BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING - QUANTITATIVE REASONING CATEGORY III/IV AND ENG 114

129 Total Units Required
Minimum Number of Units in Major: 93

Course	Title	Units
First Semester		
ENG 114	Writing the First Year: Finding Your Voice (A2) [1]	3
ENGR 100	Introduction to Engineering (Major Core)	1
ENGR 101	Engineering Graphics (Major Core)	1
MATH 197	Prelude to Calculus I (Prerequisite for MATH 226) [2,3]	3
GE Area A: Oral Communication (A1) [4,5]		3
GE Area D		3
	Units	14
Second Semester		
Select One (Major Core):		3-5
CHEM 115	General Chemistry I: Essential Concepts of Chemistry	
CHEM 180	Chemistry for the Energy and the Environment (B1, B3, ES)	
MATH 198	Prelude to Calculus II (Prerequisite for MATH 226, B4) [2,3]	3
GE Area C		3
GE Area D		3
GE Area E		3
	Units	15-17
Third Semester		
ENGR 200	Materials of Engineering (Major Core)	3
MATH 226	Calculus I (Major Core, B4) [2,3]	4
GE Area B: Life Science (B2)		3
GE Area C		3
GE Area D		3
	Units	16
Fourth Semester		
ENGR 103	Introduction to Computers (Major Core)	1
MATH 227	Calculus II (Major Core)	4
PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Core, B1, B3)	4
Modular Elective - Take Three [6]		3
GE Area C		3
	Units	15
Fifth Semester		
ENGR 102	Statics (Major Core)	3
MATH 228	Calculus III (Major Core)	4
PHYS 230 & PHYS 232	General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Core)	4
GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)		3
	Units	14
Sixth Semester		
ENGR 201	Dynamics (Major Core) [5]	3
ENGR 205 & ENGR 206	Electric Circuits and Circuits and Instrumentation Laboratory (Major Core) [5]	4
MATH 245	Elementary Differential Equations and Linear Algebra (Major Core)	3
PHYS 240 & PHYS 242	General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Core)	4
GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)		3
	Units	17
Seventh Semester		
ENGR 300	Engineering Experimentation (Major Core) [7]	3
ENGR 303	Engineering Thermodynamics (Major Core)	3

ENGR 304	Mechanics of Fluids (Major Core)	3
ENGR 305	Linear Systems Analysis (Major Core)	3
ENGR 309	Mechanics of Solids (Major Core)	3
	Units	15
Eighth Semester		
ENGR 302	Experimental Analysis (Major Core) [7]	1
ENGR 364	Materials and Manufacturing Processes (Major Core)	3
Select One Set of Courses (Major Emphasis Elective):		4
ENGR 410 & ENGR 411	Process Instrumentation and Control and Instrumentation and Process Control Laboratory	
ENGR 447 & ENGR 446	Control Systems and Control Systems Laboratory	
ENGR 467	Heat Transfer (Major Core)	3
ENGR 696	Engineering Design Project I (Major Core) [8]	1
Major Upper-Division Electives - Take One [9]		3
	Units	15
Ninth Semester		
ENGR 463	Thermal Power Systems (Major Core)	3
ENGR 464	Mechanical Design (Major Core)	3
ENGR 697GW	Engineering Design Project II - GWAR (Major Core)	2
Major Upper-Division Electives - Take Two [9]		6
	Units	14
	Total Units	135-137

[1] ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

[2] Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (http://cms.sfsu.edu/content/student-center). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (http://developmentalstudies.sfsu.edu).

[3] QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.

[4] It is recommended that you meet the **SF State Studies** requirements (AERM, GP, ES, SJ) within your GE or major to avoid taking additional units.

[5] GE Area A: Critical Thinking (A3) is satisfied upon completion of ENGR 205 and ENGR 201 or ENGR 213.

[6] **Lower-Division Modular Electives (3 units)**
ENGR 271 Introduction to MATLAB (1 units)
ENGR 272 Engineering Project Management (1 units)
ENGR 291 Introduction to Creo Parametric (1 units)
ENGR 292 Introduction to Solid Works - Level I (1 units)
ENGR 294 Introduction to Microcontrollers (1 units)
ENGR 295 Design Methodology (1 units)

[7] Upper-Division General Education, Physical and Life Sciences (UD-B) is satisfied upon completion of ENGR 300 and one of ENGR 301 or ENGR 302.

[8] Students must complete 21 units of upper-division Engineering units before registering for ENGR 696.

9 **Upper-Division Major Electives (9 units)**

Choice of upper-division electives must present a clearly identifiable educational objective and ensure that the program requirements in engineering science and design are met by all students. Distribution of credit units among engineering science and design is given in the *Advising Guide*. A study plan of intended upper-division electives must be approved by the student's advisor and the program coordinator prior to the seventh semester of the Engineering program.

A total of nine units from the following list of courses is required, subject to the minimum number of units specified for each group. Courses selected for the controls (emphasis) elective may not be double-counted as upper-division electives.

ENGR 306 Electromechanical Systems (3 units)
ENGR 410 Process Instrumentation and Control (3 units) (Hidden Prerequisite for ENGR 411)
ENGR 411 Instrumentation and Process Control Laboratory (1 units)
ENGR 415 Mechatronics (3 units) (Hidden Prerequisite for ENGR 416)
ENGR 416 Mechatronics Lab (1 units)
ENGR 432 Finite Element Methods in Structural and Continuum Mechanics (3 units)
ENGR 441 Fundamentals of Composite Materials (3 units)
ENGR 446 Control Systems Laboratory (1 units) (Hidden Prerequisite for ENGR 447)
ENGR 447 Control Systems (3 units)
ENGR 461 Mechanical and Structural Vibrations (3 units)
ENGR 465 Principles of HVAC (3 units)
ENGR 466 Gas Dynamics and Boundary Layer Flow (3 units)
ENGR 468 Applied Fluid Mechanics and Hydraulics (3 units)
ENGR 469 Alternative and Renewable Energy Systems (3 units)
ENGR 470 Biomechanics (3 units)
ENGR 610 Engineering Cost Analysis (3 units)
ENGR 699 Independent Study (1-3 units)
ENGR 820 Energy Resources and Sustainability (3 units)
ENGR 863 Advanced Thermal-Fluids (3 units)
ENGR 865 Energy-Efficient Buildings (3 units)
ENGR 866 Air Quality Engineering (3 units)
ENGR 867 Energy Auditing and Measurement and Verification (3 units)
ENGR 871 Advanced Electrical Power Systems (3 units)