UC San Diego
Jacobs School of Engineering

Mechanical - Aerospace Engineering

2025
PROSPECTIVE STUDENT HANDBOOK

Welcome to the Department of Mechanical and Aerospace Engineering

Congratulations on being admitted to the Department of Mechanical and Aerospace Engineering (MAE) in the Jacobs School of Engineering. We are sure you have questions about what to do next. We hope that this handbook will help you get familiar with our department's policies and expectations. Make sure to contact us if there are questions or concerns that are not answered.

MAE Undergraduate Academic Advising

The MAE advising staff assists students with their programs of study.
The advising staff is available in EBU II, first floor.

Undergraduate Advisors

- **Chad Baldwin (Last names A-L)**
- **Nadia Espinoza (Last names M-Z)**

Intake Advisor

- **Regina Ready**

Please see the MAE website for all advising options.

The MAE advising program runs parallel to the work of college advisors who assist students with the general-education requirements of each college.

If you have questions about your major please contact us at:

MAE-UGRADADM@UCSD.EDU

UCSD Mechanical and Aerospace Engineering

MAE PROGRAM EDUCATIONAL OBJECTIVES

Our primary educational objectives are:

To provide our students with a strong technical education that will enable them to have successful careers as engineers, technology leaders and innovators.

To prepare our students for rapid technological change with the core knowledge central to assuring that they are able to further develop their knowledge and skills across a range of disciplines throughout their professional careers and pursue advanced education.

To prepare our students to communicate effectively and to deal knowledgeably and ethically with the impact of technology in our society and on global issues.

PROGRAM OUTCOMES

(ABET-accredited programs)

Aerospace and Mechanical Engineering:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as being able to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively with written, oral, and visual means.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- A recognition of the need for and an ability to engage in life-long learning.
- A knowledge of contemporary issues.
- An ability to use modern engineering techniques, skills, and computing tools necessary for engineering practice.

Aerospace Engineering

- Knowledge of key topics in aeronautical engineering including aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control.
- Knowledge of topics in astronautical engineering including attitude determination and control, space structures, orbital mechanics, and rocket propulsion.
- An ability to integrate knowledge of the fundamental topics in the design of an aerospace system.

Mechanical Engineering

- A familiarity with chemistry, calculus-based physics, and advanced mathematics.
- Familiarity with probability theory, statistics, and linear algebra.
- Ability to work professionally in mechanical systems areas including the design and realization of such systems.
- Ability to work professionally in thermal systems areas including the design and realization of such systems.

WHAT IS ABET?

ABET (Accreditation Board for Engineering and Technology)

All majors at US San Diego are accredited by the Western Association of Schools and Colleges (WASC). ABET is a specialized accreditation of educational programs in applied science, computing, engineering, and technology. It's a certification recognized in the engineering industry as having satisfied set institutional requirements upon completion of the major. The board places emphasis on the following categories: engineering fundamentals, teamwork, leadership, presentation, creative design and application, and ethics.

DURING THE FIRST YEAR:

By the end of the first year, all students should complete at least the following courses. These courses can be taken at UC San Diego or transferred in from a different university or community college.

1 introductory course	3 Math Courses	2 Physics Courses	General Chemistry
MAE 3 (For ME) MAE 2 (For AE)	Math 20A Math 20B Math 20C	Physics 2A Physics 2B	Chem 6A

MAJOR ACADEMIC ADVISING

MAE Undergraduate Advising Staff

The MAE advising staff assists students with their programs of study. The advising staff is available in EBU II, first floor for advising. Occasionally, we have meetings and need to close advising.
Please see the MAE website for all advising options.

Student Affairs Lobby

The student lobby is a great resource for students. The MAE Student Affairs lobby is located in EBU II on the first floor. We suggest you come prior to the Fall quarter to familiarize yourself with the lobby and EBU II itself.

GENERAL EDUCATION/COLLEGE REQUIREMENTS

For graduation, each student must satisfy general-education course requirements determined by the student's college as well as the major requirements determined by the department. The eight colleges at UC San Diego require widely different general-education courses and the number of such courses differs from one college to another. Each student should choose his or her college carefully, considering the special nature of the college and the breadth of general education.

In practice, the overwhelming majority of students are happy with their college assignment, even if it was not their first choice originally, and few students apply to switch. Petitions to transfer between colleges are difficult to justify and approved only in exceptional cases. To qualify, you must complete your originally assigned college's writing program, demonstrate that switching to a different college will substantially shorten your time to degree, and have a cumulative grade point average of at least 2.5 with a specified number of completed units. Talk to your college advisor for more information about this.

Each MAE program allows for humanities and social science (HSS) courses so that students can fulfill their college requirements. In the ABET-accredited programs, students must follow a program that includes a total of at least twenty-four units in the arts, humanities, and social sciences, not including subjects such as accounting, industrial management, finance, or personnel administration. It should be noted, however, that some colleges require more than the nine or ten HSS courses indicated in the curriculum tables. Accordingly, students in these colleges could take longer to graduate than the indicated four-year schedule. Students must consult with their college to determine which HSS courses to take.

An approximate guide to the number of college general education courses in addition to those met within MAE major programs:		
	# of Courses	# of Units
Warren	10	40
Marshall	10-11	40-44
Muir	11	44
Sixth	12-14	52-60
ERC	10-15	44-64
Revelle	12-16	52-68
Seventh	14	56
Eighth	14	56

MAE MAJOR PROGRAMS AND REQUIREMENTS

Specific course requirements for each major program are outlined in this handbook. In addition to the required technical courses specifically indicated, a suggested scheduling of humanities and social science courses (HSS) are distributed in the curricula for students to use to meet college general-education requirements. **To graduate, students must maintain an overall GPA of at least 2.0 and they must have received at least a D grade in each course required for the major. Students are allowed only one 'D' letter grade in their major required courses.** In the ABET-accredited programs, TE courses are restricted to meet ABET standards. Students are encouraged to complete lower and upper-division courses as suggested in the curriculum tables in a timely fashion and in the sequences outlined.

We STRONGLY discourage students deviating from their academic plan when taking MAE upper-division courses

Lower-division courses are offered more than once each year to permit students some flexibility in their program scheduling. However, many MAE upper-division courses are taught only once per year, and the courses are scheduled to be consistent with the curricula as shown in the tables. Students taking upper-division courses in a different order than that shown in the tables may experience conflicts as the schedules of different courses may overlap. A recommended schedule of course offerings is available from the department each spring for the following academic year. **Courses with a letter grade of F must be repeated before you can move on to the next course in the sequence**. Prerequisites are strictly enforced by the department.

SELECTIVE MAJORS

Due to high demand, ALL engineering majors at the Jacobs School have been designated as oversubscribed and have been granted selective status as of Fall 2014.

