2022 – 2023 DEGREE WORKSHEET
Bachelor of Science in Mechanical Engineering

The Bachelor of Science Degree in Mechanical Engineering obtained through the Computer Science & Engineering Partnership Program is conferred by the University of Colorado Boulder. Lower-division coursework is completed through Western Colorado University before applying for admission to the University of Colorado Boulder. The entire program is completed on the campus of Western Colorado University. A student may apply for admission to the Western-University of Colorado Boulder Partnership Program when they have satisfied all criteria of one of the following scenarios:

Scenario One

- Complete a college-level, two-course sequence in calculus with a grade of "B-" or higher
- Complete one college-level physical science course (calculus-based physics and/or college chemistry) with a grade of "B-" or higher
- Maintain a cumulative GPA of 3.0 or higher

Scenario Two

- Complete the course sequence listed on the current Program Sheet/Degree Plan for the first and second years
- Maintain a college cumulative GPA of 3.0 or higher

Student Outcomes. Graduates of this program will have...

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. 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
3. an ability to communicate effectively with a range of audiences
4. 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
5. 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
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Program Educational Objectives

The Mechanical Engineering program is designed to prepare students for successful careers having positive societal impact in industry, academia, government, and consulting. Our alumni are expected to:

- Apply their engineering and computer science knowledge, critical thinking, creativity, and problem solving skills with integrity and inclusivity in a professional practice or in non-engineering or technical fields, such as law, medicine, or business.
- Continue their intellectual development through graduate education, professional development courses, self-directed investigation, and/or on-the-job training and experience.
- Embrace leadership and collaborative roles in their careers.

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The Bachelor of Science Degree in Mechanical Engineering requires:

- Transfer of all coursework listed on the plan of study to the University of Colorado Boulder
- At least 45 credits earned from the University of Colorado Boulder (residency requirement)
- A minimum of 128 credits earned to degree program
- Student knowledge and adherence to course prerequisites as listed in the course catalog
- A cumulative and major GPA of at least 2.00 (from entirely CU Boulder coursework as a student's Western GPA will not continue in the CU portion of the program)
- Satisfactory completion of all Minimum Academic Preparation Standards (MAPS) deficiencies
- Successful completion of an outcome measurement prior to graduation

AP & IB Credit
Partnership students are to adhere to CU Boulder standards for AP and IB Scores (not Western standards). These scores are often higher than the score required for credit from Western (particularly those listed below).

- An AP score of 5 is required on **Physics C: Mechanics** to receive credit for General Physics I (4 credits) at CU Boulder (CU PHYS 1110, Western PHYS 200).
- An AP score of 5 is required on **Physics C: Electricity & Magnetism** to receive credit for General Physics II (4 credits) at CU Boulder (CU PHYS 1120, Western PHYS 201).
- An AP score of 4 or higher is required on **Calculus AB** to receive credit for Calculus I (5 credits) at CU Boulder (CU MATH 1300, Western MATH 151)
- An AP score of 4 or higher is required on **Calculus BC** to receive credit for Calculus I (5 credits) and Calculus II (5 credits) at CU Boulder (CU MATH 1300 and 2300, Western MATH 151 and 251)
    - Additionally, a **Calculus BC** score of 3 or higher with an AB sub score of 4 or higher is required to receive credit for Calculus I (5 credits) at CU Boulder (CU MATH 1300, Western MATH 151)
- An AP score of 5 is required on **Chemistry** to receive credit for General Chemistry I with lab (5 credits) at CU Boulder (CU CHEM 1113 and 1114, Western CHEM 121)
- An AP score of 5 is required on either **Computer Science A or Computer Science Principles** to receive credit for Computer Science 1 (4 credits) at CU Boulder (CU CSCI 1300, Western CS 191)

MAPS (Minimum Academic Preparation Standards)
MAPS content areas are usually fulfilled by high school coursework, but sometimes students have to address "MAPS deficiencies" with their college coursework. Typically, one unit equals one year of high school study or one semester of college course work. For engineering students, those who experience a MAPS deficiency most often need to take additional foreign language and/or social science courses. The good news is that these courses can do "double duty" by fulfilling MAPS as well as humanities/social sciences requirements. The MAPS requirement for foreign language is:

2 units in a single foreign language

What this requirement means is that students must demonstrate written and oral language proficiency through the *second-level* of a single foreign language, where *second-level* means a second full year of high school or a second semester college course (e.g., SPAN 1020 Beginning Spanish 2).

