

Required Courses for Materials Science & Engineering Degree – 2017-18

This program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

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To make advising appointments, please visit: appointments.ucdavis.edu

Note: Curriculum and course offerings are subject to change. You must fulfill the degree requirements stated in the catalog of the year you graduate or the year immediately prior. For additional detail on courses, please visit the course supplement located at <http://catalog.ucdavis.edu/index.html>

Writing and General Education Requirements

Lower Division Composition (4 units)

Select ONE of the following courses:

UWP 1, 1V, or 1Y	Expository Writing
ENL 3	Introduction to Literature
COM 1	Bks of West Civ /Ancient World
COM 2	Bks of West Civ/MidAge-Enligh.
COM 3	Bks of West Civ/Modern Crisis
COM 4	Bks of Contemporary World
NAS 5	Intro to Native American Lit.

Course must be completed with a C- or better.

Rhetoric and Communication (4 units)

Select ONE of the following courses:

CMN 1	Introduction to Public Speaking
CMN 3	Interpersonal Communication Competence (SS GE3 credit)

Upper Division Composition (0 or 4 units)

Select ONE of the following courses:

UWP 102E or 102F	Writing in the Disciplines
UWP 104A, 104E, or 104T	Writing in the Professions

Course must be completed with a C- or better. [Alternatively, you may satisfy the upper division English requirement by passing the Upper Division Composition Exam](#)

General Education Requirement:

This requirement will vary depending on the year you entered UC Davis. Please refer to your [specific GE requirements](#).

Lower Division Major Requirements

Math, Physics, and Chemistry (56 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
MAT 21A	Calculus	4	F	W	S	Score of 35 or more on Mathematics Placement test
MAT 21B	Calculus	4	F	W	S	MAT 21A or 21AH
MAT 21C	Calculus	4	F	W	S	MAT 21B or 21BH
MAT 21D	Vector Analysis	4	F	W	S	MAT 21C or 21CH
MAT 22A	Linear Algebra	3	F	W	S	9 units of college math; ENG 6 or MAT 22AL [Ⓢ] , or experience on MATLAB
MAT 22B	Differential Equations	3	F	W	S	MAT 21C; 22A, or MAT 67
PHY 9A	Classical Physics	5	F		S	MAT 21B
PHY 9B	Classical Physics	5	F	W		PHY 9A, MAT 21C, MAT 21D [Ⓢ]
PHY 9C	Classical Physics	5		W	S	PHY 9B, MAT 21D, MAT 22A [Ⓢ]
PHY 9D	Classical Physics	4	F		S	PHY 9C, MAT 22A, MAT 22B recommended [Ⓢ]
CHE 2A	General Chemistry	5	F	W		Score of 24 or more on Chemistry Placement test
CHE 2B	General Chemistry	5		W	S	CHE 2A or 2AH
CHE 2C	General Chemistry	5	F		S	CHE 2B or 2BH

Engineering (14 units)

EMS 2	Materials Marvels	2		W	S	None
ECH 60	Computational Methods	4			S	MAT 21C
ENG 17	Circuits	4	F		S	C- or better in MAT 22A and PHY 9C; MAT 22B [Ⓢ]
ENG 45 or ENG 45Y	Properties of Materials	4 4	F	W	S SS	C- or better in all of the following: MAT 21C, CHE 2A & PHY 9A ENG 45Y is an online course only offered in Summer Session (same prerequisites as ENG 45)

Upper Division Major Requirements

Engineering (3 units)

Course Number	Description	Units	Qrt Offered		Prerequisites
ENG 190	Professional Responsibilities of Engineers (<i>SS GE3 credit</i>)	3	W	S	Upper division standing in the College of Engineering

Materials Science Fundamentals (20 units)

Course Number	Description	Units	Qrt Offered		Prerequisites
EMS 160	Thermodynamics of Materials Proc.	4	F		C- or better in each of the following: ENG 45, PHY 9B, MAT 22B; CHE 2C recommended
EMS 162	Structure & Characterization of Engineering Materials	4		W	C- or better in each of the following: ENG 45, MAT 22A, PHY 9B
EMS 164	Rate Processes in Materials Science	4		W	C- or better in ENG 45; EMS 160
EMS 172	Electronic, Optical & Magnetic Properties of Materials	4	F		CHE 110A or PHY 9D; ENG 6 or ECH 60 or equivalent (recommended)
EMS 174	Mechanical Behavior of Materials	4		S	C- or better in ENG 45; EMS 162 (recommended)

