeling. The results of his research can be used for achieving optimal and stable operation of electromechanical valve systems.

ZAHRA NILI AHMADABADI, Assistant Professor of Mechanical Engineering. Ph.D., University of Quebec (École de Technologie Supérieure).

Research Interests
Dr. Ahmadabadi's research interests include cooperative robotics, acoustic perception, robot learning, motion planning, nonlinear dynamical systems, dynamic systems and control, deep learning and sequence modeling, autonomy, and autonomous fault detection.

EUGENE OLEVSKY, Dean of College of Engineering, Distinguished Professor of Mechanical Engineering, Director of the Joint Doctoral Program. Ph.D., Ukraine National of Academy of Sciences.

Research Interests
Dr. Olevsky's research encompasses materials science and mechanics applied to processing of powders and porous materials, metals, ceramics, glass, and polymer composites, including nanomaterials. His current interests include materials for solid-oxide fuel cells, thermal management of electronic circuitry, hydrogen storage, and solar cells.

SUNG-YONG PARK, Assistant Professor of Mechanical Engineering, Ph.D., University of California, Los Angeles

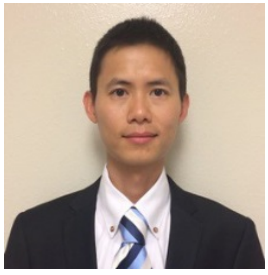
Research Interests
Dr. Park's research interests lie in the general area of optofluidic energy and environmental systems with applications to biomedical sensors, optofluidic solar energy systems, triboelectric energy harvesting from wastewater sources, lab on smartphone, smartphone based-environmental monitoring.

ELISA TORRESANI, Assistant Professor of Mechanical Engineering, Ph.D., University of Trento in Italy.

Research Interests
Dr. Torresani's research interests lie in the general area of materials science and engineering with a focus on advanced processing of powder materials, field assisted sintering, sintering-assisted additive manufacturing, numerical and experimental methods in materials science.

KEVIN WOOD, Assistant Professor of Mechanical Engineering. Ph.D., Colorado School of Mines.

Research Interests
Dr. Wood's interests center around interfacial design, electrochemistry, batteries, electromagnetic radiation and renewable energy technology.



WENWU XU, Assistant Professor of Mechanical Engineering, Ph.D., Beijing University of Technology

Research Interests
Dr. Xu's research interests include computational Multiscale Modeling of Materials (continuum, microscopic, atomistic, and quantum mechanics) and characterization of material microstructure at multiple scales from 2D (electron microscopy) to 3D (synchrotron X-ray computed tomography), and 4D (time-resolved tomography).

YANG YANG, Assistant Professor of Mechanical Engineering, Ph.D., Wuhan University and University of California, Los Angeles

Research Interests
Dr. Yang's research interests include bioinspired 3D printing, ceramic 3D printing, 3D printing of micro-scale superhydrophobic structure, 3D printing of battery and capacitor, novel applications of 3D printing, mechanism of materials and structures, stereolithography, piezoelectric/thermoelectric energy harvesting device, wearable sensor, 4D printing, high dielectric nanocomposites, self-healing materials.

GEORGE YOUSSEF, Professor of Mechanical Engineering. Ph.D., University of California, Los Angeles

Research Interests
Dr. Youssef's research interests are in the areas of mechanics of nontraditional materials, magnetoelectric composites, in-situ characterization, experimental mechanics, polymer matrix composites, shock waves and biomechanics.

8.2 Lecturers

Name	*Office*	*Email*
Richard Ayala	E-323A	rayala@sdsu.edu
Dr. Luis Escalona Galvis	E-221A	lwescalonagalvis@sdsu.edu
Luciana Jaenichen	E-323H	ljaenichen@sdsu.edu
Dr. Alexander Lehman	E-323A	atlehman@sdsu.edu
Vanita Murthy	E-323H	vmurthy@sdsu.edu
Hamid Nourollahi	E-221A	hnourollahi@sdsu.edu
Dr. Alireza Pakravan	E-323A	apakravan@sdsu.edu
Dr. Cyrus Saghafi	E-221A	csaghafi@sdsu.edu
Dr. Scott Shaffer	E-323H	sshaffar@sdsu.edu
Dr. Vi Vu	E-323H	vtvu@sdsu.edu
Jeff Wield	E-323A	pwield@sdsu.edu