1. **Mechanical Engineering** (Effective Fall 2009 for freshmen. Effective Fall 2011 for transfers)
2. **Aerospace Engineering** (Effective Fall 2009 for freshmen. Effective Fall 2011 for transfers)

Acceptance into an Engineering Major

Admission to an engineering major is based on academic excellence demonstrated in high school, community college or other four-year institutions.

Admitted students that have applied to a selective major will be further evaluated by the Office of Admissions and Relations with Schools for admission to the major. Acceptance will be granted up to the maximum number of students in each of these selective major programs. Students who are not admitted to the selective major are placed into the alternate major selected on the UC Undergraduate Application, provided the alternate is not impacted.

Students who would like to switch into a selective MAE major must (1) complete at least one year of academic study at UC San Diego, (2) meet the minimum requirements to apply, and (3) submit an online application through the JSOE Selective Major Application system during an application period. For more information, please contact MAE Student Affairs.

TRANSCRIPTS AND COURSE EQUIVALENTS

Your major department does not receive, handle, or evaluate your transcripts. If you have questions about your transcript evaluations, please contact the admissions office.

University of California, San Diego
Office of Admissions and Relations with Schools
Attn: Transcripts
9500 Gilman Dr., # 0021
La Jolla, CA 92093-0021

Some engineering courses may not transfer into MAE so you will need to petition for equivalency. For the MAE Department, a course substitution petition must be submitted through the MAE Undergraduate Online Petition Portal. You must provide documentation from the community college course in the form of a full syllabus (not just the course catalog description). Your complete petition will be reviewed by an MAE faculty member.

ACADEMIC ENRICHMENT

Cooperative Education (Co-op)

The Cooperative Education (Co-op) Program is an immersive work experience in which students are employed full-time by a company for up to six months, which includes summer and one academic quarter, to supplement education with real-world experiences. Students with a minimum junior standing and a 3.0 GPA are eligible to apply. Positions are not guaranteed and students must apply and interview such as in any internship/job opportunity. For more information, please see undergraduate advisors.

Undergraduate Research and Independent Study (MAE 199)

Undergraduates may participate in engineering research at UC San Diego through Independent Study (MAE 199). MAE 199 courses offer qualified and motivated students the opportunity to work closely with faculty and graduate students and gain first-hand experience in conducting research. MAE students may take MAE 199, Independent Study for Undergraduates, under the guidance of an MAE faculty member. This course is taken on a P/NP basis and may qualify as one technical elective under special circumstances.

Academic Internships: Special Study (MAE 197)

The Academic Internship Program coordinates work experiences for undergraduates with industry, government offices, and hospitals. Students work under the supervision of either a faculty member or an industrial supervisor. The position may or may not be salaried. Students may receive up to 12 units of academic credit by registering for MAE 197 Engineering Internship and completing a research paper or technical lab report on their internship work. The typical student time commitment to the internship is 10 hours per week for every four units of academic credit. However, students may not receive upper division technical elective credit for such internships.

Study Abroad

Engineering is already a global field offering jobs throughout the world. You can prepare yourself for these opportunities with an exciting study or internship experience abroad. Through the Study Abroad Office, students may receive credit for international study through a variety of programs. For information on EAP and OAP programs, contact the Study Abroad Office.

Freshman Seminar Series

Informal seminars (MAE 87) are offered to new freshmen to provide them with the opportunity to explore an intellectual topic with a faculty member in a small seminar setting. Topics vary quarter by quarter.

Teams in Engineering Service (TIES)

Teams in Engineering Service is an innovative service-learning academic program putting UC San Diego undergraduates and their technical and creative skills to work for San Diego non-profit organizations. Multi-disciplinary teams of UC San Diego students design, build, and deploy projects that solve technology-based problems for community partners.

TIES projects can range from working with orthopedists and physical therapists to developing and building mechanical tools or prosthetics for the developmentally disabled and to working with agriculture to develop new irrigation solutions for local farming communities.

The benefits for student's involvement in TIES are numerous, and include improved communication, organizational, and leadership skills, start-to-finish design experience, multidisciplinary teamwork, experience in project and resource management, ethics training and responsibility, as well as customer and community awareness. Finally, TIES provides demonstrable and measurable outcomes of undergraduate engineering theoretical knowledge, technical skills, teamwork, communication, ethical responsibility and value for professional development. MAE majors students are eligible to receive 4 units of technical elective credit. Note:

Team Internship Program (TIP)

Today's employers are looking for engineers who have both technical skills and the ability to collaborate and function as a team. Summer Team Internships are part of the Jacobs School's effort to enhance our students' education through real-world engineering experiences in a team setting. Students work on-site with local, domestic, and international industry partners as a multi-disciplinary team of 2-5 students, focused on a clearly defined and significant project. TIP is a 10-12 week, full time, paid internship program during the summer. Undergraduate and graduate students of all levels in all engineering departments are eligible to apply. All applications and resumes are screened by the TIP Office and candidates who best meet the criteria are forwarded to companies for review. TIP also offers resume guidance and professional development training to all applicants. This is designed to help students make the best impression at their interviews. TIP, in collaboration with the Corporate Affiliates Program (CAP), works with some of the top engineering companies. TIP students are often offered full time employment upon finishing their internship.

Some Participating Companies


AEROSPACE ENGINEERING

Aerospace engineering is a four-year curriculum that begins with fundamental engineering courses in mechanics, thermodynamics, materials, solid mechanics, fluid mechanics, and heat transfer. Additional courses are required in aerospace structures, aerodynamics, flight mechanics, propulsion, controls, and aerospace design. Graduates of this program normally enter the aerospace industry to develop aircraft and spacecraft but also find employment in other areas that use similar technologies, such as mechanical and energy-related fields. Examples include automobile, naval, and sporting equipment manufacturing. This program received ABET accreditation in 2002.

This four-year plan is tentative and should be used as a guide.
Please refer to the MAE website for the most updated curriculum plan.

FALL QUARTER	WINTER QUARTER	SPRING QUARTER
Year 1		
Math 20A	Math 20B	Math 20C
MAE 2-Intro to Aerospace	Phys 2A	Phys 2B
Chem 6A	GE	GE
GE (General Education)	GE	GE
Year 2		
Math 18	Math 20D	Math 20E
Phys 2C + Phys 2CL	MAE 8- MATLAB	MAE 131A- Solid Mechanics
MAE 21–Aerospace Materials Science	MAE 30A - Statics and Intro to Dynamics	MAE 30B- Dynamics and Vibrations
GE	GE	TE (Technical Elective)
Year 3		
MAE 11 – Thermodynamics	MAE 101B - Advanced Fluids	MAE 104 - Aerodynamics
MAE 101A - Intro to Fluids	MAE 143A - Signals and Systems	MAE 143B- Linear Control
MAE 105- Intro Mathematical Phys	SE 160A- Aerospace Structural Mechanics I	MAE 170- Experimental Techniques
MAE 107- Computational Methods	TE	GE
Year 4		
MAE 142 - Dynamics and Controls	MAE 155A - Aerospace Design I	MAE 155B- Aeronautics Design II
MAE 113 - Propulsion	MAE 175A - Engineering Lab	GE
GE	TE	TE
TE	GE	GE

AEROSPACE ENGINEERING

Chem 6AH may be taken in place of Chem 6A

In fulfilling the General Education requirements, students must take at least 24 units in the arts, humanities, and social sciences, not including subjects such as accounting, industrial management, finance, or personnel administration. Twelve GE courses are listed here; individual college requirements may be higher or lower.