Materials Science Laboratory (6 units)

Course Number	Description	Units	Qrt Offered		Prerequisites
EMS 162L	Structure & Characterization of Engineering Materials Lab	2		W	EMS 162 ☺ (concurrent enrollment recommended)
EMS 172L	Electronic, Optical & Magnetic Properties Lab	2	F		EMS 172 ☺ (concurrent enrollment recommended)
EMS 174L	Mechanical Behavior Lab	2		S	EMS 174 ☺ (concurrent enrollment recommended)

Engineering Application of Materials (16 units)

Course Number	Description	Units	Qrt Offered		Prerequisites
EMS 180	Materials in Engineering Design	4		S	C- or better in ENG 45, upper division standing
EMS 181	Materials Processing	4		W	C- or better in ENG 45; ENG 105 or EEC 140A or EMS 164 or ECH152B or equivalent
EMS 188A	Materials Design Project	4		W	EMS 160, 162, 164, 172, and 174
EMS 188B	Materials Design Project	4		S	EMS 188A

Applied Mathematics Elective (4 units) *Choose one of the following courses.*

Course Number	Description	Units	Qrt Offered		Prerequisites
EME 115	Introduction to Numerical Analysis and Methods	4	F	W	C- or better in all of the following: MAT 21A-D, 22A-B, PHY 9A-C; C- or better in ENG 6, EME 5 or CSE 30 or ECH 60
ECH 140	Mathematical Methods	4	F		MAT 22B; ECH 60 or equivalent
ECI 114	Probabilistic Systems Analysis for Civil Engineers	4		W S	C- or better in MAT 21C
ENG 180	Engineering Analysis	4	F		C- or better in all of the following: MAT 21D, 22B, ENG 6 or EME 5 or CSE 30.
MAT 135A	Probability	4	F	W	MAT 125A
PHY 104A	Mathematical Physics	4	F		C- or better in all of the following: PHY 9B/C/D, MAT 21D, MAT 22A/B; or ☺
STA 120*	<i>Probability & Random Variable for Engineers</i>	4			MAT 21A/B/C
STA 131A	Intro. To Probability Theory	4	F	S	MAT 21B/C, MAT 22A

Basic Science Elective (3-4 units) *Choose one of the following courses.*

Course Number	Description	Units	Qrt Offered		Prerequisites
CHE 110A	Physical Chemistry: Intro. to Quantum Mech.	4	F	S	CHE 2C, MAT 16C or 21C; 1 year college physics
CHE 124A	Inorganic Chemistry: Fundamentals	3	F	W S	CHE 2C
CHE 128A	Organic Chemistry	3	F	W	C or better in CHE 2C
PHY 108/108L	Optics/Optics Lab	4		S	PHY 9A/B/C/D, MAT 21A/B/C/D, or ☺
PHY 110A	Electricity and Magnetism	4		W	PHY 9B, 9C, 9D and Mathematics 21D, 22A, and 22B with grade C- or better, or consent of department
PHY 122A	Advanced Condensed Matter Lab	4		W	PHY 104A, 105A, 110B, 115A and 112 or consent of department
PHY 151*	Stellar Structure & Evolution	4	F		PHY 9A/B/C/D or ☺ (offered alternate years)
PHY 160	Environmental Physics and Society	3		S	PHY 9D or 7C; or PHY 10 or 1B and MAT 16B or equivalent

Sustainability in Engineering Elective (3-4 units) Choose one of the following courses.

