

Energy Engineering

Bachelor of Science (BS)

The Energy Engineering major offered through the Engineering Science Program interweaves the fundamentals of classical and modern physics, chemistry, and mathematics with energy engineering applications. A great strength of the major is its flexibility. The firm base in physics and mathematics is augmented with a selection of engineering course options that prepare the student to tackle the complex energy-related problems faced by society. Because the program emphasizes science and mathematics, students are well-prepared to pursue graduate studies in physics or engineering. Energy engineering is a multidisciplinary field requiring an integration of physical principles with engineering analysis, augmented with the realities of policy and engineering economics. The program incorporates courses from many departments on campus to create a discipline that is rigorously based in science, mathematics, and engineering, while addressing a wide variety of environmental issues.

Admission to the Major

Prospective undergraduates in the College of Engineering must apply for admission to one specific major/degree program. For further information, please see the College of Engineering's website (<http://coe.berkeley.edu/students/prospective-students/admissions.html>) .

Admission to engineering via a Change of College application for current UC Berkeley students is very competitive, as there few open spaces in engineering for students admitted to other colleges at UC Berkeley. For further information regarding a Change of College to Engineering, please see the college's website (<http://coe.berkeley.edu/students/current-undergraduates/change-of-college>) .

Minor Program

The Energy engineering minor has arisen as a natural outgrowth of the large amount of energy-related research in the College of Engineering. For a number of years, courses have been developed across the College of Engineering, and the energy engineering minor is designed to coordinate these courses for students who have an interest in systems that are associated with all aspects of energy systems, such as generation, transmission and consumption. The energy minor, offered through the College of Engineering, is an optional program that encourages coherence in the work students undertake around energy engineering.

For admission to the minor, students must have a minimum over-all grade point average (GPA) of 3.00, and have also completed all of the prerequisite courses. For information regarding the prerequisites, please see the Minor Requirements tab on this page.

After completion of the prerequisite courses, students will need to complete and submit a Petition for Admission form (<http://engineering.science.berkeley.edu/wp-content/uploads/2013/09/Energy-Minor-Application-2103-141.pdf>) to the undergraduate staff adviser. Students must apply at least one semester prior to graduation (i.e., students cannot be on the official degree list at the time of application). Students will also need to submit a copy of their transcript and a course plan at the time of application.

Upon completion of the minor requirements, submit a Petition for Completion of the Undergraduate Minor (<http://engineering.science.berkeley.edu/wp-content/uploads/2013/09/energy->

[minor-confirm-completion-of-Minor-2013-141.pdf](#)) to the undergraduate staff adviser. This must be completed no later than two weeks prior to the end of the semester.

Other Majors offered by the Engineering Science Program

Engineering Mathematics and Statistics (<http://guide.berkeley.edu/archive/2016-17/undergraduate/degree-programs/engineering-math-statistics>)

Engineering Physics (<http://guide.berkeley.edu/archive/2016-17/undergraduate/degree-programs/engineering-physics>)

Environmental Engineering Science (<http://guide.berkeley.edu/archive/2016-17/undergraduate/degree-programs/environmental-engineering-science>)

In addition to the University, campus, and college requirements, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All technical courses (courses in engineering, mathematics, chemistry, physics, statistics, biological sciences, and computer science) must be taken for a letter grade.
2. No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs.
3. A minimum overall grade point average (GPA) of 2.0 is required for all work undertaken at UC Berkeley.
4. A minimum GPA of 2.0 is required for all technical courses taken in satisfaction of major requirements.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

For a detailed plan of study by year and semester, please see the Plan of Study tab.

Lower Division Requirements

MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations	4
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4
Select one of the following chemistry options:		4
CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	1
CHEM 4A	General Chemistry and Quantitative Analysis ¹	
ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4
or COMPSCI 61A	The Structure and Interpretation of Computer Programs	
ENGIN 93	Energy Engineering Seminar	1
MEC ENG 40	Thermodynamics	3-4
or ENGIN 115	Engineering Thermodynamics	
Select two Engineering Prep courses: ²		6-10
CHEM 1B	General Chemistry	

CHEM 3A	Chemical Structure and Reactivity
COMPSCI 61B	Data Structures
COMPSCI C8	Foundations of Data Science (must also take connector course: course number 88)
CIV ENG 11	Engineered Systems and Sustainability
CIV ENG 70	Engineering Geology
EL ENG 16A	Designing Information Devices and Systems I
EL ENG 16B	Designing Information Devices and Systems II
ENGIN 45 & 45L	Properties of Materials and Properties of Materials Laboratory
MEC ENG C85	Introduction to Solid Mechanics
MEC ENG 104	Engineering Mechanics II
PHYSICS 7C	Physics for Scientists and Engineers

¹ CHEM 4A is intended for students majoring in chemistry or a closely-related field.