The MAPS requirement for social science is 3 units (at least one which must be U.S. or world history).

The full policy on MAPS can be found on the CEAS Degree Requirement website.

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REQUIRED COURSES

Western coursework is in red font, while CU Boulder coursework is in black font.

College Writing Requirement: 3 credit hours

ENG 302	Technical Writing	3

Humanities and Social Sciences: 15 credit hours, 6 of which must be upper-division

Upper-division Humanities & Social Science:

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Remaining (Lower-division) Humanities & Social Sciences:

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Computer Science: 3 credit hours

CS 191	Computer Science II	3

Mathematics and Basic Sciences: 30 credit hours

MATH 151	Calculus I	4
MATH 251	Calculus II	4
MATH 252	Calculus III	4
MATH 358	Differential Equations w/ Linear Algebra	4
CHEM 121	General Chemistry for Engineers	3
PHYS 200	General Physics I w/ lab	4
PHYS 201	General Physics II w/ lab	4
PHYS 320	Modern Physics (or approved Math/Science Foundation)	3

General Engineering: 15 credit hours

ENGR 131	Intro to Engineering Design	3
PHYS 250	Statics	3
ENGR 224	Materials Science	3
ENGR/PHYS 251	Dynamics	3
ENGR 363	Mechanics of Solids	3

TOTAL CREDITS **128**

Mechanical Engineering: 43 credit hours

ENGR 161	Computer-Aided Design	3
ENGR 162	Fabrication	1
ENGR 265	Engineering as a Profession	1
PHYS/ENGR 335	Fluid Mechanics	3
MCEN 3012	Thermodynamics I	3
MCEN 3017	Circuits & Electronics for MEs	3
MCEN 3022	Heat Transfer	3
MCEN 3025	Component Design	3
MCEN 3030	Computational Methods	3
MCEN 3032	Thermodynamics II	3
MCEN 3047	Data Analysis & Experimental Methods	4
MCEN 4026	Manufacturing Processes & Systems	3
MCEN 4043	System Dynamics	3
MCEN 4045	ME Design Project I	3
MCEN 4085	ME Design Project II	3
MCEN 4086	Writing for Design	1

Mechanical Engineering Technical Electives: 6 credit hours of MCEN 3000-level or higher not already in degree

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General Technical Electives: 6 credit hours of selected engineering, science, math, computer science, or engineering management courses at 3000-level or higher not already in degree (subject to departmental approval)

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Free Electives: Credit hours variable

Complete enough electives to bring the total credit hours toward the degree to 128. Normally this is 7 credit hours but could vary (for example due to transfer credits). Please consult with your academic advisor with questions.

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ADDITIONAL DEGREE INFORMATION

Acceptable Course Substitutions:
CHEM 111 + 112 (General Chemistry I with lab, 4 credits) for CHEM 121 (General Chemistry for Engineers, 3 credits).
To investigate additional course substitutions from Western or another institution, check www.transferology.com to verify how applicable courses will transfer to CU Boulder and discuss options with an Academic Advisor.

Approved Humanities & Social Sciences
At least 15 credit hours in humanities and social sciences are required in order to graduate. A list of acceptable humanities and social sciences with Western can be found on the "Humanities and Social Science Requirements" PDF.

Approved Math/Science Foundations
Undergraduate students pursuing the Bachelor of Science in Mechanical Engineering major at CU Boulder are required to complete a Math/Science Foundations course as part of their curriculum. The following Western courses are approved to fulfill that requirement:

- BIOL 150 Biological Principles (with laboratory, 4 credits)
- BIOL 151 Diversity and Patterns of Life (with laboratory, 4 credits)
- BIOL 372 Human Anatomy and Physiology I (with laboratory, 4 credits)
- CHEM 113 General Chemistry II (3 credits, with optional CHEM 114 General Chemistry II lab for 4 credits)
- CHEM 331 Organic Chemistry I (3 credits)
- ECON 216 Statistics for Business and Economics (3 credits)
- GEOL 101 Physical Geology (3 credits, with optional GEOL 105 Physical Geology lab for 4 credits)
- GEOL 201 Historical Geology (with laboratory, 4 credits)
- MATH 113 Statistical Thinking (3 credits)
- MATH 220 Introduction to Advanced Mathematics (3 credits)
- MATH 471 Abstract Algebra I (3 credits)
- PHYS 110 Introductory Astronomy (3 credits)
- PHYS 320 Modern Physics (3 credits)

Please refer to the Math/Science Foundations list for a complete list of CU Boulder courses that have been pre-approved to satisfy this requirement, as students may also choose to take one of those courses directly from CU Boulder.

