

MECHANICAL ENGINEERING - BACHELOR OF SCIENCE (BSME)

Mechanical engineering is a broad engineering discipline that incorporates skills and expertise in the areas of design, manufacturing, mechanics and thermal sciences that are essential to most sectors of industry.

Program Educational Objectives

Within the first three years after graduation, our alumni will have built on the educational foundation gained through our program by establishing themselves in professional careers and/or pursuing a graduate degree. In addition, within these three years, our alumni should have begun to generate new knowledge and/or exercise leadership in their positions.

Colorado Mesa University/University of Colorado Boulder Partnership Program (Mechanical Engineering)

Colorado Mesa University (CMU) (<http://www.coloradomesa.edu/engineering/>) and CU Boulder have created a partnership to deliver specific engineering baccalaureate programs in their entirety in Grand Junction, Colorado. The first two years of coursework are taught by CMU faculty and the second two years of coursework are taught by CU Boulder faculty located in Grand Junction. Students completing the programs will be awarded a Bachelor of Science from CU Boulder.

Degrees are offered in mechanical engineering, civil engineering, and electrical & computer engineering, with additional details on the partnership website (<https://www.coloradomesa.edu/engineering/partnership-program/>).

Coursework requirements and plans of study specific to this partnership can be found on the Colorado Mesa University mechanical engineering partnership website (<https://www.coloradomesa.edu/engineering/degrees/mechanical-engineering-partnership.html>). Learn more about this program on the CU Boulder partnership website (<https://www.colorado.edu/academics/cmu-cu-boulder-bs-mechanical-engineering/>).

Western Colorado University/University of Colorado Boulder Partnership Program (Mechanical Engineering)

Western Colorado University (Western) (<https://western.edu/school/paul-m-rady-school-of-computer-science-engineering/>) and CU Boulder have created a partnership to deliver specific engineering and computer science baccalaureate programs in their entirety in Gunnison, Colorado. The first two years of coursework are taught by Western faculty and the second two years of coursework are taught by CU Boulder faculty located in Gunnison. Students completing the programs will be awarded a Bachelor of Science from CU Boulder.

Degrees are offered in mechanical engineering and computer science, with additional details on the Computer Science (<https://western.edu/program/computer-science-university-colorado-partnership/>) and

Mechanical Engineering (<https://western.edu/program/mechanical-engineering-university-colorado-partnership/>) partnership websites.

Coursework requirements and plans of study specific to this partnership can be found on the Western Colorado University mechanical engineering partnership website (<https://western.edu/program/mechanical-engineering-university-colorado-partnership/>). Learn more about this program on the CU Boulder partnership website (<https://www.colorado.edu/academics/western-cu-boulder-bs-mechanical-engineering/>).

Requirements Program Requirements

In order to earn a bachelor's degree in mechanical engineering, students must complete the curriculum in the undergraduate major program, as outlined below. For up-to-date program requirements, visit the Bachelor of Science in Mechanical Engineering (<https://www.colorado.edu/mechanical/academics/undergraduate-program/>) (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/>) webpage.

Required courses in engineering, physical science, and mathematics are interwoven throughout the curriculum to provide a balanced education in the fundamentals of the mechanical engineering profession. The core courses are complemented by technical electives (<http://www.colorado.edu/mechanical/current-students/undergraduate/electives/>), (<http://www.colorado.edu/engineering/academics/policies/hss/>) humanities and social sciences electives (<https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/>), free electives, and a writing course (<https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/>), for a total of 128 credits required for the degree.

Required Courses and Credits

Code	Title	Credit Hours
Required Courses		
MCEN 1025	Computer-Aided Design and Fabrication	4
MCEN 2000	Mechanical Engineering as a Profession	1
MCEN 2023	Statics and Structures	3
or GEEN 2851	Statics for Engineers	
or CVEN 2121	Analytical Mechanics 1	
or ASEN 2001	Aerospace 1: Introduction to Statics, Structures, and Materials	
or ASEN 2701	Introduction to Statics, Structures, and Materials	
MCEN 2024	Materials Science	3
or GEEN 3024	Materials Science for Engineers	
or ASEN 1022	Materials Science for Aerospace Engineers	
MCEN 2043	Dynamics	3
or CVEN 3111	Analytical Mechanics 2	
or PHYS 3210	Classical Mechanics and Mathematical Methods 2	
or ASEN 2703	Introduction to Dynamics and Systems	
MCEN 2063	Mechanics of Solids	3
or CVEN 3161	Mechanics of Materials 1	
MCEN 3012	Thermodynamics	3