² Students interested in the areas of data, distribution, generation or materials are advised to choose the following courses for Engineering Prep:

- Data: COMPSCI C8 + connector (course number 88) and COMPSCI 61B
- Distribution: EL ENG 16A and EL ENG 16B
- Generation: MEC ENG C85 and MEC ENG 104
- Materials: ENGIN 45 + ENGIN 45L and PHYSICS 7C

Upper Division Requirements

Due to the interdisciplinary nature of this major, electives may be approved throughout the year.

CIV ENG 100	Elementary Fluid Mechanics	3-4
or MEC ENG 106 Fluid Mechanics		
CIV ENG 186	Design of Cyber-Physical Systems	3
EL ENG 134	Fundamentals of Photovoltaic Devices	4
EL ENG 137A	Introduction to Electric Power Systems	4
EL ENG 137B	Introduction to Electric Power Systems	4
ENE,RES C100	Energy and Society ¹	4
ENGIN 194	Undergraduate Research	3
MEC ENG 109	Heat Transfer	3
Sustainability Course, select one course from the following:		3
CIV ENG 111	Environmental Engineering	
CIV ENG 113N	Course Not Available	
CIV ENG 115	Water Chemistry	
CY PLAN 119	Planning for Sustainability ³	
ENE,RES 101	Ecology and Society	
Economics Course: Choose one from the following		3-4
CIV ENG 156	Infrastructure Planning and Management	
ENE,RES 180	Ecological Economics in Historical Context	
ENGIN 120	Principles of Engineering Economics	
ENVECON 147	Regulation of Energy and the Environment ⁴	
ENVECON C15	Economic Development ⁴	
ENVECON 153	Population, Environment, and Development ⁴	
ENVECON 154	Economics of Poverty and Technology ⁴	
ESPM 102D	Climate and Energy Policy ⁴	
POLECON 101	Contemporary Theories of Political Economy ⁴	
Math/Statistics/Analysis Course: Choose from list below or choose CIV ENG 191 or EL ENG 127 ⁵		3-4

CIV ENG 93	Engineering Data Analysis
COMPSCI 70	Discrete Mathematics and Probability Theory
ENGIN 117	Methods of Engineering Analysis
IND ENG 172	Probability and Risk Analysis for Engineers
MATH 55	Discrete Mathematics
STAT 134	Concepts of Probability
Engineering Electives ⁶	12

¹ ENE,RES C100 satisfies both a major requirement and one of the upper division humanities/social sciences requirements.

² CIV ENG 111 cannot be used to fulfill more than one requirement.

³ This course satisfies both the sustainability requirement and one of the upper division humanities/social sciences requirements.

⁴ This course satisfies both the economics requirement and one of the upper division humanities/social sciences requirements.

⁵ Students interested in data are advised to take CIV ENG 191, IND ENG 172 or STAT 134 for the Math/Statistics/Analysis requirement.