8.3 Professor Emeriti

Name	*Email*
Greg W. Bailey	gbailey@mail.sdsu.edu
Randall German	randgerman@gmail.com
Nihad A. Hussain	nihadhussain@gmail.com
Thomas J. Impelluso	timpellu@sdsu.edu
Ronald Kline	rkline@sdsu.edu
Alvin E. Lybarger	
George A. Mansfield, Jr.	gmansfield75@gmail.com
Robert J. Murphy	

8.4 Staff

Name	*Office*	*Phone*	*Email*
Julie Smitherman (Dept. Coordinator)	E-326A	619-594-6067	jsmitherman@sdsu.edu
Allyson Korba	E-326	619-594-7050	akorba@sdsu.edu
Michael Lester	E-105A	619-594-0319	lester@sdsu.edu
Greg Morris	E-103B	619-594-6063	gmorris@sdsu.edu
ME Advisors in CSSE			
Juno Lee Chambers	E-22lB		jlchambers@sdsu.edu
Oscar Duran	E-221B		oduran2@sdsu.edu

9. Major Research Areas in the Department

This information is provided to assist BS/MS (4+1) students select a Thesis Adviser and BSME students select an adviser for ME499 Projects.

Bioengineering

- *Biomaterials (Drs. Katira, May-Newman, Morsi, Youssef)*
- *Biomechanics (Drs. Katira, May-Newman, Youssef)*
- *Design of Medical Devices (Dr. May-Newman)*
- *Neural Engineering (Drs.Kassegne, May-Newman, Moon)*
- *Sensors, Smart Health (Drs.Kassegne. Moon, Park)*
- *Tissue Engineering (Dr. Katira)*
- *Computational Biomechanics/Biofluids (Drs. Bhalla, He, Katira, May-Newman)*

Energy and Thermofluids

- *Combustion (Drs. Abraham, Bhattacharjee, Camacho, Miller)*
- *Computational Methods (Drs. Abraham, Bhalla, Bhattacharjee, He, Miller)*
- *Energy Systems (Drs. Beyene, Miller, Park, Wood)*
- *Renewable Energy (Drs. Abraham, Beyene, Bhalla, He, Miller, Park, Wood, Yang)*
- *Multiphase Flows (Drs. Abraham, Bhalla)*

Materials & Manufacturing

- *Automation in Manufacturing (Dr. Kang)*
- *Computational Methods (Drs. Bhalla, He)*
- *Manufacturing (Drs. Kang, Torresani, Yang)*
- *Materials Processing (Drs. Camacho, Morsi, Olevsky, Torresani, Wood)*
- *Mechanics of Sintering (Drs. Olevsky, Torresani)*
- *Multiscale Modeling of Materials (Drs. He, Xu)*
- *Powder Metallurgy (Drs. Morsi, Olevsky, Torresani)*

Mechanics

- *Computational Mechanics (Drs. He, Kassegne, Katira)*
- *Experimental Mechanics (Drs. Olevsky, Torresani, Youssef)*
- *Mechanical Polymers, Composites, Multiferroic Materials, Non-traditional Materials (Dr. Youssef)*