Technical Elective (TE) courses must be upper-division or graduate courses in the engineering sciences, natural sciences or mathematics. See the MAE website for a list of pre-approved Technical Electives.

Aerospace Engineering Specializations (Optional)
Students will have the option to take four out of five technical electives from a list of pre-approved technical electives in a selected specialization in a particular topic. This optional specialization will show on the student's transcript and final degree. The specializations are:

- Astrodynamics and Space Applications
- Aerothermodynamics
- Flight Dynamics and Controls

Photos courtesy of the MAE 2 course of 2008

First-year aerospace engineering students work in teams to design, build, and fly multi-disciplinary payload experiments on balloon satellites to near-space. Students gain real-world engineering experience developing and assembling sub-systems on space flight critical systems.

MECHANICAL ENGINEERING

The Mechanical Engineering program has a traditional ABET-accredited four-year curriculum involving mechanics, vibrations, thermodynamics, fluid flow, heat transfer, materials, control theory and mechanical design. Graduates
of this program find employment in the high-technology elector-mechanical industry as well as in the mechanical and aerospace industry.

This four-year plan is tentative and should be used as a guide.
Please refer to the MAE website for the most updated curriculum plan.

FALL QUARTER	WINTER QUARTER	SPRING QUARTER
Year 1		
Math 20A	Math 20B	Math 20C
Chem. 6A	Phys 2A	Phys 2B
GE (General Education)	GE	MAE 3- Intro to Mechanical Design
GE	GE	GE
Year 2		
Math 18	Math 20D	Math 20E
Phys. 2C	MAE 30A - Statics and Intro to Dynamics	MAE 131A- Solid Mechanics
MAE 20- Materials Science	MAE 8- MATLAB	MAE 30B – Dynamics and Vibrations
GE	GE	TE (Technical Elective)
Year 3		
MAE 11- Thermodynamics	MAE 101A - Intro to Fluids	MAE 101B - Advanced Fluids
MAE 40- Linear Circuits	MAE 143A - Signals and Systems	MAE 143B- Linear Control
MAE 105- Intro Mathematical Phys	TE	MAE 170- Experimental Techniques
MAE 107- Computational Methods	MAE 160 or MAE 131B	GE
Year 4		
MAE 101C - Heat Transfer	MAE 156A - Mechanical Design I	MAE 156B- Mechanical Design II
MAE 150 - Computational Methods for Design	MAE 171A - Engineering Lab I	TE
TE	TE	GE
GE	GE	GE

MECHANICAL ENGINEERING

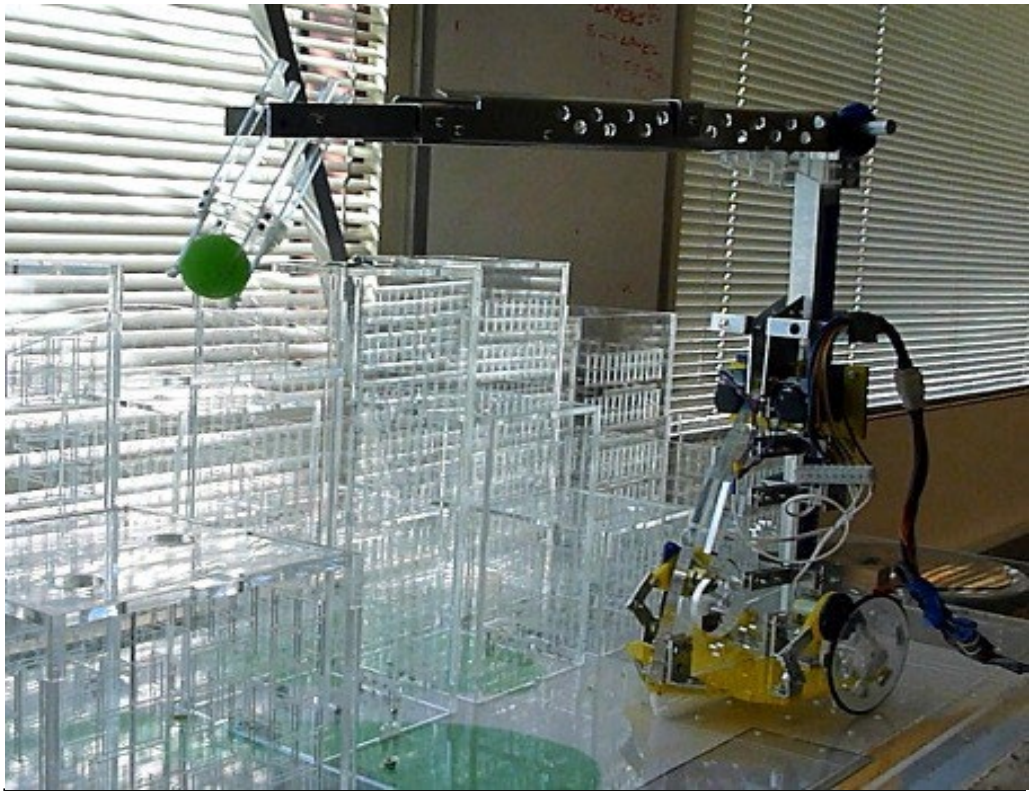
Chem 6AH can be taken in place of Chem 6A

In fulfilling the General Education (GE) requirements, students must take at least 24 units in the arts, humanities, and social sciences, not including subjects such as accounting, industrial management, finance, or personnel administration. Twelve GE courses are listed here; individual college requirements may be higher or lower.

Technical Elective (TE) courses must be upper-division or graduate courses in the engineering sciences, natural sciences or mathematics. See the MAE website for a list of pre-approved TEs.

Mechanical Engineering Specializations (Optional)
Students will have the option to take four out of five technical electives from a list of pre-approved technical electives in a selected specialization in a particular topic. This optional specialization will show on the student's transcript and final degree. The specializations are:

- Controls and Robotics
- Fluid Mechanics and Thermal Systems
- Mechanics of Materials
- Materials Science and Engineering
- Renewable Energy and Environmental Flows (REEF)



Example of an MAE 3 Project

This course introduces the fundamentals of engineering graphics and the design. Emphasis is placed on applying engineering tools to design and fabrication of working machines. Course material will be centered around two projects:

- *Model Clock Project (2.5 weeks): Students will use AutoCAD to design an escapement wheel and pendulum for a model clock, and make the model using shop tools.*
- *Robot Design Project (7.5 weeks): Teams of students will design and build a machine for a competition using DC motors, solenoids, and fabrication tools.*

FREQUENTLY ASKED QUESTIONS

"What are the criteria and requirements to apply to a capped major?"