⁶ Students are required to take four Engineering Electives of at least 3 units each. Engineering Electives are upper division courses in any engineering department and must be chosen in consultation with a faculty adviser. Engineering Electives cannot include any course taken on a P/NP basis; BIO ENG 100, CHM ENG 185, COMPSCI 195, COMPSCI H195, DES INV courses (except DES INV 190E), ENGIN 125, ENGIN 157AC, IND ENG 172, IND ENG 190, IND ENG 191, IND ENG 192, IND ENG 195, MEC ENG 190K, MEC ENG 190L, MEC ENG 190M, MEC ENG 190N, MEC ENG 190P, MEC ENG 190Q, MEC ENG 190R, MEC ENG 190S, MEC ENG 190T, MEC ENG 190U, MEC ENG 190V, MEC ENG 190W, MEC ENG 190X, MEC ENG 190Y, MEC ENG 190Z, MEC ENG 190AA, MEC ENG 190AB, MEC ENG 190AC, MEC ENG 190AD, MEC ENG 190AE, MEC ENG 190AF, MEC ENG 190AG, MEC ENG 190AH, MEC ENG 190AI, MEC ENG 190AJ, MEC ENG 190AK, MEC ENG 190AL, MEC ENG 190AM, MEC ENG 190AN, MEC ENG 190AO, MEC ENG 190AP, MEC ENG 190AQ, MEC ENG 190AR, MEC ENG 190AS, MEC ENG 190AT, MEC ENG 190AU, MEC ENG 190AV, MEC ENG 190AW, MEC ENG 190AX, MEC ENG 190AY, MEC ENG 190AZ, MEC ENG 190BA, MEC ENG 190BB, MEC ENG 190BC, MEC ENG 190BD, MEC ENG 190BE, MEC ENG 190BF, MEC ENG 190BG, MEC ENG 190BH, MEC ENG 190BI, MEC ENG 190BJ, MEC ENG 190BK, MEC ENG 190BL, MEC ENG 190BM, MEC ENG 190BN, MEC ENG 190BO, MEC ENG 190BP, MEC ENG 190BQ, MEC ENG 190BR, MEC ENG 190BS, MEC ENG 190BT, MEC ENG 190BU, MEC ENG 190BV, MEC ENG 190BW, MEC ENG 190BX, MEC ENG 190BY, MEC ENG 190BZ, MEC ENG 190CA, MEC ENG 190CB, MEC ENG 190CC, MEC ENG 190CD, MEC ENG 190CE, MEC ENG 190CF, MEC ENG 190CG, MEC ENG 190CH, MEC ENG 190CI, MEC ENG 190CJ, MEC ENG 190CK, MEC ENG 190CL, MEC ENG 190CM, MEC ENG 190CN, MEC ENG 190CO, MEC ENG 190CP, MEC ENG 190CQ, MEC ENG 190CR, MEC ENG 190CS, MEC ENG 190CT, MEC ENG 190CU, MEC ENG 190CV, MEC ENG 190CW, MEC ENG 190CX, MEC ENG 190CY, MEC ENG 190CZ, MEC ENG 190DA, MEC ENG 190DB, MEC ENG 190DC, MEC ENG 190DD, MEC ENG 190DE, MEC ENG 190DF, MEC ENG 190DG, MEC ENG 190DH, MEC ENG 190DI, MEC ENG 190DJ, MEC ENG 190DK, MEC ENG 190DL, MEC ENG 190DM, MEC ENG 190DN, MEC ENG 190DO, MEC ENG 190DP, MEC ENG 190DQ, MEC ENG 190DR, MEC ENG 190DS, MEC ENG 190DT, MEC ENG 190DU, MEC ENG 190DV, MEC ENG 190DW, MEC ENG 190DX, MEC ENG 190DY, MEC ENG 190DZ, MEC ENG 190EA, MEC ENG 190EB, MEC ENG 190EC, MEC ENG 190ED, MEC ENG 190EE, MEC ENG 190EF, MEC ENG 190EG, MEC ENG 190EH, MEC ENG 190EI, MEC ENG 190EJ, MEC ENG 190EK, MEC ENG 190EL, MEC ENG 190EM, MEC ENG 190EN, MEC ENG 190EO, MEC ENG 190EP, MEC ENG 190EQ, MEC ENG 190ER, MEC ENG 190ES, MEC ENG 190ET, MEC ENG 190EU, MEC ENG 190EV, MEC ENG 190EW, MEC ENG 190EX, MEC ENG 190EY, MEC ENG 190EZ, MEC ENG 190FA, MEC ENG 190FB, MEC ENG 190FC, MEC ENG 190FD, MEC ENG 190FE, MEC ENG 190FF, MEC ENG 190FG, MEC ENG 190FH, MEC ENG 190FI, MEC ENG 190FJ, MEC ENG 190FK, MEC ENG 190FL, MEC ENG 190FM, MEC ENG 190FN, MEC ENG 190FO, MEC ENG 190FP, MEC ENG 190FQ, MEC ENG 190FR, MEC ENG 190FS, MEC ENG 190FT, MEC ENG 190FU, MEC ENG 190FV, MEC ENG 190FW, MEC ENG 190FX, MEC ENG 190FY, MEC ENG 190FZ, MEC ENG 190GA, MEC ENG 190GB, MEC ENG 190GC, MEC ENG 190GD, MEC ENG 190GE, MEC ENG 190GF, MEC ENG 190GG, MEC ENG 190GH, MEC ENG 190GI, MEC ENG 190GJ, MEC ENG 190GK, MEC ENG 190GL, MEC ENG 190GM, MEC ENG 190GN, MEC ENG 190GO, MEC ENG 190GP, MEC ENG 190GQ, MEC ENG 190GR, MEC ENG 190GS, MEC ENG 190GT, MEC ENG 190GU, MEC ENG 190GV, MEC ENG 190GW, MEC ENG 190GX, MEC ENG 190GY, MEC ENG 190GZ, MEC ENG 190HA, MEC ENG 190HB, MEC ENG 190HC, MEC ENG 190HD, MEC ENG 190HE, MEC ENG 190HF, MEC ENG 190HG, MEC ENG 190HH, MEC ENG 190HI, MEC ENG 190HJ, MEC ENG 190HK, MEC ENG 190HL, MEC ENG 