General Technical Electives
CU Boulder 3000- and 4000- level courses in the following subjects are considered General Technical Electives: MCEN (offered in Gunnison), CSCI (offered in Gunnison), and EMEN (offered remotely). Partnership students are also eligible for any General Technical Electives via offerings in Boulder or remote as indicated on the Full List of General Technical Electives.

Mechanical Engineering Technical Electives
3000- or 4000-level MCEN courses not otherwise required for the major are considered ME Technical Electives. One EMEN 3000-level or higher course, or CSCI 3302, can also apply to this category provided the second ME Technical Elective is completed within MCEN.

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Grade Requirements

The minimum passing grade for prerequisite and co-requisite classes specifically for mechanical engineering majors is a C. This includes courses completed outside the program. **The minimum passing grade for standalone classes is a D–.** Per CEAS Academic Expectations and Policies, if the minimum required grade in a prerequisite course is not achieved, the student is required to repeat the course until the minimum acceptable grade has been earned (maximum of 3 attempts total). If a student takes the advanced (post-requisite) course, it does not remove the obligation to meet the prerequisite course minimum grade requirement, even if the grade earned in the advanced course is acceptable. To remain in good academic standing, students must maintain a **cumulative CU Boulder GPA of 2.00.** In addition, students need to have a cumulative and **major GPA of at least 2.00** to graduate from the CU Boulder College of Engineering.

Taking Courses in Boulder or Remotely

Students considering taking main campus courses in Boulder (including remote courses) to fulfill degree requirements should be aware that these classes may incur additional student fees, since partnership students taking courses in Gunnison pay a reduced fee structure. Tuition discount programs (ex. Western Undergraduate Exchange and Central Plains) do not apply. Online classes (which are different than remote classes and usually offered through Continuing Education) generally do not incur the same additional fees.

Free Electives

College-level coursework accepted by CU Boulder not used otherwise to satisfy BSME degree requirements. Mechanical Engineering does allow courses counting as free electives to be taken on a pass/fail basis (however the college limits use to 6 per semester and 16 cumulative and students must first submit a petition prior to choosing this option). Use www.transferology.com to verify that courses will transfer to CU Boulder as appropriate equivalencies.

Fundamentals of Engineering (FE) Examination

Taking the Fundamentals of Engineering (FE) Examination, fall or spring of the student's senior year (including both the general portion in the morning and the Mechanical Engineering Subject-Specific Section in the afternoon), is encouraged, but not required for this catalog year. Graduation is not contingent upon passing. However, it is beneficial to do so because this exam is the first step toward a Professional Engineer's certification. All partnership student outcomes will be tracked via alternative assessment methods.

Coursework Not Accepted for Transfer Credit

All courses will undergo a transfer evaluation and the credit be transferred to CU Boulder as applicable. The following coursework will not be accepted for transfer credit and will not count toward a degree at CU Boulder, as described in the Campus Transfer Credit Policy:

- any courses in which the grade earned is below a C- (1.70)
- courses identified by CU Boulder as remedial, such as remedial English, mathematics, science and developmental reading
- vocational-technical courses that are offered at two-year and proprietary institutions (exceptions may be granted only by the CU Boulder dean responsible for the student's curriculum)
- courses in religion that constitute specialized religious training or that are doctrinal in nature
- credits earned for work experience or through a cooperative education program
- outdoor leadership education coursework

- credits earned in physical education activity courses
- courses or programs identified as college orientation

Credit hours required for graduation that were earned more than ten years prior to transferring into an undergraduate degree program at CU Boulder may not apply to the completion of a student's graduation requirements.