Continuing students who wish to change into any MAE major must submit an online application through the JSOE Selective Major Application system during an application period. Applications will be accepted once a year. ***Admission is based on available space, and meeting these requirements does not guarantee admission.*** *On average, those admitted to the major will exceed the minimum GPA required to apply.*

All students who wish to apply MUST meet the minimum requirements as listed below:

(A) Complete at least one year/three quarters in residence at UC San Diego.

(B) Complete ALL of the following lower-division requirements.

Freshmen Applicants:

- Math 20A, 20B and 20C
- Physics 2A and 2B
- Chemistry 6A or Chemistry 6AH

Note: For selective status, the Freshmen class level is determined by number of registered quarters-not number of units completed.

For Sophomore/Transfer Applicants

- Math 20A, 20B, 20C, 20D, 20E, and 18 (or 20F)
- Physics 2A, 2B, 2C
- Chemistry 6A or Chemistry 6AH
- MAE 8 (or NANO 15 or CENG 15 or SE 9)

(C) Must have a minimum GPA of 2.5.

(D) Students will be **considered for the major using a point system that awards one point each for; having a 3.0 GPA or higher in the major screening courses, California residency, Pell Grant eligibility, first-generation college status (as determined by information received at the time of initial admission to UC San Diego).**

(D) **Students with the highest number of points will be admitted until all available spaces within the major have been filled.**

"Which of the eight UC San Diego colleges do engineering students choose?"

Each undergraduate college at UC San Diego is composed of all types of majors so there is no "particular" college for engineering students. The main difference is that each college has its own general education requirements to graduate, mission, philosophy, traditions, and housing/dining facilities.

"Can I double major?"

UC San Diego does allow students to double major. However, you cannot double major or minor within the Jacobs School of Engineering.

"What companies recruit UC San Diego students?"

Various engineering companies actively recruit students from the Jacobs School of Engineering and a majority of these companies belong to our Corporate Affiliates Program (CAP). Below are just some of the companies affiliated with UC San Diego through CAP.

Course Descriptions

2025-2026

Lower Division

MAE 02. Introduction to Aerospace Engineering (4)

An introduction to topics in aeronautical and astronautical engineering including aerodynamics, propulsion, flight mechanics, structures, materials, orbital mechanics, design, mission planning, and environments. General topics include historical background, career opportunities, engineering ethics, and professionalism. ***Prerequisites:*** none.

MAE 03. Introduction to Mechanical Design (4)

Introduction to design process through hands-on individual and team projects. Topics include 2D/3D CAD (drawing projections/isometrics, dimensioning), design problem identification, prototype fabrication techniques (shop skills, rapid prototyping), design process (concept generation/selection, risk reduction strategies, scheduling), learning from hardware performance (problem solving/redesign), teamwork. Use of components: fasteners, couplings, DC motors, oral/written communication with graphics. Program or materials fees may apply. ***Prerequisites:*** PHYS 2A or 4A. Enrollment restricted to BE 25, MC 25, MC 27, MC 29, and MC 30–37 majors only.

MAE 05. Quantitative Computer Skills (4)

Introductory course for nonengineering majors. Use of computers in solving problems; applications from life sciences, physical sciences, and engineering. Students run existing computer programs and complete some programming in BASIC. ***Prerequisites:*** none.

MAE 07. Spatial Visualization (1)

(Cross-listed with SE 7.) Spatial visualization is the ability to manipulate 2-D and 3-D shapes in one's mind. In this course, students will perform exercises that increase their spatial visualization skills. P/NP grades only. Students may not receive credit for SE 7 and MAE 7. ***Prerequisites:*** none.

MAE 08. MATLAB Programming for Engineering Analysis (4)

Computer programming in MATLAB with elementary numerical analysis of engineering problems. Arithmetic and logical operations, arrays, graphical presentation of computations, symbolic mathematics, solutions of equations, and introduction to data structures. ***Prerequisites:*** MATH 20A and 20B or consent of instructor.

MAE 11. Thermodynamics (4)

Fundamentals of engineering thermodynamics: energy, work, heat, properties of pure substances, first and second laws for closed systems and control volumes, gas mixtures. Application to engineering systems, power and refrigeration cycles, combustion. Renumbered from MAE 110A. Students may not receive credit for MAE 11 and MAE 110A. ***Prerequisites:*** PHYS 2C and CHEM 6A. Enrollment restricted to engineering majors only.

MAE 20. Elements of Materials Science (4)

The structure of materials: metals, ceramics, glasses, semiconductors, superconductors, and polymers to produce desired, useful properties. Atomic structures. Defects in materials, phase diagrams, microstructural control. Mechanical and electrical properties are discussed. Time temperature transformation diagrams. Diffusion. ***Prerequisites:*** PHYS 2A or 4A, CHEM 6A or CHEM 6AH, and MATH 20C.

MAE 21. Aerospace Materials Science (4)

Atomic structure and physical properties of engineering materials including metals, ceramics, glasses, polymers, and composite materials. Defects and phase diagram of materials. Material testing and processing. Program or materials fees may apply. ***Prerequisites:*** PHYS 2A or 4A, CHEM 6A or CHEM 6AH, and MATH 20B. Enrollment restricted to MC 25 and MC 35–37 majors only.

MAE 30A. Statics and Introduction to Dynamics (4)

Statics: statics of particles and rigid bodies in 3-D. Free body diagrams. Moment of a force, couples, equivalent systems of forces. Distributed forces, centroids, and centers of gravity. Introduction to dynamics: 3-D relative motion, kinematics, and kinetics of particles. Newton's equations of motion. Equilibrium problems with friction. Enrollment restricted to engineering majors MC 25, MC 27, MC 29, MC 30–34, MC 35–37, and SE 27. ***Prerequisites:*** PHYS 2A and MATH 31BH or MATH 20C.

MAE 30B. Dynamics and Vibrations (4)

Dynamics: energy methods for motion of particles and rigid bodies, including virtual work, power, and Lagrange's equations. Impact and impulses. Systems of particles. Introduction to 3-D dynamics of rigid bodies. Introduction to vibrations: free and harmonically forced vibrations of undamped and damped single degree of freedom systems. Enrollment restricted to engineering majors only MC 25, MC 27, MC 29, MC 30–34, MC 35–37, and SE 27. ***Prerequisites:*** MAE 30A.

MAE 40. Linear Circuits (4)

Steady-state and dynamic behavior of linear, lumped-parameter electrical circuits. Kirchhoff's laws. RLC circuits. Node and mesh analysis. Operational amplifiers. Signal acquisition and conditioning. Electric motors. Design applications in engineering. ***Prerequisites:*** MATH 20D and MATH 31AH or MATH 18 or MATH 20F, and PHYS 2B.