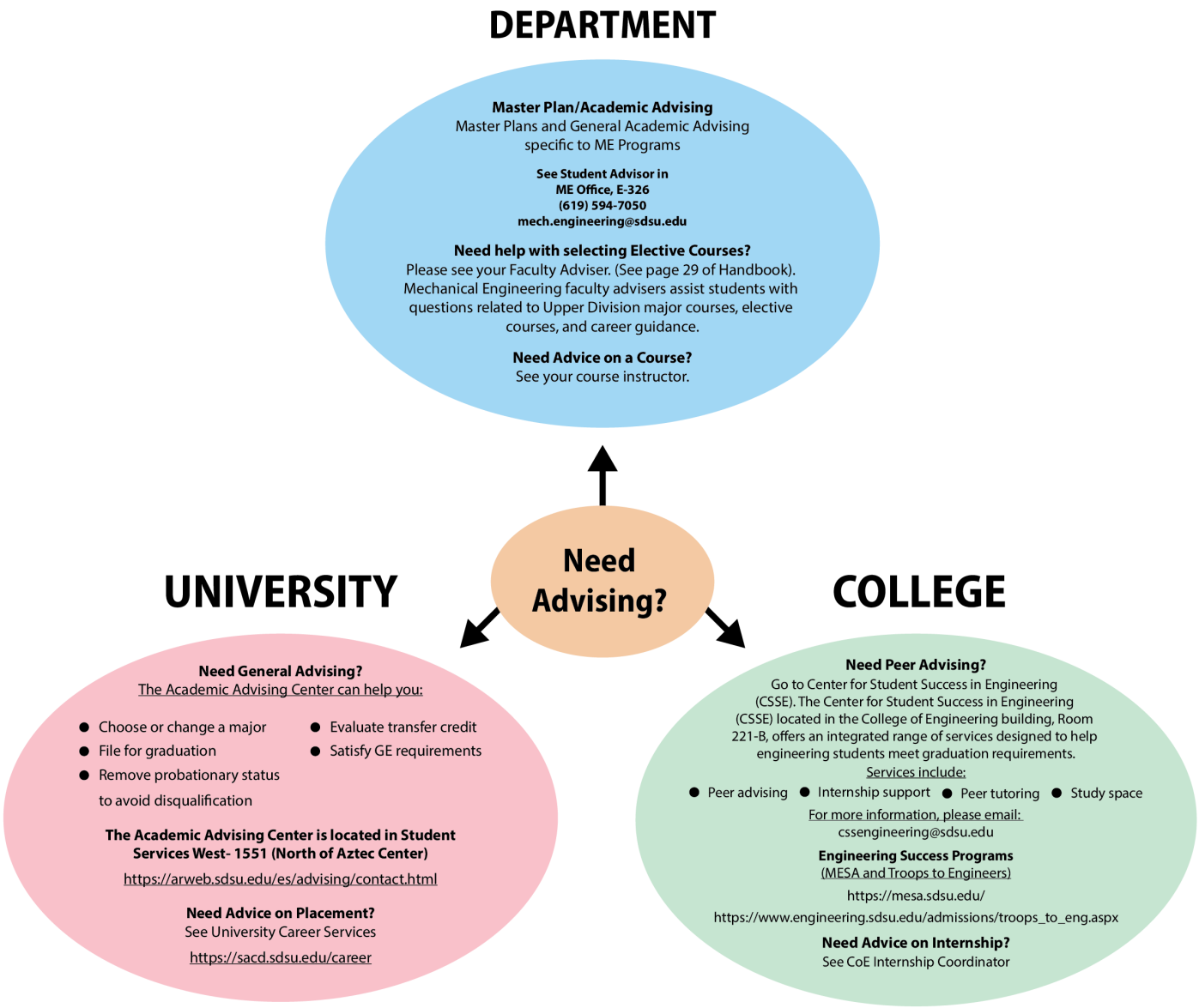
Microelectromechanical and Nanoelectromechanical Systems (MEMS/NEMS)

- *Bio-Nanoelectronics (Dr. Kassegne)*
- *Computational MEMS (Dr. Kassegne)*
- *Micro and Nano Fabrication (Drs.Kassegne, Park, Yang)*
- *Microfluids (Dr. Kassegne)*
- *Nano Mechatronics (Dr. Moon)*
- *Polymer Solar Cells (Drs. Kassegne, Wood)*
- *Sensors (Drs. Kassegne, Moon, Park)*

Robotics, Dynamic Systems and Control, Mechatronics

- *Automation (Dr. Kang)*
- *Dynamic Systems and Control (Drs. Naseradinmousavi, Nili Ahmadabadi)*
- *Mechatronics (Dr. Moon)*
- *Robotics (Drs. Naseradinmousavi, Nili Ahmadabadi)*
- *Smart Valves (Dr. Naseradinmousavi)*

10. Student Advising



10.1 2021-22 Advising

Advising in Mechanical Engineering is provided by (a) Advisors assigned to Mechanical Engineering in the Center for Student Success in Engineering, (b) Allyson Korba, Administrative Assistant, in the Mechanical Engineering Office, and (c) ME Faculty (https://mechanical.sdsu.edu/undergraduate/2021-2022-advisor-assignments.pdf). The Advisors assigned to ME in the CSSE are Juno Lee Chambers and Oscar Duran. The responsibilities of the Advisors are shown in the table below.