or GEEN 3852	Thermodynamics for Engineers	
or AREN 2110	Thermodynamics	
or EVEN 3012	Thermodynamics for Environmental Science & Engineering	
MCEN 3017	Circuits and Electronics for Mechanical Engineers	3
or ECEN 3010	Circuits and Electronics for Mechanical Engineers	
or GEEN 3010	Circuits for Engineers	
MCEN 3021	Fluid Mechanics	3
or CHEN 3200	Chemical Engineering Fluid Mechanics	
or CVEN 3313	Theoretical Fluid Mechanics	
or AREN 2120	Fluid Mechanics and Heat Transfer	
MCEN 3022	Heat Transfer	3
or CHEN 3210	Chemical Engineering Heat and Mass Transfer	
MCEN 3025	Component Design	3
MCEN 3030	Computational Methods	3
or APPM 4650	Intermediate Numerical Analysis 1	
or CSCI 3656	Numerical Computation	
MCEN 3032	Thermodynamics 2	3
MCEN 3047	Data Analysis and Experimental Methods	4
or GEEN 3853	Data Analysis for Engineers	
MCEN 4026	Manufacturing Processes and Systems	3
MCEN 4043	System Dynamics	3
or ECEN 3300	Linear Systems	
& ECEN 4138	and Control Systems Analysis	
MCEN 4045	Mechanical Engineering Design Project 1	3
MCEN 4085	Mechanical Engineering Senior Design Project 2	3

Mechanical Engineering (ME) Technical ElectivesChoose 6 credit hours of ME Technical Elective coursework. ¹ 6**General Technical Electives**Choose 6 credit hours of General Technical Elective coursework. ² 6**Math/Science Foundations**Choose at least 3 credit hours of approved Math/Science Foundations coursework. ³ 3-6**Required Mathematics Courses**

APPM 1350	Calculus 1 for Engineers	4-5
or MATH 1300	Calculus 1	
or APPM 1345	Calculus 1 with Algebra, Part B	
APPM 1360	Calculus 2 for Engineers	4-5
or MATH 2300	Calculus 2	
APPM 2350	Calculus 3 for Engineers	4-5
or MATH 2400	Calculus 3	
APPM 2360	Introduction to Differential Equations with Linear Algebra	4-6
or MATH 2130	Introduction to Linear Algebra for Non-Mathematics Majors	
& MATH 3430	and Ordinary Differential Equations	
or MATH 2135	Introduction to Linear Algebra for Mathematics Majors	
& MATH 3430	and Ordinary Differential Equations	

Required Chemistry Course

MCEN 1024	Chemistry for Energy and Materials Science	3
or CHEN 1201	General Chemistry for Engineers 1	
or CHEN 1203	General Chemistry for Engineers 2	
or CHEN 1211	Accelerated Chemistry for Engineers	
or CHEM 1113	General Chemistry 1	

Required Physics Courses

PHYS 1110	General Physics 1	4
or PHYS 1115	General Physics 1 for Majors	
PHYS 1120	General Physics 2	4
or PHYS 1125	General Physics 2 for Majors	
PHYS 1140	Experimental Physics 1	1

Required Engineering Courses

CSCI 1300	Computer Science 1: Starting Computing	4
or ECEN 1310	C Programming for ECE	
or ASEN 1320	Aerospace Computing and Engineering Applications	
GEEN 1400	Engineering Projects	3
or GEEN 2400	Engineering Projects for the Community	
or GEEN 3400	Invention and Innovation	
or ASEN 1400	Gateway to Space	
or ASEN 1403	Introduction to Rocket Engineering	
or ECEN 1400	Introduction to Digital and Analog Electronics	

Humanities, Social Sciences and Writing

Writing ⁴		3
Humanities & Social Sciences - at least 6 credits must be completed at the upper-division level (3000-level or higher). ⁴		15

Free Electives

Choose at least 6 credit hours of free electives to meet the minimum 128 credit hours required for the BS degree. 6

Total Credit Hours 128-136

¹ Refer to the course options listed on the ME Technical Electives (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/me-technical-electives/>) webpage.

