

Colorado State University – Pueblo

Master of Science
in Industrial and Systems Engineering
(MSISE)
and
Master of Science in Engineering
(MSE)

Department of Engineering

Graduate Student Handbook

Dear graduate student,

In many engineering circles today a prevailing opinion is that the Master's degree should be the first professional engineering degree. So, the question is not *whether to earn a Master's degree* but *when and where to get it*. Thank you for choosing a Master of Science degree at Colorado State University – Pueblo. We offer the MS in Industrial and Systems Engineering (MSISE), the MS in Engineering with emphasis areas in Mechatronics and Railroad Engineering. Our degrees have the following strong features:

- Industrial and Systems Engineering, Mechatronics, and Railroad Engineering are strong and growing professions in the USA offering excellent career opportunities;
- The engineering curricula at CSU-Pueblo provides students with a strong engineering education needed in industry today;
- CSU-Pueblo's low faculty-to-student ratio allows close student interactions with faculty and professionals in the Pueblo area;
- CSU-Pueblo was named among the top “real world” colleges by author Michael Viollt in his book “201 Colleges for the Real World,” and
- CSU-Pueblo is located in Pueblo, Colorado, a place averaging 320 sunny days a year.

If you have a degree in any quantitative major, our MSISE program can add valuable skills you can use to improve organizations and businesses. Our graduates work for manufacturing, distribution, health care, and telecommunications companies as well as for governmental and educational institutions.

The MSE with Mechatronics emphasis area provides course work in a exciting area combining mechanical, electrical, and computer engineering. Any device with a computer brain is a mechatronics device.

The MSE with Railroad Engineering emphasis area will prepare you to work for a wide range of companies in the railroad field.

At CSU-Pueblo, the university environment is created to support your learning. Our exceptional faculty members are dedicated to help you achieve your educational goals. The fellow students will make this a life-long experience.

Sincerely,

Jude DePalma, Chair

Department of Engineering

(719) 549-2036

<https://www.csupueblo.edu/profile/jude-depalma/index.html>

This handbook describes the structure of the MSISE and MSE programs. Additional rules are given in the Graduate Programs section of the CSU-Pueblo catalog, available online at: <https://www.csupueblo.edu/catalog/index.html>.

Admission Requirements

The MSISE and MSE programs are open to applicants with quantitatively based baccalaureate degrees from accredited colleges or universities. Students with non-quantitatively based baccalaureate degrees may be admitted conditionally, but additional prerequisites may be required. A completed application for admission to graduate programs and a \$35 application fee must be sent to the CSU-Pueblo Office of Admissions. This fee is non-refundable and is not applicable toward tuition. An online application can be submitted at the web page: <https://www.csupueblo.edu/admissions/apply-now.html>.

Official transcripts of all college and university work must be sent directly to the Office of Admissions by each institution attended. Records received directly from students cannot be accepted except for advisement purposes. If you previously attended CSU-Pueblo, you do not need to request that transcript.

All applicants must submit the score from the aptitude portion of the Graduate Record Examination (GRE). A total GRE score of 300 is the minimum required for admission to regular status (the minimum is 1000 on the old GRE scales).

An English language proficiency test (test of English as a Foreign Language Proficiency – TOEFL) is required for students whose native language is not English. A minimum score of 500 (TOEFL- paper based), 173 (TOEFL – computer based), or 80 (Michigan) is required for admission. Level 6 proficiency from the American Language Academy will also be accepted. Students who complete an undergraduate degree at an institution in the United States are exempt from this requirement.

Submit application materials to:

Office of Admissions
Colorado State University – Pueblo
2200 Bonforte Blvd.
Pueblo, CO 81001-4901
(719) 549-2462

Admission Status

Applicants are admitted with regular, conditional, non-degree, or guest status, as determined by specific criteria.

Regular Status:

Regular status admission will be given to students who hold a baccalaureate degree from an accredited university or college with an undergraduate GPA of at least 3.0, who submitted an acceptable Graduate Record Examination (GRE) score (above 300 total), who have a completed admissions file, and who have complied with any additional requirements from the MSISE/MSE Program Directors.