190HM, MEC ENG 190HN, MEC ENG 190HO, MEC ENG 190HP, MEC ENG 190HQ, MEC ENG 190HR, MEC ENG 190HS, MEC ENG 190HT, MEC ENG 190HU, MEC ENG 190HV, MEC ENG 190HW, MEC ENG 190HX, MEC ENG 190HY, MEC ENG 190HZ, MEC ENG 190IA, MEC ENG 190IB, MEC ENG 190IC, MEC ENG 190ID, MEC ENG 190IE, MEC ENG 190IF, MEC ENG 190IG, MEC ENG 190IH, MEC ENG 190II, MEC ENG 190IJ, MEC ENG 190IK, MEC ENG 190IL, MEC ENG 190IM, MEC ENG 190IN, MEC ENG 190IO, MEC ENG 190IP, MEC ENG 190IQ, MEC ENG 190IR, MEC ENG 190IS, MEC ENG 190IT, MEC ENG 190IU, MEC ENG 190IV, MEC ENG 190IW, MEC ENG 190IX, MEC ENG 190IY, MEC ENG 190IZ, MEC ENG 190JA, MEC ENG 190JB, MEC ENG 190JC, MEC ENG 190JD, MEC ENG 190JE, MEC ENG 190JF, MEC ENG 190JG, MEC ENG 190JH, MEC ENG 190JI, MEC ENG 190JJ, MEC ENG 190JK, MEC ENG 190JL, MEC ENG 190JM, MEC ENG 190JN, MEC ENG 190JO, MEC ENG 190JP, MEC ENG 190JQ, MEC ENG 190JR, MEC ENG 190JS, MEC ENG 190JT, MEC ENG 190JU, MEC ENG 190JV, MEC ENG 190JW, MEC ENG 190JX, MEC ENG 190JY, MEC ENG 190JZ, MEC ENG 190KA, MEC ENG 190KB, MEC ENG 190KC, MEC ENG 190KD, MEC ENG 190KE, MEC ENG 190KF, MEC ENG 190KG, MEC ENG 190KH, MEC ENG 190KI, MEC ENG 190KJ, MEC ENG 190KK, MEC ENG 190KL, MEC ENG 190KM, MEC ENG 190KN, MEC ENG 190KO, MEC ENG 190KP, MEC ENG 190KQ, MEC ENG 190KR, MEC ENG 190KS, MEC ENG 190KT, MEC ENG 190KU, MEC ENG 190KV, MEC ENG 190KW, MEC ENG 190KX, MEC ENG 190KY, MEC ENG 190KZ, MEC ENG 190LA, MEC ENG 190LB, MEC ENG 190LC, MEC ENG 190LD, MEC ENG 190LE, MEC ENG 190LF, MEC ENG 190LG, MEC ENG 190LH, MEC ENG 190LI, MEC ENG 190LJ, MEC ENG 190LK, MEC ENG 190LL, MEC ENG 190LM, MEC ENG 190LN, MEC ENG 190LO, MEC ENG 190LP, MEC ENG 190LQ, MEC ENG 190LR, MEC ENG 190LS, MEC ENG 190LT, MEC ENG 190LU, MEC ENG 190LV, MEC ENG 190LW, MEC ENG 190LX, MEC ENG 190LY, MEC ENG 190LZ, MEC ENG 190MA, MEC ENG 190MB, MEC ENG 190MC, MEC ENG 190MD, MEC ENG 190ME, MEC ENG 190MF, MEC ENG 190MG, MEC ENG 190MH, MEC ENG 190MI, MEC ENG 190MJ, MEC ENG 190MK, MEC ENG 190ML, MEC ENG 190MM, MEC ENG 190MN, MEC ENG 190MO, MEC ENG 190MP, MEC ENG 190MQ, MEC ENG 190MR, MEC ENG 190MS, MEC ENG 190MT, MEC ENG 190MU, MEC ENG 190MV, MEC ENG 190MW, MEC ENG 190MX, MEC ENG 190MY, MEC ENG 190MZ, MEC ENG 190NA, MEC ENG 190NB, MEC ENG 190NC, MEC ENG 190ND, MEC ENG 190NE, MEC ENG 190NF, MEC ENG 190NG, MEC ENG 190NH, MEC ENG 190NI, MEC ENG 190NJ, MEC ENG 190NK, MEC ENG 190NL, MEC ENG 190NM, MEC ENG 190NN, MEC ENG 190NO, MEC ENG 190NP, MEC ENG 190NQ, MEC ENG 190NR, MEC ENG 190NS, MEC ENG 190NT, MEC ENG 190NU, MEC ENG 190NV, MEC ENG 190NW, MEC ENG 190NX, MEC ENG 190NY, MEC ENG 190NZ, MEC ENG 190OA, MEC ENG 190OB, MEC ENG 190OC, MEC ENG 190OD, MEC ENG 190OE, MEC ENG 190OF, MEC ENG 190OG, MEC ENG 190OH, MEC ENG 190OI, MEC ENG 190OJ, MEC ENG 190OK, MEC ENG 190OL, MEC ENG 190OM, MEC ENG 190ON, MEC ENG 190OO, MEC ENG 190OP, MEC ENG 190OQ, MEC ENG 190OR, MEC ENG 190OS, MEC ENG 190OT, MEC ENG 190OU, MEC ENG 190OV, MEC ENG 190OW, MEC ENG 190OX, MEC ENG 190OY, MEC ENG 190OZ, MEC ENG 190PA, MEC ENG 190PB, MEC ENG 190PC, MEC ENG 190PD, MEC ENG 190PE, MEC ENG 190PF, MEC ENG 190PG, MEC ENG 190PH, MEC ENG 190PI, MEC ENG 190PJ, MEC ENG 190PK, MEC ENG 190PL, MEC ENG 190PM, MEC ENG 190PN, MEC ENG 190PO, MEC ENG 190PP, MEC ENG 190PQ, MEC ENG 190PR, MEC ENG 190PS, MEC ENG 190PT, MEC ENG 190PU, MEC ENG 190PV, MEC ENG 190PW, MEC ENG 190PX, MEC ENG 190PY, MEC ENG 190PZ, MEC ENG 190QA, MEC ENG 190QB, MEC ENG 190QC, MEC ENG 190QD, MEC ENG 190QE, MEC ENG 190QF, MEC ENG 190QG, MEC ENG 190QH, MEC ENG 190QI, MEC ENG 190QJ, MEC ENG 190QK, MEC ENG 190QL, MEC ENG 190QM, MEC ENG 190QN, MEC ENG 190QO, MEC ENG 190QP, MEC ENG 190QQ, MEC ENG 190QR, MEC ENG 190QS, MEC ENG 