MAE 87. First-year Student Seminar (1)

The First-year Student Seminar program is designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small seminar setting. First-year student seminars are offered in all campus departments and undergraduate colleges. Topics vary from quarter to quarter. Enrollment is limited to fifteen to twenty students, with preference given to entering first-year students. ***Prerequisites:*** none.

MAE 92A. Design Competition—Design, Build, and Fly Aircraft (1)

(Cross-listed with SE 10A.) Student teams design, build, and fly unmanned aircraft for a national student competition. Students concentrate on vehicle system design including aerodynamics, structures, propulsion, and performance. Teams engineering, fabricate the aircraft, submit a design report, and prep aircraft for competition. ***Prerequisites:*** consent of instructor.

MAE 93. Design Competition—Design, Build, and Test Race Car (1)

Student teams design, build, and test a formula-style racing car for an international student competition. Students concentrate on vehicle system analysis and design, manufacturability and performance. Teams engineer, fabricate car, submit a design report and prep car for competition. ***Prerequisites:*** department approval.

MAE 94. Rocketry Competitions—Design and Build Rockets and Space Systems (1)

Student teams design, build, and test different components of rockets and cubesats for national level competitions. Students will be involved in planning, designing, manufacturing, and testing various systems. Team engineers will

focus on the feasibility of manufacturing and performance for the targeted competitions. Final design reports will be prepared by the teams.

MAE 98. Directed Group Study (2)

Directed group study on a topic or in a field not included in the regular departmental curriculum. P/NP grades only. May be taken for credit two times. Credit may not be received for a course numbered 97, 98, or 99 subsequent to receiving credit for a course numbered 197, 198, or 199. ***Prerequisites:*** department approval.

MAE 99H. Independent Study (1)

Independent study or research under direction of a member of the faculty. ***Prerequisites:*** student must be of first-year standing and a Regent's Scholar; approved Special Studies form.

Upper Division

MAE 101A. Introductory Fluid Mechanics (4)

Fluid statics; fluid kinematics; integral and differential forms of the conservation laws for mass, momentum, and energy; Bernoulli equation; potential flows; dimensional analysis and similitude. ***Prerequisites:*** PHYS 2A or 4A and MATH 20D and MATH 20E or MATH 31CH, or consent of instructor. Enrollment restricted to MC 25, MC 27, MC 29, MC 30–34, and MC 35–37 majors only.

MAE 101B. Advanced Fluid Mechanics (4)

Laminar and turbulent flow. Pipe flow including friction factor. Boundary layers, separation, drag, and lift. Compressible flow including shock waves. ***Prerequisites:*** MAE 101A or CENG 101A, and MAE 11 or MAE 110A or CENG 102, or consent of instructor.

MAE 101C. Heat Transfer (4)

Extension of fluid mechanics in MAE 101A–B to viscous, heat-conducting flows. Application of the energy conservation equation to heat transfer in ducts and external boundary layers. Heat conduction and radiation transfer. Heat transfer coefficients in forced and free convection. Design applications. ***Prerequisites:*** MAE 101A or CENG 101A, MAE 101B, and MAE 105.

MAE 101D. Intermediate Heat Transfer (4)

Course builds on the MAE fluids sequence, offering more advanced concepts in conduction, convection, radiation, and heat exchanger design. This course covers numerical methods in conduction, boiling, condensation and evaporation analysis, natural and turbulent convection, spectral and directional radiative transfer, heatpipes, thermal design of spacecraft, heat exchanger analysis and design. ***Prerequisites:*** senior standing and MAE 101C, or consent of instructor.

MAE 104. Aerodynamics (4)

Basic relations describing flow field around wings and bodies at subsonic and supersonic speed. Thin-wing theory. Slender-body theory. Formulation of theories for evaluating forces and moments on airplane geometries. Application to the design of high-speed aircraft. ***Prerequisites:*** MAE 101A and 101B, or consent of instructor. Enrollment restricted to MC 25, MC 27, MC 29, MC 30–34, MC 35–37, and SE 27 majors only.

MAE 105. Introduction to Mathematical Physics (4)

Fourier series, Sturm Liouville theory, elementary partial differential equations, integral transforms with applications to problems in vibration, wave motion, and heat conduction. ***Prerequisites:*** PHYS 2A and B, and MATH 20D or 21D. Enrollment restricted to engineering majors only.

MAE 107. Computational Methods in Engineering (4)

Introduction to scientific computing and algorithms; iterative methods, systems of linear equations with applications; nonlinear algebraic equations; function interpolation and differentiation and optimal procedures; data fitting and least-squares; numerical solution of ordinary differential equations. ***Prerequisites:*** MAE 8 or 9, and MATH 18 or 20F or 31AH.

MAE 108. Probability and Statistical Methods for Engineering (4)

Probability theory, conditional probability, Bayes theorem, random variables, densities, expected values, characteristic functions, central limit theorem. Engineering reliability, elements of estimation, random sampling, sampling distributions, hypothesis testing, confidence intervals. Curve fitting and data analysis. Students cannot receive credit for MAE 108 and ECE 109, ECON 120A, MATH 180A, MATH 183, MATH 186, or SE 125. ***Prerequisites:*** MATH 18 or 20F.

MAE 110. Thermodynamic Systems (4)

Thermodynamic analysis of power cycles with application to combustion driven engines: internal combustion, diesel, and gas turbines. Thermodynamics of mixtures and chemical and phase equilibrium. Computational methods for calculating chemical equilibrium. Renumbered from MAE 110B. Students may not receive credit for MAE 110 and MAE 110B. ***Prerequisites:*** MAE 11 or 110A. (Course not offered every year.)

MAE 113. Fundamentals of Propulsion (4)

Compressible flow, thermodynamics, and combustion relevant to aircraft and space vehicle propulsion. Analysis and design of components for gas turbines, including turbines, inlets, combustion chambers and nozzles. Fundamentals of rocket propulsion. ***Prerequisites:*** MAE 11 or MAE 110A or CENG 102, and MAE 101A or CENG 101A, and MAE 101B or CENG 101C. Enrollment restricted to MC 25, MC 27, MC 29, MC 30–34, and MC 35–37 majors only.

MAE 114. Space Propulsion (4)

This course covers the fundamentals of rocket propulsion and discusses advanced concepts in space propulsion. Topics include liquid and solid propellant rocket engines, electrical rocket propulsion, nuclear propulsion devices, solar-powered vehicles, and current challenges and opportunities in launch vehicle technologies. ***Prerequisites:*** MAE 113.

MAE 117A. Elementary Plasma Physics (4)

(Cross-listed with Physics 151.) Particle motions, plasmas as fluids, waves, diffusion, equilibrium and stability, nonlinear effects, controlled fusion. Recommended preparation: PHYS 100B–C or ECE 107. ***Prerequisites:*** MATH 20D or 21D, or consent of instructor.