Conditional Status:

Conditional status admission may be assigned to students whose undergraduate GPA is above 2.5 yet below 2.8, provided the recommendations and GRE score indicate the applicant has the potential to complete graduate work satisfactorily; the admission letter will specify conditions that the student must meet to achieve regular status. A student may also be conditionally admitted while completing the prerequisite courses (see Prerequisite Requirements below). Students must complete all prescribed prerequisites as determined by the Program Director before completing 12 semester hours of graduate coursework.

Non Degree Status:

Non-degree status may be assigned to students desiring graduate coursework for professional development. Non-degree students will document prerequisite background for graduate courses in which they enroll for professional purposes.

Non-degree status may also be assigned when the student's record shows that he/she does not meet the qualifications for admission to a degree program with conditional or regular status. In this case, with the approval of the Program Director, the Director of Admissions will notify the student of the deficiency, the procedure to follow to become qualified, and the name of the Program Director who can assist the student. The Director will be sent a copy of the notification.

A student with non-degree status who has completed 12 hours approved by the MSISE Program Director with a 3.0 GPA or better at CSU-Pueblo may petition the Program Director for a change to the regular degree-seeking status. A maximum of 12 hours taken in non-degree status may be applied toward a degree. Their inclusion requires the approval of the Program Director. Although non-degree students may claim a maximum of 12 semester hours of graduate coursework earned while holding non-degree status, a GRE score needs to be received before permission will be given to enroll in MSISE courses for a second semester.

Prerequisites Requirements

Students will be required to demonstrate preparation for graduate study in the chosen field by completing prerequisite background courses or by documenting previous equivalent course of experiential work. Students who do not possess the specified prerequisite background may be admitted conditionally but will be required to complete prescribed prerequisites. Courses used as prerequisites for required graduate courses must be taken for credit and do not count in the MSISE/MSE program of study. For each prerequisite, the equivalent CSU-Pueblo course is listed in parenthesis. Note that some courses may have other undergraduate level prerequisites.

MSISE Prerequisites

- Two semesters of calculus (Math 126 and Math 224)
- Two semesters of calculus-based physics (PHYS 221/221L and 222/222L)
- Computer programming, preferably in Matlab (EN 103)
- Engineering economy or finance (EN 343)
- Calculus based probability and statistics (EN 375)

MSE Mechatronics prerequisites

- Two semesters of calculus (Math 126 and Math 224)
- Two semesters of calculus-based physics (PHYS 221/221L and 222/222L)
- Computer programming, preferably in Matlab (EN 103)
- Engineering economy or finance (EN 343)
- Engineering mechanics (statics and dynamics), (EN 211 and 212)
- Electrical circuits (EN 231/231L)
- Electromechanical devices (EN 263)
- Linear analog control systems theory (EN 360)

MSE Railroad engineering prerequisites

- Two semesters of calculus (Math 126 and Math 224)
- Two semesters of calculus-based physics (PHYS 221/221L and 222/222L)
- Computer programming, preferably in Matlab (EN 103)
- Engineering economy or finance (EN 343)
- Calculus based probability and statistics (EN 375)
- Engineering mechanics (statics and dynamics), (EN 211 and 212)
- Electrical circuits (EN 231/231L)
- Linear analog control systems theory (EN 360)

Program of Study

A graduate degree program involves specialized study in a planned, coherent framework. Each MSISE or MSE student selects an advisor in the first semester of study and works with that advisor to develop a plan of study meeting the requirements below. The plan of study must be approved by the student's advisor and the Program Director before the beginning of the student's second semester in the program. The plan of study can be changed, with approval of the advisor and the Program Director. A signed printed copy and an electronic version should be submitted to the Program Director. The university requires submission of a graduation planning sheet the semester before graduation and the courses listed there must match the plan of study.

1. Introduction to study for the MSISE.

Every MSISE/MS program of study must include EN 593 (2 credits, Fall semester). In this seminar, the students are exposed to different areas of engineering, to the nature of graduate education and thesis research, and to the specialty areas of each professor. The seminar helps the student select a faculty advisor and to decide whether to do a thesis.

2. Core knowledge.

Every MSISE graduate must demonstrate knowledge of material in these core MSISE courses.