190QT, MEC ENG 190QU, MEC ENG 190QV, MEC ENG 190QW, MEC ENG 190QX, MEC ENG 190QY, MEC ENG 190QZ, MEC ENG 190RA, MEC ENG 190RB, MEC ENG 190RC, MEC ENG 190RD, MEC ENG 190RE, MEC ENG 190RF, MEC ENG 190RG, MEC ENG 190RH, MEC ENG 190RI, MEC ENG 190RJ, MEC ENG 190RK, MEC ENG 190RL, MEC ENG 190RM, MEC ENG 190RN, MEC ENG 190RO, MEC ENG 190RP, MEC ENG 190RQ, MEC ENG 190RR, MEC ENG 190RS, MEC ENG 190RT, MEC ENG 190RU, MEC ENG 190RV, MEC ENG 190RW, MEC ENG 190RX, MEC ENG 190RY, MEC ENG 190RZ, MEC ENG 190SA, MEC ENG 190SB, MEC ENG 190SC, MEC ENG 190SD, MEC ENG 190SE, MEC ENG 190SF, MEC ENG 190SG, MEC ENG 190SH, MEC ENG 190SI, MEC ENG 190SJ, MEC ENG 190SK, MEC ENG 190SL, MEC ENG 190SM, MEC ENG 190SN, MEC ENG 190SO, MEC ENG 190SP, MEC ENG 190SQ, MEC ENG 190SR, MEC ENG 190SS, MEC ENG 190ST, MEC ENG 190SU, MEC ENG 190SV, MEC ENG 190SW, MEC ENG 190SX, MEC ENG 190SY, MEC ENG 190SZ, MEC ENG 190TA, MEC ENG 190TB, MEC ENG 190TC, MEC ENG 190TD, MEC ENG 190TE, MEC ENG 190TF, MEC ENG 190TG, MEC ENG 190TH, MEC ENG 190TI, MEC ENG 190TJ, MEC ENG 190TK, MEC ENG 190TL, MEC ENG 190TM, MEC ENG 190TN, MEC ENG 190TO, MEC ENG 190TP, MEC ENG 190TQ, MEC ENG 190TR, MEC ENG 190TS, MEC ENG 190TT, MEC ENG 190TU, MEC ENG 190TV, MEC ENG 190TW, MEC ENG 190TX, MEC ENG 190TY, MEC ENG 190TZ, MEC ENG 190UA, MEC ENG 190UB, MEC ENG 190UC, MEC ENG 190UD, MEC ENG 190UE, MEC ENG 190UF, MEC ENG 190UG, MEC ENG 190UH, MEC ENG 190UI, MEC ENG 190UJ, MEC ENG 190UK, MEC ENG 190UL, MEC ENG 190UM, MEC ENG 190UN, MEC ENG 190UO, MEC ENG 190UP, MEC ENG 190UQ, MEC ENG 190UR, MEC ENG 190US, MEC ENG 190UT, MEC ENG 190UU, MEC ENG 190UV, MEC ENG 190UW, MEC ENG 190UX, MEC ENG 190UY, MEC ENG 190UZ, MEC ENG 190VA, MEC ENG 190VB, MEC ENG 190VC, MEC ENG 190VD, MEC ENG 190VE, MEC ENG 190VF, MEC ENG 190VG, MEC ENG 190VH, MEC ENG 190VI, MEC ENG 190VJ, MEC ENG 190VK, MEC ENG 190VL, MEC ENG 190VM, MEC ENG 190VN, MEC ENG 190VO, MEC ENG 190VP, MEC ENG 190VQ, MEC ENG 190VR, MEC ENG 190VS, MEC ENG 190VT, MEC ENG 190VU, MEC ENG 190VV, MEC ENG 190VW, MEC ENG 190VX, MEC ENG 190VY, MEC ENG 190VZ, MEC ENG 190WA, MEC ENG 190WB, MEC ENG 190WC, MEC ENG 190WD, MEC ENG 190WE, MEC ENG 190WF, MEC ENG 190WG, MEC ENG 190WH, MEC ENG 190WI, MEC ENG 190WJ, MEC ENG 190WK, MEC ENG 190WL, MEC ENG 190WM, MEC ENG 190WN, MEC ENG 190WO, MEC ENG 190WP, MEC ENG 190WQ, MEC ENG 190WR, MEC ENG 190WS, MEC ENG 190WT, MEC ENG 190WU, MEC ENG 190WV, MEC ENG 190WW, MEC ENG 190WX, MEC ENG 190WY, MEC ENG 190WZ, MEC ENG 190XA, MEC ENG 190XB, MEC ENG 190XC, MEC ENG 190XD, MEC ENG 190XE, MEC ENG 190XF, MEC ENG 190XG, MEC ENG 190XH, MEC ENG 190XI, MEC ENG 190XJ, MEC ENG 190XK, MEC ENG 190XL, MEC ENG 190XM, MEC ENG 190XN, MEC ENG 190XO, MEC ENG 190XP, MEC ENG 190XQ, MEC ENG 190XR, MEC ENG 190XS, MEC ENG 190XT, MEC ENG 190XU, MEC ENG 190XV, MEC ENG 190XW, MEC ENG 190XX, MEC ENG 190XY, MEC ENG 190XZ, MEC ENG 190YA, MEC ENG 190YB, MEC ENG 190YC, MEC ENG 190YD, MEC ENG 190YE, MEC ENG 190YF, MEC ENG 190YG, MEC ENG 190YH, MEC ENG 190YI, MEC ENG 190YJ, MEC ENG 190YK, MEC ENG 190YL, MEC ENG 190YM, MEC ENG 190YN, MEC ENG 190YO, MEC ENG 190YP, MEC ENG 190YQ, MEC ENG 190YR, MEC ENG 190YS, MEC ENG 190YT, MEC ENG 190YU, MEC ENG 190YV, MEC ENG 190YW, MEC ENG 190YX, MEC ENG 190YY, MEC ENG 190YZ, MEC ENG 190ZA, MEC ENG 190ZB, MEC ENG 190ZC, MEC ENG 190ZD, MEC ENG 190ZE, MEC ENG 190ZF, MEC ENG 190ZG, MEC ENG 190ZH, MEC ENG 190ZI, MEC ENG 190ZJ, MEC ENG 190ZK, MEC ENG 190ZL, MEC ENG 190ZM, MEC ENG 190ZN, MEC ENG 190ZO, MEC ENG 190ZP, MEC ENG 190ZQ, MEC ENG 190ZR, MEC ENG 190ZS, MEC ENG 190ZT, MEC ENG 190ZU, MEC ENG 190ZV, MEC ENG 190ZW, MEC ENG 190ZX, MEC ENG 190ZY, MEC ENG 190ZZ