Allyson Korba, akorba@sdsu.edu, ME Department Administrative Assistant	Contact Allyson for setting up appointments with Department Chair; Change of Major; (4+1) program; Registration overrides; direct to ME Faculty as needed
Oscar Duran, oduran2@sdsu.edu, Undergraduate Advisor, CSSE	Students whose last names start with alphabet A-J; Master Plans (specific attention in ME 190, ME 350, ME 490A); RAAR forms;
Juno Lee Chambers, jlchambers@sdsu.edu, Undergraduate Advisor, CSSE	Students whose last names start with alphabet K-Z; Master Plans (specific attention in ME 190, ME 350, ME 490A); RAAR forms;
ME Faculty Advisor; students have been assigned to Faculty based on last name	Meet your instructional Faculty for advice on course material; meet your assigned Faculty Advisor for advice regarding career, appropriate electives to take to meet your career goals, post-baccalaureate plans.

11. Undergraduate and Graduate Required and Elective Courses (2021-22)

11.1 Lower Division Courses

AE 280. Methods of Analysis (3)
Prerequisite: MATH 151 with minimum grade of C. Recommended: MATH 252.
Selected topics from ordinary differential equations, the Laplace transform, Fourier series, and linear algebra, with engineering applications.

CHEM 200. General Chemistry (5)
Three lectures, one hour of discussion, and three hours of laboratory.
Prerequisites: Knowledge of introductory chemistry as demonstrated by completion of CHEM 100 with a grade of C or better; or satisfaction of the SDSU Mathematics/Quantitative Reasoning Assessment requirement and qualification on the Chemistry Department Placement Examination.
General principles of chemistry with emphasis on inorganic materials.

CHEM 202. General Chemistry for Engineers (4)
Three lectures and three hours of laboratory.
Prerequisite: Knowledge of introductory chemistry as demonstrated by completion of CHEM 100 with a grade of C or better; or satisfaction of the SDSU Mathematics/Quantitative Reasoning Assessment requirement and qualification on the Chemistry Department Placement Examination.
General principles of chemistry with emphasis on inorganic and physical chemistry and chemistry basics for engineers.
Not open to students with credit in Chemistry 200. Restricted to chemical physics and engineering majors.

EE 204. Principles of Electrical Engineering (3)
Prerequisites: MATH 151 and PHYS 196 with a grade of C or better in each course. Circuit analysis, phasor diagrams, single-phase and three-phase power, semiconductor devices and applications, and energy conversion devices.
Not acceptable for electrical or computer engineering majors.

MATH 150. Calculus I (4) [GE]
Three lectures and two hours of activity.
Prerequisites: Knowledge of algebra, geometry, and trigonometry as demonstrated by either (1) satisfactory completion of MATH 141 with a grade of C (2.0) or above; or (2) qualification on the Mathematics Placement Assessment. **Proof of completion of prerequisites required.**
Algebraic and transcendental functions. Continuity and limits. The derivative and its applications. The integral and the fundamental theorem of calculus.

MATH 151. Calculus II (4) [GE]
Three lectures and two hours of activity.
Prerequisite: MATH 150 with minimum grade of C. **Proof of completion of prerequisite required.**
Techniques and applications of integration. Improper integrals. Differential equations. Infinite series. Conic sections. Curves in parametric form, polar coordinates.

MATH 252. Calculus III (4) [GE]
Prerequisite: MATH 151 with minimum grade of C.
Functions of several variables. Vectors. Partial derivatives and multiple integrals. Line integrals and Green's Theorem.

PHYS 195. Principles of Physics (3)
Prerequisites: High school physics or PHYS 180A. MATH 150 with a minimum grade of C.
Fundamental principles of physics in areas of mechanics and oscillatory motion. Designed for students requiring calculus-based physics.