- EN 520 (4 credits, Spring semester) Simulation Experiments
- EN 571 (3, Fall) Operations Research
- EN 575 (3, Fall) Facility Planning and Design
- EN 577 (3, Spring) Operations Planning and Control

Students with an undergraduate degree in industrial engineering may have the equivalent of some courses, but exemption from these courses is not automatic.

Every MSE graduate with emphasis area in Mechatronics must demonstrate knowledge of material in these core Mechatronics courses.

- EN 507 (3, Fall) Virtual Reality.
- EN 513 (3, Spring) Artificial Intelligence.
- EN 561 (3, Fall) Advanced Controls.
- EN 563 (3, Spring) Intelligent Robotics.

Every MSE graduate with emphasis area in Railroad Engineering must demonstrate knowledge of material in these core Railroad Engineering courses.

- EN 511 (3, Fall) Structural Engineering.
- EN 531 (3, Spring) Railroad Power Systems.
- EN 551 (3, Spring) Fleet Management.
- EN 552 (3, Fall) Vehicle Dynamics.

3. *Electives*

In consultation with his or her advisor, the student selects electives so that, as a whole, the program of study is a coherent plan that prepares the student for thesis work, for future employment, or for career advancement. Electives can be chosen from the core courses outside the student's major, from other elective graduate courses in engineering, and from graduate courses in other departments.

For MSISE students, strong supporting courses include EN 513 Artificial Intelligence, EN 551 Fleet Management and courses in Accounting, Business Administration, Computer Information Systems, Economics, Finance, Management, or Marketing that can support a focus in Engineering Management.

Students are encouraged to include EN 588 Graduate Projects, and EN 590 Special Projects. A Graduate Project is the application of what you have learned in classes, usually to a project involving a real application in some organization. A Special Project is course work under the direct supervision of a faculty member, including directed reading, laboratory work, and other work. For 3 credits, the student is expected to meet at least 1 hour per week with the faculty member and to spend at least 10 total hours a week on the project. Since Engineering faculty have special expertise in certain tracks and since many students have specific knowledge they want for professional progress, a Graduate Project or a Special Project involving a match between faculty expertise and student desire for knowledge presents an opportunity for a highly individualized learning experience.

Other graduate courses not included in the core of any of the three programs are:

EN 503 Ergonomics

EN 504 Sequencing and Scheduling*

EN 539 Time and Motion Studies

EN 540 Safety Engineering

EN 541 and EN 541L Engineering of Manufacturing Processes

EN 543 Quality Control and Reliability

EN 544 Advanced Engineering Economics*

EN 556 Design and Analysis of Experiments*

EN 560 and EN 560L Control Systems II

EN 563 Intelligent Robotics

EN 573 and 573L Computer Integrated Manufacturing

See the CSU-Pueblo catalog for details on these courses. Courses marked with * are not offered regularly.

Other requirements

Since each student will receive a graduate degree, each program of study must include at least 21 credit hours of graduate engineering courses; the 21 credit hours may include graduate projects (EN 588), special projects (EN 590), and thesis (EN 599) hours.

The total program must be at least 33 credit hours.

The program of study may include at most 9 credit hours of graduate level work at another institution.

Thesis

Each student selects either the General Emphasis Option or the Thesis Option. The General Emphasis Option does not require a thesis. The Thesis Option requires the completion of a research thesis. While it is not required, all students are encouraged to choose the thesis option. A student who intends to study for a Ph.D. is strongly encouraged to do a thesis.

Students must submit a research plan prior to the thesis work. The plan must define the topic of study and outline the research design. The research/thesis plan should be filed as soon as possible after the degree plan is filed and before 18 credit hours of the student's degree plan have been completed. The plan must have the written approval of all members of the student's graduate committee and the program director/coordinator. The thesis advisor should be an engineering faculty member. The graduate committee shall consist of at least three faculty members approved by the thesis advisor and the program director/coordinator. The thesis committee should include at least one additional member with PhD. At least two members of the committee must be from within the department of the student's graduate program. Changes in membership in the graduate committee may be requested in writing by the student to the program director/coordinator.