Minor programs are areas of concentration requiring fewer courses than an undergraduate major. These programs are optional, but can provide depth and breadth to a UC Berkeley education. The College of Engineering does not offer additional time to complete a minor, but it is usually possible to finish within the allotted time with careful course planning. Students are encouraged to meet with their ESS adviser to discuss the feasibility of completing a minor program.

All the engineering departments offer minors. Students may also consider pursuing a minor in another School or College.

General Guidelines

1. All courses taken to fulfill the minor requirements must be taken for graded credit.
2. A minimum overall grade point average (GPA) of 3.0 and a minimum GPA of 3.0 in the prerequisite courses is required for acceptance into the minor program.
3. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.

- No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs.
- Completion of the minor program cannot delay a student's graduation.

Lower Division Prerequisites

MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations	4

Select one of the following:

CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	
CHEM 4A	General Chemistry and Quantitative Analysis	
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4
ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4

Upper Division Minor Requirements

MEC ENG 40	Thermodynamics (or approved equivalent)	3
or ENGIN 115	Engineering Thermodynamics	

EL ENG 137A	Introduction to Electric Power Systems	4
Select one of the following:		4

ENE,RES C10	Energy and Society	
CIV ENG 111	Environmental Engineering	
CIV ENG C106	Air Pollution	3

Select two of the following: 8

ARCH 140	Energy and Environment	
CY PLAN 119	Planning for Sustainability	
CIV ENG 107	Climate Change Mitigation	
CIV ENG 111	Environmental Engineering	
CIV ENG 113N	Course Not Available	
CIV ENG 115	Water Chemistry	
CIV ENG 156	Infrastructure Planning and Management	
EL ENG 134	Fundamentals of Photovoltaic Devices	
EL ENG 137B	Introduction to Electric Power Systems	
ENE,RES C100	Energy and Society	
ENE,RES 101	Ecology and Society	
ENE,RES C180	Course Not Available	
ENGIN 120	Principles of Engineering Economics	
ENGIN 194	Undergraduate Research	
ENVECON 147	Regulation of Energy and the Environment	
ENVECON C150	Economic Development	
ENVECON 153	Population, Environment, and Development	
ENVECON 154	Economics of Poverty and Technology	
ESPM 102D	Climate and Energy Policy	
GEOG 142	Climate Dynamics	
IND ENG 172	Probability and Risk Analysis for Engineers	
or STAT 134	Concepts of Probability	
MAT SCI 136	Materials in Energy Technologies	