PHYS 195L Principles of Physics Laboratory (1)
Three hours of laboratory.
Prerequisite: Credit or concurrent registration in PHYS 195.
Experiments in mechanics, wave motion, resonance phenomena using precision air tracks.
Not open to students with credit in Physics 182A.

PHYS 196. Principles of Physics (3)
Prerequisites: PHYS 195 and MATH 151.
Fundamental principles of physics in areas of electricity and magnetism. Designed for students requiring calculus-based physics.

PHYS 196L. Principles of Physics Laboratory (1)
Three hours of laboratory.
Prerequisite: Credit or concurrent registration in PHYS 196.
Experiments in DC circuits, AC circuits, electrical resonance, oscilloscope measurement techniques, and electric and magnetic fields.
Not open to students with credit in Physics 182B.

PHYS 197. Principles of Physics (3)
Prerequisite: PHYS 196.
Fundamental principles of physics in areas of wave motion, sound, electromagnetic waves, optics, relativity, thermodynamics and modern physics. Designed for students requiring calculus-based physics.

ME 190. Computer-Aided Design (2)
Three hours of laboratory.
Introduction to 3-D computer-aided mechanical design. Creation of basic to intermediate solid parts, assemblies, and drawings to include orthographic, pictorial, section, and detail views. Dimensioning, dimension tolerancing, and thread notation per ASME Y14.5M-1994. CREO and SolidWorks software. *Not open to students with credit in Mechanical Engineering 102.*

ME 200. Statics (3) (Same course as AE 200)
Prerequisites: MATH 150 and PHYS 195 with a grade of C or better in each course. **Proof of completion of prerequisites required:** Copy of transcript.
Force systems, equilibrium, structures, distributed forces, friction, virtual work, moments of inertia, vector algebra.

ME 202. Computer Programming and Applications (3)
Two lectures and three hours of activity.
Prerequisites: MATH 151.
Principles of programming using MATLAB. Syntax topics to include arrays, control flow, data types, functions and loops. Numerical methods to include curve fitting, Gauss reduction, interpolation, matrix operations, Newton-Raphson, numerical differentiation, and numerical integration. MATLAB implementations. Application areas in mechanical engineering to include dynamic systems, finite element analysis, graphical user interfaces and image analysis.

ME 220. Dynamics (3) (Same course as AE 220)
Prerequisite: ME 200 or AE 200 and MATH 151, with a grade of C or better in each course. **Proof of completion of prerequisites required:** Copy of transcript.
Kinetics of a particle, central force motion, systems of particles, work and energy, impulse and momentum, moments and products of inertia, Euler's equations of motion, vibration and time response, engineering application.

ME 240. Introduction to Engineering Materials (3)
Prerequisites: CHEM 200 or 202. **Proof of completion of prerequisites required:** Copy of transcript
Atomic and molecular structure of materials utilized in engineering. Analysis of the relationships between structure of materials and their mechanical, thermal, electrical, corrosion, and radiation properties. Examples of material structure relevant to civil, electrical, aerospace, and mechanical engineering applications.

ME 241. Materials Laboratory (1)
Three hours of laboratory.
Prerequisite: ME 240.
Experimental methods used to characterize engineering materials and their mechanical behavior.

ME 296. Basics of Mechatronics (3)
Basic breadboarding, basic DC and AC circuits, capacitors and inductors, circuit components, filters, integrated circuit amplifiers, Ohm's Law. Measurement techniques using function generator, multimeter, oscilloscope, and computer simulation using circuit analysis software.

11.2 Upper Division Courses (Intended for Undergraduates)

NOTE: Proof of completion of prerequisites required for all Mechanical Engineering 300-, 400-, and 500-level courses: Copy of transcript is acceptable as proof.

AE 341. Fluid Mechanics Laboratory (1)
Three hours of laboratory.
Prerequisite: Credit or concurrent registration in ME 360.
Flow measuring devices. Experimental applications of continuity, Bernoulli and momentum equations. Model studies. Pipe and channel flows. Flow visualization techniques. Operating characteristics of wind tunnel and water table.