A student who does a thesis must take at least 6 credits of EN 599; no more than 6 hours of EN 599 can be counted toward the required 33 credit hours. All students admitted to a graduate program at Colorado State University-Pueblo are required to be continuously registered in the fall and spring semester throughout their degree programs. This policy applies from the time of first enrollment through the graduation term. Students may fulfill this requirement by registering for any graduate credit-bearing course (regular or non-regular). As an alternative, students may opt for a Continuous Registration (CR) status. See the catalog for more details on CR.

The library requires one copy of the thesis on high-quality paper (paper that has a minimum of 25 percent rag content) and an electronic copy of the thesis. In addition, the Department requires two bound copies. It is customary, but not required, for the student to give a bound copy to each member of the thesis committee. The student submits sufficient unbound copies to the library, which arranges for binding, at the expense of the student.

Continuous Registration

All students admitted to a graduate program at Colorado State University-Pueblo are required to be continuously registered in the fall and spring semesters throughout their degree programs. If the student is not taking any courses, continuous registration can be accomplished by registering for CR (Continuous Registration) status and paying the fee. See the university catalog for more information.

Dual Degree Credit

Up to six semester hours of elective credit may be applied to more than one graduate program if the degrees are pursued concurrently pending approval of the graduate committees of the programs involved and the Graduate Studies Board.

Graduation Requirements

Degree candidates must:

- Have regular student status.
- Complete 33 semester hours of approved course work.
- Submit a graduation planning sheet to the Program Director prior to the semester in which graduation is to occur (deadline for submission is published in the semester schedule of courses).
- Earn a cumulative grade-point average (GPA) of 3.0 or better at graduation. A maximum of six semester hours of course work at the grade of C may apply toward graduation. A minimum of 24 semester hours in the approved degree plan must have been earned at CSU-Pueblo.
- When completing a thesis, the student will submit to the Library one electronic copy and a sufficient number of approved copies of the thesis for binding. The bound thesis will be distributed to each of the following: one to the Program Director, one to the University Library, one to each committee member, and one to the department.

Financial Support

Graduate Assistantships

Full-time students admitted to the program with regular status are eligible to apply for graduate assistantships. Graduate assistants may get additional assistance to pay tuition and fees. Full-time assistantships require students to work an average of 12 hours per week and carry a stipend. Students awarded full-time positions are required to choose the thesis option unless excused by the MSISE Program Director. Half-time assistantships require students to work an average of 6 hours per week and carry a stipend. The stipend amount varies. Assistantships are renewable for a second academic year provided students perform satisfactorily in assistantship assignments, remain in good academic standing, and make satisfactory progress toward the completion of their degree programs.

An application for assistantship consists of a letter or email of interest, résumé, and GRE scores addressed to the department chair. The deadline for applications is April 1 for the following academic year.

Financial Aid

Financial aid in the form of other assistantships, scholarships, fellowships, grants, and loans are available from a variety of sources including the National Science Foundation, NASA, and the Society of Women Engineers. Deadlines and applications may be obtained from the CSU-Pueblo Foundation at (719) 549-2380. The Department of Engineering serves as another source of information on these programs and additional grant-supported assistantships (for which qualifications may vary from the CSU-Pueblo assistantships, described in Graduate Assistantships), as well as job opportunities. In addition, the university offers the following scholarships:

Frank J. Helwig Memorial Scholarship:

Graduate students in ISE who are U.S. citizens, meet the academic criteria, and demonstrate financial need are eligible. The scholarship provides the equivalent of Colorado resident tuition and fees for up to two years.

Lindsey Education for Science and Technology Scholarship:

The scholarship is for exceptional students in financial need. The graduate student must be a full-time student, have received a degree from an accredited baccalaureate institution, and have a minimum GPA of 3.4. The scholarship is \$1,000.

Crane Scholarship:

The scholarship is based on financial need and pays tuition and fees. Applicants must be U.S. citizens. The scholarship is renewable.

Course Descriptions

The university catalog containing course descriptions is available at:
<https://www.csupueblo.edu/catalog/index.html>.

Changes

13 Sep 2014: Linear analog control systems theory (EN 360) had been incorrectly omitted from MSE Railroad engineering prerequisites and was added.

39 Jan 2019: Links updated