MAE 118. Introduction to Energy and Environment (4)

Overview of present-day primary energy sources and availability: fossil fuel, renewable, and nuclear; heat engines; energy conservation, transportation, air pollution, and climate change. Students may not receive credit for both MAE 118 and MAE 118A. ***Prerequisites:*** MAE 101A or CENG 101A, or consent of instructor.

MAE 119. Introduction to Renewable Energy: Solar and Wind (4)

Basic principles of solar radiation—diffuse and direct radiation; elementary solar energy engineering—solar thermal and solar photovoltaic; basic principles of wind dynamics—hydrodynamic laws, wind intermittency, Betz's law; elementary wind energy engineering; solar and wind energy perspectives; operating the California power grid with 33 percent renewable energy sources. Students may not receive credit for both MAE 118B and MAE 119. ***Prerequisites:*** PHYS 2C or consent of instructor.

MAE 120. Introduction to Nuclear Energy (4)

Overview of basic fission and fusion processes. Elementary fission reactor physics and engineering; environmental and waste disposal issues. Survey of fusion technology issues and perspectives. May not receive credit for both MAE 118C and MAE 120. ***Prerequisites:*** MAE 101A or CENG 101A, or consent

of instructor.

MAE 121. Air Pollution Transport and Dispersion Modeling (4)

Overview of air pollution and wastes and their impact. Characteristics of air pollutants. Air pollution transport. Atmospheric stability. Plume rise and dispersion. Meteorological data. Selecting the appropriate air quality model and case studies. Modeling complex terrain situations. Current air quality modeling issues. Laws and regulations to control air pollution. ***Prerequisites:*** MAE 122.

MAE 122. Flow and Transport in the Environment (4)

Introduction to the air and aquatic environments. Buoyancy, stratification, and rotation. Earth surface energy balance. Introduction to the atmospheric boundary layer. Advection and diffusion. Turbulent diffusion and dispersion in rivers and in the atmospheric boundary layer. Surface waves and internal gravity waves. ***Prerequisites:*** MAE 101A or CENG 101A, or consent of instructor.

MAE 123. Introduction to Transport in Porous Media (4)

Introduction to groundwater flow. Pollution transport through the water table. Fundamentals of flow. Single- and multi-phase flow. Darcy law. Well hydraulics. Diffusion and dispersion. Gravity currents and plumes in porous media. Chemistry of fluid-solid interactions. Fundamentals of adsorption and surface reactions. ***Prerequisites:*** MAE 105, or consent of instructor.

MAE 125. Building Energy Efficiency (4)

Physical building performance including building thermodynamics, daylighting, and solar control. Heat transfer through building envelope, solar geometry, and shading. Heating, ventilation, and air conditioning system design, water heating, microclimates, passive system design, energy efficient design, applicant energy use, cost estimating. Building energy codes and standards. Building design project with whole building energy simulation software. ***Prerequisites:*** upper-division standing.

MAE 126A. Environmental Engineering Laboratory (4)

Analysis of experiments in Environmental Engineering: Drag in a water tunnel, shading effects on solar photovoltaic, buoyant plume dispersion in a water tank, atmospheric turbulence, and others. Use of sensors and data acquisition. Laboratory report writing; error analysis; engineering ethics. ***Prerequisites:*** MAE 101A or CENG 101A; MAE 170.

MAE 126B. Environmental Engineering Design (4)

Fundamental principles of environmental design. Building a working prototype or computer model for an environmental engineering application. Work in teams to propose and design experiments and components, obtain data, complete engineering analysis, and write a report. Engineering ethics and professionalism. ***Prerequisites:*** MAE 126A.

MAE 130. Advanced Vibrations (4)

Harmonically excited vibrations. Vibration of multiple degree-of-freedom systems. Observations, including beat frequencies, static and dynamic coupling, traveling, and standing wave phenomena. Vibration of continuous systems. Hamilton's equations. Distributed and point forces and moments in continuous systems and the generalized Dirac distribution. Response to impact and impulse excitation. Modeling continuous systems with approximate discrete models. Restricted to engineering majors only MC 25, MC 27, MC 29, MC 30–34, MC 35–37, MO 21, SE 27. ***Prerequisites:*** MATH 18 or MATH 20F or MATH 31AH and MAE 30B or MAE 130B.

MAE 131A. Solid Mechanics I (4)

Concepts of stress and strain. Hooke's Law. Axial loading of bars. Torsion of circular shafts. Shearing and normal stresses in beam bending. Deflections in beams. Statically determinate and indeterminate problems. Combined loading. Principal stresses and design criteria. Buckling of columns. ***Prerequisites:*** MATH 20D and MAE 30A or MAE 130A or SE 101A.

MAE 131B. Fundamentals of Solid Mechanics II (4)

Analysis of 3-D states of stress and strain. Governing equations of linear elasticity. Solution of elasticity problems in rectangular and polar coordinates. Stress concentration. Failure criteria. Torsion of noncircular and thin walled members. Energy methods. Plastic collapse and limit analysis. ***Prerequisites:*** MAE 131A or SE 110A and MAE 105. Enrollment restricted to engineering majors only.

MAE 133. Finite Element Methods in Mechanical and Aerospace Engineering (4)

Development of stiffness and mass matrices based upon variational principles and application to static, dynamic, and design problems in structural and solid mechanics. Architecture of computer codes for linear and nonlinear finite element analysis. The use of general-purpose finite element codes. ***Prerequisites:*** MAE 131A or SE 110A. (Not offered every year.)

MAE 142. Dynamics and Control of Aerospace Vehicles (4)

The dynamics of vehicles in space or air are derived for analysis of the stability properties of spacecraft and aircraft. The theory of flight, lift, drag, Dutch roll and phugoid modes of aircraft are discussed. Optimal state space control theory for the design of analog and digital controllers (autopilots). ***Prerequisites:*** MAE 104 and MAE 143B or ECE 171A, or consent of instructor. Enrollment restricted to engineering majors only.

MAE 143A. Signals and Systems (4)

Dynamic modeling and vector differential equations. Concepts of state, input, output. Linearization around equilibria. Laplace transform, solutions to ODEs. Transfer functions and convolution representation of dynamic systems. Discrete signals, difference equations, z-transform. Continuous and discrete Fourier transform. ***Prerequisites:*** MATH 20D or 21D, MATH 20E, MATH 18 or 20F or 31AH, or consent of instructor.

MAE 143B. Linear Control (4)

Analysis and design of feedback systems in the frequency domain. Transfer functions. Time response specifications. PID controllers and Ziegler-Nichols tuning. Stability via Routh-Hurwitz test. Root locus method. Frequence response: Bode and Nyquist diagrams. Dynamic compensators, phase-lead and phase-lag. Actuator saturation and integrator wind-up. ***Prerequisites:*** MAE 143A or consent of instructor.