ME 304. Mechanics of Materials (3)
Prerequisite: ME 200 or AE 200.
Concepts of stress and strain. Generalized Hooke's law. Formulations for axial, shear, bending, torsion, and combined stresses applied to tension members, pinned joints, beams, and shafts. Euler buckling criteria for columns. Energy methods. *Not open to students with credit in Civil Engineering 301.*

ME 314. Engineering Design: Mechanical Components (3)
Prerequisites: ME 190, 202, 241, 304 (or CIVE 301).
Application of mechanics, physical properties of materials, and solid mechanics to the design of machine elements. Student design projects.

ME 330. Control Systems Laboratory (3)
Two lectures and three hours of laboratory.
Prerequisites: ME 202, 220 (or AE 220); EE 204 (or ME 296); AE 280 and PHYS 196L.
Actuating devices, data acquisition systems, hardware controllers, machine and process control applications, sensors and transducers, transducer signal processing and conditioning.

ME 350. Thermodynamics (3)
Prerequisites: MATH 252 and ME 200.
Basic concepts and principles of thermodynamics with emphasis on simple compressible substances. First and second law analysis, entropy, exergy analysis and state relations.

ME 360: Fluids Engineering (3)
Prerequisites: ME 220 and AE 280.
Fluid mechanics with applications to mechanical engineering systems. Statics and dynamics of fluids. Conservation laws of mass, momentum and energy analysis in control volume and differential form. Real life applications of these fundamental concepts and systems to include turbomachinery. *Not open to students with credit in AE 340.*

ME 420: Fundamentals of Manufacturing (3)
Prerequisite: ME 314
Applications of mechanics of materials and systems in product design and fabrication. Design challenges and constraints of various fabrication technologies. Fabrication technologies and processes.

ME 430. System Modeling and Analysis (3)
Prerequisites: ME 330.
System-level lumped parameter modeling of dynamic systems using first principles. Predict performance of engineered systems based on its dynamic response. Feedback control to achieve closed loop stability and specified system performances.

ME 450. Applications of Thermodynamics (3)
Prerequisites: ME 350
Air-conditioning, combustion, exergy analysis, gas power systems, heat pumps, power plant cycles, psychrometrics, refrigeration; thermoeconomics

ME 452. Principles of Heat Transfer (3)
Prerequisites: ME 350 and 360.
Analytical and numerical solutions of steady and transient one- and two-dimensional conduction problems, forced and natural convection in external and internal flows, and thermal radiation. Applications.

ME 490A-490B. Engineering Design: Senior Project (3-3)
One lecture and four hours of guided design activities.
Prerequisites for 490A: ME 304 (or CIVE 301), 314, 452.
Prerequisites for 490B: ME 490A, 495. Bioengineering emphasis: ME 490A.
Applications of engineering principles and design techniques to the designing, building, and testing of an engineering system. A single project is completed in this two-course sequence and is judged completed upon presentation of an oral and a written report. In addition, issues related to ethics and engineering practice are discussed.

ME 495. Mechanical and Thermal Systems Laboratory (2)
One lecture and three hours of laboratory.
Prerequisites: ME 330, 452.
Data acquisition theory, instrumentation, sensors, data reduction, statistical and uncertainty analysis, and design of experiments. Experience in designing, performing, and reporting experiments on mechanical and thermal systems, mechanisms, vibrations, structures, thermodynamics, heat transfer.

ME 496. Advanced Mechanical Engineering Topics (1-3)
Prerequisite: Consent of instructor. **Proof of completion of prerequisite required:** Copy of transcript.
Modern developments in mechanical engineering. See *Class Schedule for* specific content. Maximum credit nine units for any combination of ME 496, 499 and 596.

ME 499. Special Study (1-3)
Prerequisite: Consent of instructor. **Proof of completion of prerequisite required:** Copy of transcript.
Individual study. Maximum credit nine units for any combination of Mechanical Engineering 496, 499 and 596.

11.3 Upper Division Courses (Also Acceptable for Advanced Degrees)

NOTE: Proof of Completion of prerequisites required for all 300-, 400-level courses, and ME 500-: Copy of transcript.

ME 520. Introduction to Mechanical Vibrations (3)
Prerequisites: ME 304 (or CIVE 301) and 330.
Analysis of mechanical vibration; single- and multi-degree of freedom systems; free and forced vibrations; vibration isolation; vibration absorbers. Theory of vibration measuring instruments.