Students are responsible for making up any difference in credit hours between the transfer credit received and the CU Boulder course. This can happen when students transfer in coursework from an institution on a quarter-system, for example. Furthermore, students must have their Academic Advisor approve how the credit shortfall is made up (based on ABET and other departmental requirements). Students need to have a minimum of 128 unique non-duplicative, degree applicable credit hours, along with meeting the specified course and other requirements for a specific bachelor's degree program per CEAS Transfer Credit Policy.

Academic Standing

To remain in good academic standing with the College of Engineering and Applied Science, a student must maintain satisfactory academic performance as measured by GPA and progress toward completion of a Bachelor of Science degree. Failure to meet these requirements (including the 2.00 GPA) results in the student being placed on Academic Alert, Academic Recovery, and/or Academic Suspension. Students in this situation should consult their Academic Advisor and review the Academic Standing Policies.

Academic Calendar

Western partnership students adhere to the same calendar as Western students (for holiday breaks, etc.). However, add, drop and withdrawal dates for coursework may differ and can be found on the CU Boulder Registrar's Website.

Petition Process

Students seeking an exception to a policy or practice (including transfer coursework policies) should first talk to their Academic Advisor and then submit a petition.

Internship for Credit

Students may receive up to 3 credits of free electives (COEN 3930) for an internship or co-op experience. Students must secure the position prior to completing the application, and have (as well as maintain) a 2.00 GPA. All internships for credit must be full-time (40 hours per week) and a minimum of 300 contact hours are required to receive the 3 credits of free elective. Students can apply online and questions can be directed to their Academic Advisor or Sharon Anderson (CEAS Director of Active Learning).

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RECOMMENDED SEQUENCE OF COURSEWORK

Students are responsible for knowing and adhering to course prerequisites as listed in the course catalog. Certain courses may only be offered during the fall or spring semester. Western coursework is in red font, while CU Boulder coursework is in black font.

First Year

	FALL SEMESTER			SPRING SEMESTER	
MATH 151	Calculus I	4	MATH 251	Calculus II	4
PHYS 200	General Physics I w/ lab	4	PHYS 201	General Physics II w/ lab	4
CHEM 121	General Chemistry for Engineers	3	ENGR 131	Intro to Engineering Design	3
CS 190	Computer Science I (free elective)	3	CS 191	Computer Science II	3
ENG 102	Academic Writing (free elective)	3		H&SS Elective (Lower-Division)	3
HWTR 100	Headwaters (free elective)	1			
	TOTAL Semester hours	18		TOTAL Semester hours	17

Sophomore Year

	FALL SEMESTER			SPRING SEMESTER	
MATH 252	Calculus III	4	MATH 358	Diff Equations w/ Linear Algebra	4
PHYS 250	Statics	3	ENGR/PHYS 251	Dynamics	3
PHYS 320	Modern Physics (or approved Math/Science Foundation)	3	ENGR/PHYS 335	Fluid Mechanics	3
ENGR 161	Computer-Aided Design	3	ENGR 265	Engineering as a Profession	1
ENGR 197	Fabrication	1	ENGR 363	Mechanics of Solids	3
ENGR 224	Materials Science	3	ENG 302	Technical Writing	3
	TOTAL Semester hours	17		TOTAL Semester hours	17

Junior Year

	FALL SEMESTER			SPRING SEMESTER	
MCEN 3012	Thermodynamics I	3	MCEN 3032	Thermodynamics 2	3
MCEN 3017	Circuits & Electronics for MEs	3	MCEN 3047	Data Analysis & Experimental Methods	4
MCEN 3025	Component Design	3	MCEN 4026	Manufacturing Processes & Systems	3
MCEN 3030	Computational Methods	3		MCEN Technical Elective	3
	MCEN Technical Elective	3		H&SS Elective (Lower-Division)	3
	TOTAL Semester hours	15		TOTAL Semester hours	16

Senior Year

	FALL SEMESTER			SPRING SEMESTER	
MCEN 3022	Heat Transfer	3	MCEN 4085	ME Design Project II	3
MCEN 4043	System Dynamics	3		General Technical Elective	3
MCEN 4045	ME Design Project I	3		H&SS Elective (Upper-Division)	3
MCEN 4086	Writing for Design	1		H&SS Elective (Upper-Division)	3
	General Technical Elective	3			
	H&SS Elective (Lower-Division)	3			
	TOTAL Semester hours	16		TOTAL Semester hours	12

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