MAE 144. Embedded Control and Robotics (4)

Each student builds, models, programs, and controls an unstable robotic system built around a small Linux computer. Review/synthesis of: A) modern physical and electrical CAD. B) dynamics, signals and systems, linear circuits; PWMs, H-bridges, quadrature encoders. C) embedded Linux, C, graphical programming; multithreaded applications; bus communication to supporting ICs. D) classical control theory in both continuous-time (CT) and discrete-time (DT); interconnection of CT and DT elements. Program or materials fees may apply. ***Prerequisites:*** upper-division standing or graduate student, and MAE 143B or BENG 122A or ECE 171A, or consent of instructor.

MAE 145. Introduction to Robotic Planning and Estimation (4)

This course is an introduction to robotic planning algorithms and programming. Topics include sensor-based planning (bug algorithms), motion planning via decomposition and search (basic search algorithms on graphs, A*), the configuration-space concept, free configuration spaces via sampling, collision detection algorithms, (optimal) planning via sampling (probabilistic trees), environment roadmaps, and filtering for robot localization and environment mapping (SLAM). ***Prerequisites:*** MAE 8, MAE 108, and senior standing or consent of instructor.

MAE 146. Introduction to Machine Learning Algorithms (4)

An introduction to the principles used to design and implement machine learning algorithms, as well as an understanding of their advantages and limitations. The topics covered are python review, supervised learning (linear, logistic/sigmoid regression, generalized linear models, nonlinear regression via

Kernels), neural network types (convolutional, recurrent, deep NN), unsupervised learning (k-means clustering). Application of ML in different examples. Recommended preparation: ECE 143 and/or python programming knowledge. ***Prerequisites:*** (MATH 31AH or MATH 18) and (MATH 20C or MATH 31BH) and MAE 8 and (MAE 108 or ECE 109 or SE 125 or MATH 186 or MATH 183 or MATH 180A or ECON 120A).

MAE 148. Introduction to Autonomous Vehicles (4)

(Cross-listed with ECE 148.) Fundamentals of autonomous vehicles. Working in small teams, students will develop 1/8-scale autonomous cars that must perform on a simulated city track. Topics include robotics system integration, computer vision, algorithms for navigation, on-vehicle vs. off-vehicle computation, computer learning systems such as neural networks, locomotion systems, vehicle steering, dead reckoning, odometry, sensor fusion, GPS autopilot limitations, wiring, and power distribution and management. ***Prerequisites:*** ECE 15 or ECE 35 or MAE 2 or MAE 3 and department approval.

MAE 149. Sensor Networks (4)

(Cross-listed with ECE 156.) Characteristics of chemical, biological, seismic, and other physical sensors; signal processing techniques supporting distributed detection of salient events; wireless communication and networking protocols supporting formation of robust censor fabrics; current experience with low power, low-cost sensor deployments. Students may not receive credit for both MAE 149 and ECE 156. May be coscheduled with SIOC 238. ***Prerequisites:*** upper-division standing. (Not offered every year.)

MAE 150. Computational Methods for Design (4)

Computer-aided analysis and design. Design methodology, tolerance analysis, Monte Carlo analysis, kinematics and computer-aided design of linkages, design of cams and cam dynamics, design optimization, finite element analysis fundamentals, design using commercially available CAD and analysis software. ***Prerequisites:*** MAE 30A or MAE 130A or SE 101A or BENG 110, MAE 107 or SE 121, MAE 3 or MAE 2, and senior standing in engineering major, or consent of instructor.

MAE 152. Introductions to Manual and CNC Machining (1)

In this class, students are introduced to precision machining. Students will learn the proper safe operating procedures of a manual mill and lathe, band saws, and hand tools. Other topics include the basics of tolerancing, design (Fusion 360), and operation of CNC milling and turning. Program or materials fees may apply. Recommended preparation: It is recommended that students take introduction to design process through a hands-on design project course or some other introduction to shop course. ***Prerequisites:*** MAE 3 or MAE 2 and consent of instructor.

MAE 153. Design of Machine Components (4)

An introduction to the fundamentals of machine design in mechanical and aerospace engineering. The course covers the principles of failure theories, design methodologies, and their application in essential machine elements and structures. Topics include analyzing components by applying the theories from statics, dynamics, and mechanics of materials; static and fatigue failure theories; and designing machine components, including shafts, gears, bearings, fasteners, and geometric dimensioning and tolerancing. ***Prerequisites:*** MAE 131A.

MAE 154. Product Design and Entrepreneurship (4)

This course will teach teams of students how to develop concepts and business plans in the design of new and innovative products. Emphasis will be placed on identifying user needs, concept generation, and prototype fabrication. ***Prerequisites:*** upper-division standing and consent of instructor.

MAE 155A. Aerospace Engineering Design I (4)

Fundamental principles of aerospace vehicle design including the conceptual, preliminary, and detailed design phases. Aeronautical or astronautical design project that integrates all appropriate engineering disciplines as well as issues associated with optimization, teamwork, manufacturability, reporting, and professionalism. ***Prerequisites:*** MAE 2, MAE 21, or SE 2 or SE 104, MAE 104, MAE 30B or MAE 130C, and SE 160A, or consent of instructor.

MAE 155B. Aerospace Engineering Design II (4)

The principles of aerospace vehicle design including the conceptual, preliminary, and detailed design phases. Aeronautical or astronautical design project that integrates all appropriate engineering disciplines as well as issues associated with optimization, teamwork, manufacturability, reporting, and professionalism. Program or materials fees may apply. ***Prerequisites:*** MAE 113, MAE 142, MAE 155A, and MAE 170, or consent of instructor.

MAE 156A. Fundamental Principles of Mechanical Design I (4)

Fundamental principles of mechanical design and the design process. Application of engineering science to the design and analysis of mechanical components. Initiation of team design projects that culminate in MAE 156B with a working prototype designed for a real engineering application. Professional ethics discussed. Program or materials fees may apply. ***Prerequisites:*** MAE 3, MAE 30B, MAE 131A, MAE 150, and MAE 170, or consent of instructor. Open to major codes MC 27 and MC 30–34 only.

MAE 156B. Fundamental Principles of Mechanical Design II (4)

Fundamental principles of mechanical design and the design process. Culmination of a team design project initiated in MAE 156A which results in a working prototype designed for a real engineering application. ***Prerequisites:*** MAE 156A in the immediately preceding quarter, MAE 101C, MAE 143B, and MAE 160 or MAE 131B. Open to major codes MC 27 and MC 30–34 only.

MAE 160. Mechanical Behavior of Materials (4)

Elasticity and inelasticity, dislocations and plasticity of crystals, creep, and strengthening mechanisms. Mechanical behavior of ceramics, composites, and polymers. Fracture: mechanical and microstructural. Fatigue. Laboratory demonstrations of selected topics. ***Prerequisites:*** MAE 20, MAE 30A or MAE 130A or SE 101A, and MAE 131A, or consent of instructor.