² Refer to the course options listed on the General Technical Electives (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/general-technical-electives/>) webpage.

³ Refer to the course options listed on the Math/Science Foundations (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/>) webpage.

⁴ Refer to the College's Humanities, Social Sciences, and Writing requirements (<https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/>) webpage.

Prerequisites and Passing Grades

The minimum passing grade for a course that is a prerequisite or corequisite for another required course is C-. If a grade of D+ or lower is received in a course which is a prerequisite to another, the student may not register for the subsequent course until the first grade has been raised to a C- or higher. If a grade of D+ or lower is received in a course which is a corequisite to another, the course must be repeated until a grade of C- or higher is achieved.

The minimum passing grade for a course that is not specifically a prerequisite or corequisite for another required course is D-.

The Mechanical Engineering Department reserves the right to drop students enrolled in MCEN courses who have not met the minimum prerequisite requirements. It is the student's responsibility to communicate with the department if summer coursework and/or transfer credit will be used to meet the prerequisite requirement.

Design Your Career

Prior to graduation, students are required to complete a co-curricular professional development requirement, called Design Your Career (DYC) (<https://www.colorado.edu/mechanical/academics/professional-development/design-your-career/>), which includes activities tailored to each year of the curriculum. The requirement may be prorated for students who transfer into the department after their first year of study.

Senior Survey

Graduating students are also required to complete the Senior Survey, administered by the College of Engineering & Applied Science, in their final semester.

Sample Four-Year Plan of Study

Year One

Fall Semester		Credit Hours
APPM 1350	Calculus 1 for Engineers	4
CSCI 1300	Computer Science 1: Starting Computing	4
PHYS 1110	General Physics 1	4
GEEN 1400	Engineering Projects	3
Credit Hours		15

Spring Semester

APPM 1360	Calculus 2 for Engineers	4
MCEN 1024	Chemistry for Energy and Materials Science	3
MCEN 1025	Computer-Aided Design and Fabrication	4
PHYS 1120	General Physics 2	4
PHYS 1140	Experimental Physics 1	1
Credit Hours		16

Year Two

Fall Semester		Credit Hours
APPM 2350	Calculus 3 for Engineers	4
MCEN 2000	Mechanical Engineering as a Profession	1
MCEN 2023	Statics and Structures	3
MCEN 2024	Materials Science	3
Math/Science Foundations ¹		3
Humanities & Social Sciences Elective ²		3
Credit Hours		17

Spring Semester

APPM 2360	Introduction to Differential Equations with Linear Algebra	4
MCEN 2043	Dynamics	3
MCEN 2063	Mechanics of Solids	3
MCEN 3012	Thermodynamics	3
Humanities & Social Science Elective ²		3

Free Electives	3
Credit Hours	19

Year Three

Fall Semester

MCEN 3017	Circuits and Electronics for Mechanical Engineers	3
MCEN 3021	Fluid Mechanics	3
MCEN 3025	Component Design	3
MCEN 3030	Computational Methods	3
Humanities & Social Science Elective ²		3
Credit Hours		15

Spring Semester

MCEN 3022	Heat Transfer	3
MCEN 4026	Manufacturing Processes and Systems	3
MCEN 4043	System Dynamics	3
College-Approved Writing Course ²		3
General Technical Elective ³		3
Credit Hours		15

Year Four

Fall Semester

MCEN 3032	Thermodynamics 2	3
MCEN 3047	Data Analysis and Experimental Methods	4
MCEN 4045	Mechanical Engineering Design Project 1	3
Humanities & Social Sciences Elective ²		3
ME Technical Elective ⁴		3
Credit Hours		16

Spring Semester

MCEN 4085	Mechanical Engineering Senior Design Project 2	3
Humanities & Social Sciences Elective ²		3
General Technical Elective ³		3
ME Technical Elective ⁴		3
Free Electives		3
Credit Hours		15

Total Credit Hours 128

¹ Refer to the course options listed on the Math/Science Foundations (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/>) webpage.