MEC ENG 106 Fluid Mechanics

MEC ENG 109 Heat Transfer

NUC ENG 161 Nuclear Power Engineering

POLECON 101 Contemporary Theories of Political Economy

Students in the College of Engineering must complete no fewer than 120 semester units with the following provisions:

- Completion of the requirements of one engineering major program (<http://coe.berkeley.edu/students/guide/departments>) of study.
- A minimum overall grade point average of 2.00 (C average) and a minimum 2.00 grade point average in upper division technical coursework required of the major.
- The final 30 units and two semesters must be completed in residence in the College of Engineering on the Berkeley campus.
- All technical courses (math, science and engineering), required of the major or not, must be taken on a letter graded basis (unless they are only offered P/NP).
- Entering freshmen are allowed a maximum of eight semesters to complete their degree requirements. Entering junior transfers are allowed a maximum of four semesters to complete their degree requirements. (Note: junior transfers admitted missing three or more courses from the lower division curriculum are allowed five semesters.) Summer terms are optional and do not count toward the maximum. Students are responsible for planning and satisfactorily completing all graduation requirements within the maximum allowable semesters.
- Adhere to all college policies and procedures (<http://engineering.berkeley.edu/academics/undergraduate-guide>) as they complete degree requirements.
- Complete the lower division program before enrolling in upper division engineering courses.

Humanities and Social Science (H/SS) Requirement

To promote a rich and varied educational experience outside of the technical requirements for each major, the College of Engineering has a six-course Humanities and Social Sciences breadth requirement (<http://engineering.berkeley.edu/student-services/degree-requirements/humanities-and-social-sciences>), which must be completed to graduate. This requirement, built into all the engineering programs of study, includes two reading and composition courses (R&C), and four additional courses within which a number of specific conditions must be satisfied. Follow these guidelines to fulfill this requirement:

- Complete a minimum of six courses from the approved Humanities/ Social Sciences (H/SS) lists (<http://coe.berkeley.edu/hssreq>).
- Courses must be a minimum of 3 semester units (or 4 quarter units).
- Two of the six courses must fulfill the college's Reading and Composition (R&C) requirement. These courses must be taken for a letter grade (C- or better required) and must be completed by no later than the end of the sophomore year (fourth semester of enrollment). The first half of R&C, the "A" course, must be completed by the end of the freshman year; the second half of R&C, the "B" course, must be completed by no later than the end of the sophomore year. View a detailed lists of courses (<http://ls-advise.berkeley.edu/requirement/rccourses.html>) that fulfill Reading and Composition requirements, or use the College of Letters and Sciences search engine (<http://>

- ls-breadth.berkeley.edu) to view R&C courses offered in a given semester.
- The four additional courses must be chosen within College of Engineering guidelines from the H/SS lists (see below). These courses may be taken on a Pass/Not Passed basis (P/NP).
 - Two of the six courses must be upper division (courses numbered 100-196).
 - One of the six courses must satisfy the campus American Cultures requirement. For detailed lists of courses that fulfill American Cultures requirements, visit the American Cultures (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/engineering/american-cultures-requirement>) site.
 - A maximum of two exams (Advanced Placement, International Baccalaureate, or A-Level) may be used toward completion of the H/SS requirement. View the list of exams (<http://engineering.berkeley.edu/academics/undergraduate-guide/exams-ap-ib-level-and-transfer-credit-information>) that can be applied toward H/SS requirements.
 - Courses may fulfill multiple categories. For example, if you complete CY PLAN 118AC (<http://guide.berkeley.edu/search/?P=CY%20PLAN%20118AC>) that would satisfy the American Cultures requirement and one upper division H/SS requirement.
 - No courses offered by any engineering department other than BIO ENG 100 (<http://guide.berkeley.edu/search/?P=BIO%20ENG%20100>), COMPSCI C79 (<http://guide.berkeley.edu/search/?P=COMPSCI%20C79>), ENGIN 125 (<http://guide.berkeley.edu/search/?P=ENGIN%20125>), ENGIN 157AC (<http://guide.berkeley.edu/search/?P=ENGIN%20157AC>), MEC ENG 191K (<http://guide.berkeley.edu/search/?P=MEC%20ENG%20191K>) and MEC ENG 191AC (<http://guide.berkeley.edu/search/?P=MEC%20ENG%20191AC>) may be used to complete H/SS requirements.
 - Foreign language courses may be used to complete H/SS requirements. View the list of language options (<http://ls-advice.berkeley.edu/requirement/fl.html>).
 - Courses numbered 97, 98, 99, or above 196 may not be used to complete any H/SS requirement
 - The College of Engineering uses modified versions of five of the College of Letters and Science (L&S) breadth requirements lists to provide options to our students for completing the H/SS requirement. No courses on the L&S Biological Sciences or Physical Sciences breadth lists may be used to complete H/SS requirements. Within the guidelines above, choose courses from any of the lists below.

