

# MASTER OF SCIENCE IN MECHANICAL ENGINEERING

The Master of Science in Mechanical Engineering program is based on 30-semester units of which at least 21 units must be earned from graduate-level courses. Students will work closely with a faculty advisor to develop a curriculum plan that ensures academic rigor while at the same time meeting the needs of the student. The curriculum includes 6 units of required engineering courses and a minimum of 9 units of elective engineering courses. A maximum of 6 units of elective non-engineering courses may be applied to the degree requirements with the consent of the faculty advisor if they are consistent with the student's program of study. There are two options for the culminating experience. One option involves 3-6 units of research (course ENGR 897, which may be taken once or twice) followed by a 3-unit thesis course (ENGR 898). The other option is to complete a 3-unit applied research project course (ENGR 895).

## Admission to the Program

Applicants must hold a bachelor's degree in engineering or a closely related discipline, with a minimum GPA of 3.0 in upper-division major classes, in addition to meeting general university requirements for graduate standing. An applicant's undergraduate degree program should include the equivalent of the following courses:

- MATH: MATH 226, MATH 227, MATH 228, MATH 245
- PHYS: PHYS 230/PHYS 232, PHYS 240/PHYS 242
- ENGR: ENGR 102, ENGR 200, ENGR 201, ENGR 205, ENGR 302, ENGR 303, ENGR 304, ENGR 309, ENGR 447, ENGR 467

In cases where these coursework requirements have not been met, applicants may be conditionally accepted and complete the necessary coursework as part of their graduate program of study.

The School of Engineering also requires two letters of recommendation from persons familiar with the student's previous academic work or professional accomplishments. Applicants whose preparatory education was principally in a language other than English must satisfy one of the following: a minimum score of 24/30 on the TOEFL writing section, an IELTS score of 7.0, or a Pearson Test of English score of 65 (if one of these are not satisfied, an applicant may be conditionally accepted but must complete SCI 614 within the first year of attendance at SF State). Graduate Record Exam (GRE) scores are not required but will be considered as part of the admissions package for applicants who wish to submit them.

## Advancement to Candidacy

The applicant is advanced to candidacy when the Advancement to Candidacy (ATC) has been signed and approved by the Dean of the Graduate Division.

## Program Learning Outcomes

- a. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- b. 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.

- c. An ability to communicate effectively with a range of audiences.
- d. 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.
- e. 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.
- f. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- g. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
- h. An ability to conduct independent research.
- i. An ability to demonstrate subject expertise in a mechanical engineering subfield.

## Mechanical Engineering (M.S.)

### – Minimum 30 units

#### Required Courses (6 units)

Code	Title	Units
ENGR 800	Research Methodology	3
ENGR 860	Advanced Engineering Analysis (Not part of bulletin description: this is a newly proposed course)	3

The required courses are designed to give students a foundation to carry out research and engineering analysis at the graduate level. The skills gained in these courses may be applied to any of the various mechanical engineering sub-fields.

#### Elective Engineering Courses (15–21 units)

Elective courses must be selected in consultation with a faculty advisor. Representative engineering elective courses are listed below. Up to 6 units of graduate or upper-division courses outside of ENGR may be used with approval of the faculty advisor. Up to 9 units of undergraduate courses are allowed, if not used to satisfy undergraduate degree program requirements.

Code	Title	Units
ENGR 415	Mechatronics	4
ENGR 441	Fundamentals of Composite Materials	3
ENGR 451	Digital Signal Processing	4
ENGR 461	Structural Dynamics	3
ENGR 463	Thermal Power Systems	3
ENGR 465	Principles of HVAC	3
ENGR 466	Gas Dynamics and Boundary Layer Flow	3
ENGR 468		3
ENGR 469	Alternative and Renewable Energy Systems	3
ENGR 470	Biomechanics	3
ENGR 478	Design with Microprocessors	4
ENGR 492	Hardware for Machine Learning	3
ENGR 801	Engineering Management	3
ENGR 820	Energy Resources and Sustainability	3

ENGR 845	Neural-Machine Interfaces: Design and Applications	3
ENGR 863	Advanced Thermal-Fluids	3
ENGR 865	Energy-Efficient Buildings	3
ENGR 866	Air Quality Engineering	3
ENGR 867	Energy Auditing and Measurement and Verification	3
ENGR 868	Advanced Control Systems	3
ENGR 869	Robotics	3
ENGR 871	Advanced Electrical Power Systems	3

### Culminating Experience (3–9 units)

Units selected from one of the options below

#### Option A

Code	Title	Units
ENGR 897 & ENGR 898	Research and Master's Thesis (thesis may not be started until completion of 12 units of graduate course work and 3 units of ENGR 897)	6-9

#### Option B

Code	Title	Units
ENGR 895	Applied Research Project (project may not be started until completion of 12 units of graduate course work)	3