Course Number	Description	Units	Qrt Offered			Prerequisites
ECH 158A	Process Economics and Green Design	4	F			ECH 142 and 143
EMS 170	Sustainable Energy Technologies: Batteries, Fuel Cells, and Photovoltaic Cells	4	SS			Summer abroad; ENG 45 and open to student in Engineering or related fields
ENG 106	Engineering Economics	3	W			Upper division standing
ENG 160 or PHY 160	Environmental Physics and Society	3	S			PHY 9D and MAT 21B
ENG 188	Science and Technology of Sustainable Power Generation	4	S			Upper division standing, PHY 9C
ECI 123	Urban Systems and Sustainability	4	S			Upper division standing
ECI 125*	Building Energy Performance	4	S			Upper division standing; Open to students in Engineering
ECI 143	Green Engineering Design and Sustainability	4	W			ENG 106; ECI 148A; Upper division standing; Pass 1 restricted to ECI majors

Upper Division Elective Credit (9 units) Choose any upper division elective for credit. Units in excess of 14 for Engineering Focus Area will apply. Students may receive elective credit up to a maximum of 4 units for engineering 199 courses, when approved by the department undergraduate affairs committee (UAC). To request credit, a student must submit a summary of their research to the committee via the academic advisor. A letter of support from the faculty mentor is also required to verify that the students has conducted substantial research activity.

Engineering Focus Areas (14 units minimum) Choose one of the following focus areas to complete in it's entirety. Units in excess of 14 will apply toward Upper Division Elective Credit.

Mechanical Engineering (16 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
ENG 35	Statics	4	F	W	S	C- or better in PHY 9A;, MAT 21D ☺
ENG 102	Dynamics	4	F	W	S	C- or better in ENG 35 and MAT 22B
ENG 103	Fluid Mechanics	4	F	W	S	C- or better in ENG 35, MAT 22B, PHY 9B
ENG 104	Mechanics of Materials	4	F	W	S	C- or better in ENG 35 and MAT 22B

Civil Engineering (16 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
ENG 35	Statics	4	F	W	S	C- or better in PHY 9A, MAT 21D ☺
ENG 104	Mechanics of Materials	4	F	W	S	C- or better in ENG 35 and MAT 22B
ECI 130	Structural Analysis	4	F	S		C- or better in ENG 104; MAT 22A; Open to ECI majors
ECI 132	Structural Design: Metallic Elements	4	F	S		ECI 130

Electrical Engineering (14 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
ENG 100	Electronic Circuits and Systems	3	F	W	S	C- or better recommended in ENG 17
EEC 140A	Principles of Device Physics I	4	F	W	S	ENG 17, PHY 9D
EEC 140B	Principles of Device Physics II	4	S			EEC 140A
EEC 146A	Integrated Circuits Fabrication	3	F	S		EEC 140A

Chemical Engineering (16 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
ECH 51	Material Balances	4	F	S		C- or better in MAT 21C; MAT 21D ☺
ECH 140	Numerical Methods	4	F	S		MAT 22B; ECH 60 or equivalent
ECH 141	Fluid Mechanics	4	W			ECH 140; ECH 51
ECH 142	Heat Transfer	4	S			C- or better in ECH 51; ECH 141

Biosystems Engineering (16 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
BIS 2A	Introduction to Biology: Essentials of Life on Earth	5	F	W	S SS	None
EBS 75	Properties of Materials in Biological Systems	4	W			BIS 2A; PHY 9C ☺
ENG 100	Electronic Circuits and Systems	3	F	W	S	C- or better recommended in ENG 17
EBS 165	Bioinstrumentation and Control	4	F	S		ENG 100

Biomedical Engineering (17 units) *Must complete NPB 101(offered F,W,S) as prereq for BIM 106 and can be used for Upper Division Elective credit.*

Course Number	Description	Units	Qrt Offered			Prerequisites
BIS 2A	Introduction to Biology: Essentials of Life on Earth	5	F	W	S SS	None
BIM 20	Fundamentals of Bioengineering	4			S	C- or better in CHE 2B and MAT 21D; PHY 9B
BIM 106	Biotransport Phenomena	4		W		C- or better in BIM 20; BIM 116 or NPB 101; PHY 9B; MAT 22B; Open to BIM majors
BIM 109	Biomaterials	4			S	BIS 2A, CHE 2C, BIM 106, upper division standing Engineering majors

☺ *May be taken concurrently* 📖 *May be taken with consent of instructor* **Course not regularly offered*

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