ME 530. Automatic Control Systems (3)
Prerequisite: ME 330.
Dynamic characteristics of control components and systems. Stability and response of closed loop systems. Design of control systems.

ME 532. Robot Modeling and Control (3)
Prerequisite: ME 330
Analysis, computer programming, modeling, motion planning, and design of control systems for robots.

ME 535. Mechanics of Composite Structures (3)
(Same course as AE 535)
Prerequisites: AE 280 and AE 310 or ME 314.
Micro- and macro-mechanics of composite materials, classical lamination theory, initial failure prediction and progressive failure analysis of beam and plate structures, stiffness and strength-based design of composites.

ME 540. Mechanics of Polymers (3)
Prerequisites: ME 314.
Polymeric materials, mechanics, and properties. Mechanical mechanics and properties essential for design. Stress-Strain behavior theories and models to include hyperelasticity, and viscoelasticity. Design and analysis methodologies and techniques.

ME 543. Powder-Based Manufacturing (3)
Prerequisite: ME 240.
Manufacturing of micro and nano-structured engineering components and composites starting with metal and/or ceramic powders. Powder production methods, characterization, powder shaping and compaction, sintering, hot consolidation, design considerations, and finishing operations.

ME 552. Heating, Ventilating, and Air-Conditioning (3)
Prerequisites: ME 452.
Fundamentals of air conditioning processes, psychrometrics, and building cooling load calculations. Design and analysis of HVAC systems. Equipment selection. Design codes and standards. Computerized cooling load calculations.

ME 554. Automotive Power (3)
Prerequisites: ME 452.
Conventional and emerging energy conversion devices for automotive applications to include fuel-cell, hybrid, and internal combustion engines. Alternative fuels to include biofuels, cleaner fossil fuels, hydrogen, and natural gas. Well-to-wheel energy and cost analysis of prime mover designs/fuels.

ME 555. Thermal Systems Analysis and Design (3)
Prerequisites: ME 452.
Analysis, design, and optimization of thermal systems using microcomputers. Modeling of thermal systems and components. Thermal system component characteristics and their effect on overall system performance. Relationship among thermal sciences in design process. Introduction to thermoeconomic optimization.

ME 556. Solar Energy Conversion (3)
Prerequisites: AE 340, ME 452.
Application of thermodynamics, fluid mechanics and heat transfer to the thermal design of solar energy conversion systems. Computer simulations utilized.

ME 580. Biomechanics (3)
Prerequisites: ME 304 (or CIVE 301) and 360.
Application of engineering methodologies for quantitative understanding of biological/physiological phenomena. Continuum mechanics principles. Cardiovascular system and its components viewed from a mechanistic standpoint.

ME 585. Fundamentals of Micro-Electro-Mechanical Systems (MEMS) (3)
One lecture and four hours of laboratory.
Prerequisites: For aerospace engineering majors: EE 204, AE 220, and ME 240. For electrical engineering majors: EE 330 and ME 240. For mechanical engineering majors: ME 220 and ME 240.
Microfabrication techniques, microsensors and microactuators, and scaling laws. A design project of a micro-device including schematic creation, test of performance, layout generation, and layout versus schematic comparison.

ME 596. Advanced Mechanical Engineering Topics (1-3)
Prerequisite: Consent of instructor.
Modern developments in mechanical engineering. May be repeated with new content. See *Class Schedule* for specific content. Maximum credit of nine units for any combination of ME 496, 499 and 596 applicable to a bachelor's degree. Credit for 596 and 696 applicable to a master's degree with approval of the MS Graduate adviser.

11.4 Graduate Courses (accessible to BSME students only with special permission)

ME 610. Finite Element Methods in Mechanical Engineering (3)
Prerequisites: AE 280 with a grade of C or better.
Development of finite elements and an introduction to solution methods. Problems from various fields of study in mechanical engineering such as stress analysis, vibrations and heat transfer. Introduction to finite element programs such as NASTRAN.

ME 640. Nanomaterials (3)
Prerequisite: ME 543.
Nanomaterials compared with conventional materials. Nanomaterials synthesis, characterization, properties, and applications.