- Arts and Literature (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-arts-literature>)
- Foreign Language (<http://ls-advice.berkeley.edu/requirement/fl.html>)
- Historical Studies (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-historical-studies>)
- International Studies (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-international-studies>)
- Philosophy and Values (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-philosophy-values>)

- Social and Behavioral Studies (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-social-behavioral-sciences>)

Class Schedule Requirements

- Minimum units per semester: 12.0.
- Maximum units per semester: 20.5.
- Minimum technical courses: College of Engineering undergraduates must enroll each semester in no fewer than two technical courses (of a minimum of 3 units each) required of the major program of study in which the student is officially declared. (Note: for most majors, normal progress will require enrolling in 3-4 technical courses each semester).
- All technical courses (math, science, engineering), required of the major or not, must be taken on a letter graded basis (unless only offered as P/NP).
- A student's proposed schedule must be approved by a faculty adviser (or on approval from the dean or a designated staff adviser) each semester prior to enrolling in courses.

Minimum Academic (Grade) Requirements

- A minimum overall and semester grade point average of 2.00 (C average) is required of engineering undergraduates. A student will be subject to dismissal from the University if during any fall or spring semester their overall UC GPA falls below a 2.00, or their semester GPA is less than 2.00.
- Students must achieve a minimum grade point average of 2.00 (C average) in upper division technical courses required of the major curriculum each semester. A student will be subject to dismissal from the University if their upper division technical grade point average falls below 2.00.
- A minimum overall grade point average of 2.00, and a minimum 2.00 grade point average in upper division technical course work required of the major is needed to earn a Bachelor of Science in Engineering.

Unit Requirements

To earn a Bachelor of Science in Engineering, students must complete at least 120 semester units of courses subject to certain guidelines:

- Completion of the requirements of one engineering major program (<http://coe.berkeley.edu/students/guide/departments>) of study.
- A maximum of 16 units of special studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed towards the 120 units; a maximum of four is allowed in a given semester.
- A maximum of 4 units of physical education from any school attended will count towards the 120 units.
- Students may receive unit credit for courses graded P (including P/NP units taken through EAP) up to a limit of one-third of the total units taken and passed on the Berkeley campus at the time of graduation.

Normal Progress

Students in the College of Engineering must enroll in a full-time program and make normal progress each semester toward the bachelor's degree. The continued enrollment of students who fail to achieve minimum academic progress shall be subject to the approval of the dean. (Note: students with official accommodations established by the Disabled Students' Program, with health or family issues, or with other reasons

deemed appropriate by the dean may petition for an exception to normal progress rules.)

For more detailed information regarding the courses listed below (e.g., elective information, GPA requirements, etc.), please see the College Requirements and Major Requirements tabs.

Freshman				
	Fall	Units	Spring	Units
CHEM 4A or 1A <i>and</i> 1AL ¹		4	MATH 1B	4
MATH 1A		4	PHYSICS 7A	4
ENGIN 93		1	ENGIN 7 or COMPSCI 61A	4
Reading and Composition Course from List A		4	Reading and Composition Course from List B	4
Free Elective		3		
		16		16
Sophomore				
	Fall	Units	Spring	Units
MATH 53		4	MATH 54	4
PHYSICS 7B		4	MEC ENG 40 or ENGIN 115	3-4
Engineering Prep course ^{1 2}		3-6	CIV ENG 100 or MEC ENG 106	3-4
ENE,RES C100 ³		4	Engineering Prep course 2 ²	3-4
			Free Elective	1
		15-18		14-17
Junior				
	Fall	Units	Spring	Units
EL ENG 137A		4	EL ENG 137B	4
MEC ENG 109		3	Engineering Electives ²	6-8
Economics Course ²		3-4	Humanities/ Social Sciences course	3-4
Engineering Elective ²		3-4		
		13-15		13-16
Senior				
	Fall	Units	Spring	Units
CIV ENG 186		3	ENGIN 194	3
Math/Statistics/Analysis Course or CIV ENG 191 or EL ENG 127 ²		3-4	EL ENG 134	4
Engineering Elective ²		3-4	Sustainability Course ²	3
Humanities/Social Sciences course		3-4	Humanities/ Social Sciences course	3-4
Free Elective		4	Free Elective	4
		16-19		17-18
Total Units: 120-135				

¹ CHEM 4A is intended for students majoring in chemistry or a closely-related field.

² See Major Requirements tab for approved courses.

³ ENE,RES C100 satisfies both a major requirement and one of the upper division humanities/social sciences requirements.