MAE 165. Fatigue and Failure Analysis of Engineering Components (4)

The engineering and scientific aspects of crack nucleation, slow crack growth, and unstable fracture in crystalline and amorphous solids. Microstructural effects on crack initiation, fatigue crack growth and fracture toughness. Methods of fatigue testing and fracture toughness testing. Fractography and microfractography. Design safe methodologies and failure prevention. Failure analysis of real engineering structures. ***Prerequisites:*** consent of instructor. (Not offered every year.)

MAE 166. Modern Concepts in Nanotechnology (4)

(Cross-listed with NANO 156.) This course offers a worm's eye perspective on recent developments on nanomaterials through case studies building on basic principles of synthesis techniques, processing, microstructural control, and unique physical properties of materials in nanoscale dimensions. Particular focus will be given to physical properties and technological applications of nanowires, quantum dots, and thin films. Students may not receive credit for both NANO 156 and MAE 166. ***Prerequisites:*** upper-division standing. (Not offered every year.)

MAE 167. Wave Dynamics in Materials (4)

Pressure and shear waves in infinite solids. Reflection and diffraction. Rayleigh and Love waves in semi-infinite space. Impulse load on a half space. Waveguides and group velocity. ***Prerequisites:*** consent of instructor. (Not offered every year.)

MAE 170. Experimental Techniques (4)

Principles and practice of measurement and control and the design and conduct of experiments. Technical report writing. Lectures relate to dimensional analysis, error analysis, signal-to-noise problems, filtering, data acquisition and data reduction, as well as background of experiments and statistical analysis. Experiments relate to the use of electronic devices and sensors. ***Prerequisites:*** PHYS 2C or PHYS 4B and PHYS 2CL or MAE 140 or MAE 40. Enrollment restricted to MC 25, MC 27, MC 29, MC 30–34, MC 35–37, BE 25, BE 27.

MAE 171A. Mechanical Engineering Laboratory I (4)

Design and analysis of experiments in fluid mechanics, solid mechanics, and control engineering. Experiments in wind tunnel, water tunnel, vibration table and material testing machines, and refined electromechanical systems. Laboratory report writing; error analysis; engineering ethics. ***Prerequisites:*** MAE 101A, MAE 143B, and MAE 170. Enrollment restricted to MC 27 and MC 30–34 majors only.

MAE 171B. Mechanical Engineering Laboratory II (4)

Design and analysis of original experiments in mechanical engineering. Students research projects using experimental facilities in undergraduate laboratories: wind tunnel, water channel, vibration table, and testing machine and control systems. Students propose and design experiments, obtain data, complete engineering analysis and write a major report. ***Prerequisites:*** MAE 171A. (Not offered every year.)

MAE 175A. Aerospace Engineering Laboratory I (4)

Analysis of aerospace engineering systems using experimental facilities in undergraduate laboratories: wind tunnel, water channel, vibration table, and testing machine. Students operate facilities, obtain data, complete engineering analysis and write major reports. ***Prerequisites:*** senior standing; MAE 143B or CENG 120; and MAE 170, or consent of instructor.

MAE 180. Orbital Mechanics (4)

Students perform analyses based on mission requirements. Selected topics include astrodynamics, orbital motion, perturbations, coordinate systems and frames of reference, ground tracks and classification of common orbits, orbit determination, orbital maneuvers, station keeping, orbit injection and launch geometry, and interplanetary and lunar trajectories.

MAE 181. Space Mission Analysis and Design (4)

Space mission concepts, architectures, and analysis. Mission geometry. Astrodynamics. Orbit and constellation design. Space environment. Payload and spacecraft design and sizing. Power sources and distribution. Thermal management. Structural design. Guidance and navigation. Space propulsion. Orbital debris and survivability. Cost modeling and risk analysis. ***Prerequisites:*** upper-division standing or consent of instructor.

MAE 182. Spacecraft Guidance and Navigation (4)

Navigational and guidance requirements for orbital, planetary, and atmospheric entry missions. Guidance systems. Observation instrument point, tracking, control. Celestial, radio, and inertial navigation schemes. Link budgets, antennas, and telemetry systems. ***Prerequisites:*** MAE 108 and MAE 180. Recommended enrollment in MAE 143B before or concurrently.

MAE 184. Flight Simulation Techniques (4)

Students will develop software and methods to simulate the motion characteristics of flight vehicles. Six degree-of-freedom equations of motion will be reviewed with emphasis on computer implementation. Algorithms for data modeling, numerical integration, equilibrium, and linearization will be introduced. Three-dimensional visualization techniques will be explored for representing operator and observer viewpoints. Applications include aircraft, launch vehicles, automobiles, and marine vessels. ***Prerequisites:*** upper-division standing or consent of instructor.

MAE 185. Computational Fluid Mechanics (4)

This course will cover numerical solutions of the compressible and incompressible Navier-Stokes equations using finite difference and finite volume discretization with a primary emphasis on programming and a secondary emphasis on application of commercial tools. Introduction to flow visualization will also be covered. ***Prerequisites:*** MAE 101B and MAE 107.

MAE 190. Topics in Mechanical and Aerospace Engineering (4)

Topics of special interest in mechanical and aerospace engineering. May be repeated for credit as topics vary. ***Prerequisites:*** upper-division standing.

MAE 191. Topics in Mechanical and Aerospace Engineering with Laboratory (4)

Topics of special interest in mechanical and aerospace engineering with laboratory. May be repeated for credit as topics vary. ***Prerequisites:*** upper-division standing.

MAE 197. Engineering Internship (1–12)

Students work in local industry or hospitals under faculty supervision. Units may not be applied toward graduation requirements. Salaried or unsalaried. Number of units determined by enrollment frequency. First quarter up to four units. Subsequent quarters cannot exceed one unit. ***Prerequisites:*** consent of instructor and department stamp, 2.50 overall GPA minimum, at least ninety units.

MAE 198. Directed Group Study (1–4)

Directed group study on a topic or in a field not included in the regular department curriculum, by special arrangement with a faculty member. May be taken P/NP only. ***Prerequisites:*** consent of instructor.

MAE 199. Independent Study for Undergraduates (1–4)

Independent reading or research on a problem by special arrangement with a faculty member. P/NP grades only. ***Prerequisites:*** consent of instructor.

STUDENT AFFAIRS CONTACT LIST

Department of Mechanical and Aerospace Engineering
9500 Gilman Drive
La Jolla, CA 92093-0411

MAE STUDENT AFFAIRS OFFICE: EBU II, FIRST FLOOR

mae.ucsd.edu

DEPARTMENT CHAIR

Stefan Llewellyn Smith	858-534-0113	mae-chair-l@ucsd.edu

DIRECTOR OF STUDENT AFFAIRS

Akemi Alpaslan	858-534-0897	aalpaslan@ucsd.edu

UNDERGRADUATE STUDENT ADVISORS

Chad Baldwin *(Last names A-L)*	858- 534-0114	chbaldwin@ucsd.edu
Nadia Espinoza *(Last names M-Z)*	858- 822-2035	nlespinoza@ucsd.edu