ME 645. Mechanical Behavior of Engineering Materials (3)
Prerequisites: ME 314 and 350.
Elastic and plastic deformation of monolithic engineering materials and composites. Dislocation theory and plasticity of crystalline solids. Linear elastic and elastic-plastic fracture mechanics. Failure analysis of engineering components. Design optimization based on materials and service environment variables.

ME 646. Mechanics of Sintering (3)
Prerequisites: Classified graduate standing.
Practical aspects and conceptual models and mechanisms associated with sintering of ceramic and metal powders.

ME 651. Advanced Thermodynamics (3)
Prerequisites: AE 280 with a grade of C or better.
Advanced concepts of macroscopic thermodynamics are developed including entropy generation, irreversibility, effectiveness, exergy, and chemical exergy of fuels. Concepts applied to power and refrigeration cycles using computer software.

ME 653. Combustion (3)
Prerequisite: Classified graduate standing.
Thermodynamics of combustion, chemical equilibrium, chemical kinetics, combustion of gaseous, liquid and solid fuels, and their application.

ME 656. Conduction Heat and Transfer (3)
Prerequisites: ME 452.
Conduction heat transfer analysis of multi-dimensional and transient processes using both classical analysis and numerical methods.

ME 657. Convection Heat Transfer (3)
Prerequisites: ME 452 and AE 515.
Convection heat transfer processes under laminar and turbulent conditions. Mass transfer. Scaling arguments, analytical and numerical modeling.

ME 658. Radiation Heat Transfer (3)
Prerequisites: ME 452 and AE 515.
Radiation heat transfer processes. Radiative properties of surfaces and gases. Absorption, emission, and scattering phenomena. Numerical modeling.

ME 661. Gas Dynamics (3)
Prerequisites: AE 515.
Thermodynamics of high velocity compressible fluid flow. Adiabatic and diabatic flow; shock phenomena; imperfect gases; multidimensional flow. Applications to the propulsive duct and turbomachinery.

ME 681. Biomaterials (3)
Prerequisites: ME 240 and 580.
Structure and properties of metallic, ceramic, and polymer biomaterials. Chemical interaction with physiological

environment. Thrombosis and hemostasis on synthetic surfaces. Sterilization and packaging. Ethics and regulatory approval process. Applications discussed in cardiovascular, pulmonary, renal, orthopedic and dental medicine.

ME 683. Design of Medical Devices (3)
Prerequisites: ME 314 and 580.
Device design, including biomaterials, human factors engineering, reliability, and manufacturing. Topics relevant to industry reviewed include regulatory, documentation, quality, and legal.

ME 685. Micro-Electro-Mechanical Systems (MEMS) Design and Applications (3) (Same course as Electrical Engineering 685)
Prerequisite: ME 585.
Design and manufacturing technology for micro- and nano-scale devices. Topics include solid-state transducers, microscale physics, biomedical microelectronics, microfluidics, biosensors, and hybrid integration of microfabrication technology. Emphasis on biomedical applications.

ME 696. Advanced Topics in Mechanical Engineering (2 or 3)
Intensive study in specific areas of mechanical engineering. May be repeated with new content. See *Class Schedule* for specific content. Credit for 596 and 696 applicable to a master's degree with approval of the graduate adviser.

ME 797. Research (1-3) Cr/NC/RP
Prerequisites: Consent of graduate adviser and advancement to candidacy. Research in engineering. Maximum credit six units applicable to a master's degree.

ME 798. Special Study (1-3) Cr/NC/RP
Prerequisite: Consent of graduate adviser; to be arranged with department chair and instructor. Individual study or internship. Maximum credit three units applicable to a master's degree.

ME 799A. Thesis or Project (3) Cr/NC/RP
Prerequisites: An officially appointed thesis committee and advancement to candidacy. Preparation of a project or thesis for the master's degree.

ME 799B. Thesis or Project Extension (0) Cr/NC
Prerequisite: Prior registration in Thesis or Project 799A with an assigned grade symbol of RP.
Registration required in any semester or term following assignment of RP in Course 799A in which the student expects to use the facilities and resources of the university; also, student must be registered in the course when the completed thesis or project is granted final approval.