² Refer to the College's Humanities, Social Sciences, and Writing requirements (<https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/>) webpage.

³ Refer to the course options listed on the General Technical Electives (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/general-technical-electives/>) webpage.

⁴ Refer to the course options listed on the ME Technical Electives (<https://www.colorado.edu/mechanical/academics/undergraduate-program/curriculum/me-technical-electives/>) webpage.

Learning Outcomes

Upon graduation, each graduate of the mechanical engineering program is expected to possess the ability to:

- Identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics.
- 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.
- Communicate effectively with a range of audiences.
- 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.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives.
- Develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Bachelor's–Accelerated Master's Degree Program(s)

The bachelor's–accelerated master's (BAM) degree program options offer currently enrolled CU Boulder undergraduate students the opportunity to receive a bachelor's and master's degree in a shorter period of time. Students receive the bachelor's degree first, but begin taking graduate coursework as undergraduates (typically in their senior year).

Because some courses are allowed to double count for both the bachelor's and the master's degrees, students receive a master's degree in less time and at a lower cost than if they were to enroll in a stand-alone master's degree program after completion of their baccalaureate degree. In addition, staying at CU Boulder to pursue a bachelor's–accelerated master's program enables students to continue working with their established faculty mentors.

BS and MS in Mechanical Engineering

Admissions Requirements

In order to gain admission to the BAM program named above, a student must meet the following criteria:

- Have a cumulative GPA of 3.250 or higher
- Completion of all MAPS requirements and no deficiencies remaining (students admitted to CU Boulder prior to Fall 2023 only)
- Have completed a minimum of 75 credit hours of coursework
- Transfer students must have completed a minimum of 24 credit hours at CU Boulder
- Have completed four of the following six courses: Component Design, Computational Methods, Fluid Mechanics, Heat Transfer, Thermodynamics 1, Thermodynamics 2

Program Requirements

Students may take up to and including 12 hours while in the undergraduate program which can later be used toward the master's degree. However, only six credits may be double counted toward the bachelor's degree and the master's degree. Students must apply to graduate with the bachelor's degree, and apply to continue with the master's degree, early in the semester in which the undergraduate requirements will be completed.

Please see the Mechanical Engineering BAM degree program (<https://www.colorado.edu/mechanical/academics/ms-programs/bachelors-accelerated-masters/>) webpage for more information.

BS in Mechanical Engineering, Professional MS in Materials Science

Admissions Requirements

In order to gain admission to the BAM program named above, a student must meet the following criteria:

- Have a cumulative GPA of 3.25 or higher
- Completion of all MAPS requirements (students admitted to CU Boulder prior to Fall 2023 only)
- Completion of the following six courses with a minimum grade of C in each course: MCEN 3012, MCEN 3021, MCEN 3022, MCEN 3025, MCEN 3030 and MCEN 3032.
- Be enrolled in CHEN 4440
- Provide an unofficial transcript

Students with a GPA below 3.25 (but above 3.0, the university minimum standard) may submit a petition with a letter of recommendation from a professor and a one-page statement of purpose. The statement should briefly describe the student's past work in the field, including any non-course educational experiences or other relevant employment, and the student's plans for graduate study and a professional career.

Program Requirements

Students must declare a track in which to specialize. Students may take up to and including 12 hours while in the undergraduate program that satisfy the specialized track courses and/or the breadth elective courses, which can later be used toward the master's degree. However, only six credit hours may be double counted toward the bachelor's degree and the master's degree. Students must apply to graduate with the bachelor's degree, and apply to continue with the master's degree, early in the semester in which the undergraduate requirements will be completed.

BS in Mechanical Engineering, Professional ME in Engineering Management

Admission Requirements

In order to gain admission to the BAM program named above, a student must meet the following criteria:

- Have a cumulative GPA of 3.000 or higher
- Have at least junior class standing
- Completion of all MAPS requirements (students admitted to CU Boulder prior to Fall 2023 only)

Program Requirements

Students may take up to and including 12 hours while in the undergraduate program which can later be used toward the master's degree. However, only six credits may be double counted toward the bachelor's degree and the master's degree. Students must apply to graduate with the bachelor's degree, and apply to continue with the master's degree, early in the semester in which the undergraduate requirements will be completed.